Maternal and paternal feeding practices : links with young children's eating behaviours and influencing factors : a systemic approach.

Kaat Philippe

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By

Kaat PHILIPPE

MATERNAL AND PATERNAL FEEDING PRACTICES: LINKS WITH YOUNG CHILDREN'S EATING BEHAVIOURS AND INFLUENCING FACTORS. A SYSTEMIC APPROACH.

Defended in Dijon on October 22nd, 2021

Jury composition:

Prof. Dr. Jacqueline BLISSETT	Aston University, UK	Reviewer
Dr. Gertrude ZEINSTRA	Wageningen University & Research, NL	Reviewer
Dr. Leigh GIBSON	University of Roehampton, UK	Examiner
Prof. Dr. Edith SALES-WUILLEMIN	Université de Bourgogne, FR	President of the Jury
Dr. Sylvie ISSANCHOU	UMR CSGA, INRAE, FR	Thesis director
Dr. Sandrine MONNERY-PATRIS	UMR CSGA, INRAE, FR	Thesis co-director

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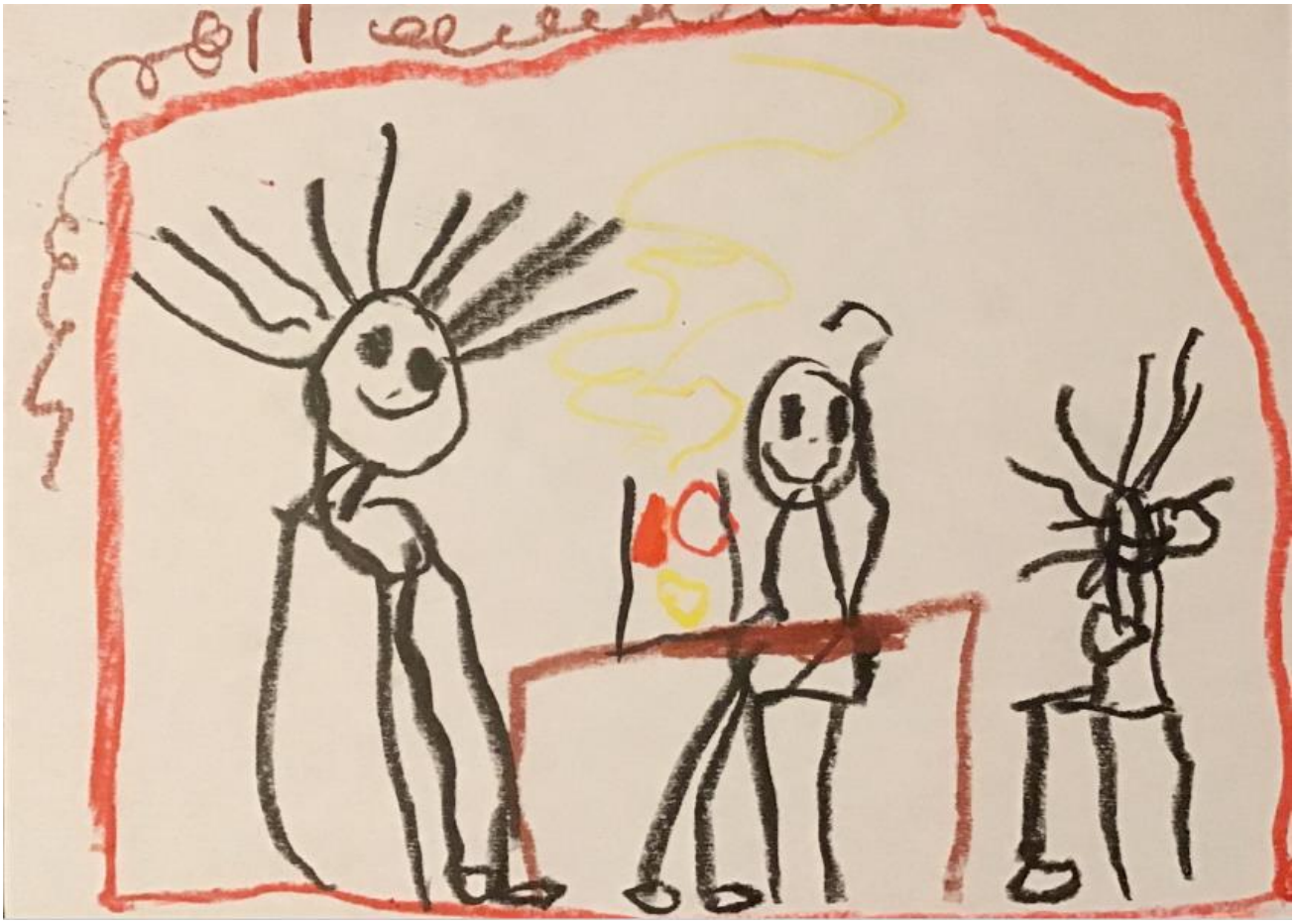
EDULIA

For more information about the European project Edulia, see: https://edulia.eu/



« *Papa, maman et moi à table* » – Priam Michels, 5 ans

Keywords

Appetite, body mass index, boredom, caregivers, children, couples, COVID-19, cross-sectional, development, early childhood, eating behaviours, eating in the absence of hunger, emotions, fathers, feeding practices, feeding styles, food culture, food enjoyment, food neophobia, food preferences, food rejection, gender differences, health, inhibitory control, mothers, mealtimes, nutrition, paediatrics, parents, portioning practices, picky eating, predictors, pre-schoolers, psychology, recommendations, qualitative approach, questionnaire, self-regulation of eating, sociodemographic characteristics, sociology, temperament, weight

Abstract

Parents play a key role in the development of children's eating preferences and behaviours. This doctoral project aimed to gain more insight into the feeding practices mothers and fathers use for pre-schoolers in France and Denmark. Four studies, combining quantitative and qualitative methods, were conducted to study the links between maternal and paternal feeding practices/styles and child eating behaviours, possible predictors of parental feeding and portioning practices, and gender differences in feeding practices and parental involvement in child feeding. Special attention was also paid to cultural influences and how changes in the context (due to the COVID-19 pandemic) can influence eating and feeding behaviours. The results, presented in six articles in this doctoral thesis, showed that maternal and paternal feeding practices/styles were significantly linked with child eating behaviours. Both in France and Denmark, fathers were found to use higher levels of coercive control practices than mothers. A systemic look at the results revealed that many child-related (e.g., appetite, food preferences and behaviours, developmental skills), parent-related (e.g., sociodemographic characteristics, self-efficacy/confidence), and external-related factors in their immediate and larger environment (e.g., food culture) influence parental feeding and portioning practices. These results provide valuable indications on the steps that still need to be taken to overcome certain methodological limitations, which issues need to be further explored taking into account parental and cultural diversity, and how mothers and fathers can be helped to create a positive and healthy eating environment for their child. Based on the results and insights obtained in this doctoral project, it is suggested that guidance for parents and structural changes in society (nudges, laws) could be of interest to facilitate this.

Résumé

Les parents jouent un rôle clé dans le développement des préférences et des comportements alimentaires des enfants. Ce projet de thèse visait à mieux comprendre les pratiques éducatives en matière d'alimentation des mères et des pères utilisées pour les jeunes enfants en France et au Danemark. Quatre études, combinant des méthodes quantitatives et qualitatives, ont été menées pour étudier les liens entre les pratiques éducatives maternelles/paternelles et les comportements alimentaires des enfants, les prédicteurs possibles des pratiques éducatives des parents, les différences genrées dans les pratiques éducatives et l'implication des parents dans l'alimentation des enfants. Une attention particulière a également été accordée aux influences culturelles et à la manière dont les changements de contexte (en raison de la pandémie de COVID-19) peuvent influencer les comportements alimentaires. Les résultats, présentés dans six articles dans cette thèse, ont montré que les pratiques éducatives en matière d'alimentation des mères et des pères étaient significativement liées aux comportements alimentaires des enfants. Tant en France qu'au Danemark, les pères ont recours à des niveaux plus élevés de pratiques de contrôle coercitif que les mères. Un examen systémique des résultats a révélé que de nombreux facteurs liés à l'enfant (ex., appétit, préférences et comportements alimentaires, capacités développementales), aux parents (ex., caractéristiques socio-démographiques, auto-efficacité/confiance), et des facteurs externes (ex., culture alimentaire) influencent les pratiques éducatives en matière d'alimentation et de détermination des tailles de portion. Ces résultats fournissent des indications précieuses sur les étapes qui restent à franchir pour surmonter certaines limites méthodologiques, quels sujets doivent être approfondis en tenant compte de la diversité parentale et culturelle, et comment les mères et les pères peuvent être accompagnés pour créer un environnement alimentaire positif et sain pour leur enfant. Sur la base des résultats et des connaissances acquis dans ce projet de doctorat, des conseils à destination des parents et des propositions de changements structurels au niveau sociétal (nudges, lois) sont discutés afin de faciliter cet accompagnement.

Acknowledgements

First, I would like to thank Prof. Dr. Jacqueline Blissett, Dr. Gertrude Zeinstra, Dr. Leigh Gibson, and Prof. Dr. Edith Sales-Wuillemin for accepting to be part of my jury. I am grateful for their interest in my work and the time they have invested in reading my doctoral thesis. I am also thankful for their presence at my defence (which is not evident during a pandemic), and for the stimulating discussions.

Second, I warmly thank my amazing supervisors, Sandrine Monnery-Patris and Sylvie Issanchou. Their passion for their job, dedication, enthousiasm, knowledge and support has inspired me throughout my PhD journey and motivated me to reach my goals with enjoyment. Thank you for always being there for me. It was a true pleasure working with you.

Third, I want to thank Claire Chabanet, who has supported me in my statistical adventures. Her patience, eye for precision, and critical thoughts have helped me to gain a deeper understanding of statistical methods and to always look for better options and solutions.

Futher, I also want to thank Sophie Nicklaus for welcoming me in her research team in Dijon, and all my dear colleagues of team 8. I enjoyed all lunch and coffee breaks, birthday celebrations, and chats in the hallway. Many have also become precious friends in Dijon. In addition, I would like to thank those colleagues at INRAE/CSGA who have helped me with administration, data-collection and data-input. I also want to thank Natalie Rigal and Camille Schwartz for the interesting discussions during my PhD committees, and the schools, childcare centres, ethical committees, and recruitment agencies for helping me with my studies and of course all families who were willing to participate.

This doctoral project was part of the European project EDULIA with many motivated and inspiring people. I would like to thank the whole consortium and my fellow ESRs for the efforts to make this project a success, to share happy and successful moments but also to share doubts and to support each other in more challenging times. A special thank you goes to the people at the Insitut Paul Bocuse Research Center in Ecully and the MAPP centre in Aarhus. I felt very welcome in these research teams, learned a lot, and had a lovely research stay because of their efforts and warmth.

Last, but not least, I would like to thank my lovely friends and family. The ones I knew from before the start of my PhD, who stay faithful to our friendship, but also my many new friends in France and Denmark with whom I’ve shared joy and challenges. Obviously, also a special thank you to my dear parents who have always supported me in all my crazy ideas. I know I can count on them when needed and that means a lot! Thank you for all the visits, listening to my struggles, and help with moving (multiple times).

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List of Abbreviations

Abbreviation	Definition
ASP	Autonomy support practices
BMI	Body mass index
CBQ	Children's Behavior Questionnaire
CCP	Coercive control practices
CEDQ	Children's Eating Difficulties Questionnaire
CEBQ	Child Eating Behaviour Questionnaire
CFA	Confirmatory factor analyses
CFI	Comparative fit index
CFQ	Child Feeding Questionnaire
CFPQ	Comprehensive Feeding Practices Questionnaire
CFRS	Children Food Rejection Scale
CFSQ	Caregiver's Feeding Styles Questionnaire
COVID-19	Coronavirus disease 2019
CSGA	Centre des Sciences du Goût et de l'Alimentation (Centre for Taste and Feeding Behaviour)
DK	Denmark
EAH	Eating in the absence of hunger
EAH-C / EAH-P	Eating in the Absence of Hunger Questionnaire for Children and Adolescents / for Parents
ESR	Early stage researcher
FNSC	Food Neophobia Scale for Children
FPSQ-28	Feeding Practices and Structure Questionnaire
FR	France
FSQ	Feeding Style Questionnaire
HomeSTEAD	Home Self-Administered Tool for Environmental Assessment of Activity and Diet Family Food Practices Survey
IFQ	Infant Feeding Questionnaire
IMC	Indice de masse corporelle
IPB	Institut Paul Bocuse

Abbreviation	Definition
IRD	Institutional review board
ITN	Innovative Training Networks
M	Mean
NL	the Netherlands
PNNS	Programme National Nutrition Santé
	(French national nutrition and health programme)
RMSEA	Root means square error of approximation
SEM	Structural equation modelling
SD	Standard deviation
SE	Standard errors
SP	Structure practices
TLI	Tucker-Lewis Index
US / USA	United States of America
WHO	World health organisation
WP	Work package

List of Valorisations

Published papers resulting from the doctoral project

Philippe, K., Chabanet, C., Issanchou, S., & Monnery-Patris, S. (2021). Child eating behaviors, parental feeding practices and food shopping motivations during the COVID-19 lockdown in France: (how) did they change? ***Appetite***, *161*, 105132. https://doi.org/10.1016/j.appet.2021.105132

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Philippe, K., Chabanet, C., Issanchou, S., Monnery-Patris, S. Child eating behaviours and parental feeding practices during the COVID-19 lockdown in France: did they change? ***Journée des doctorants*** (CSGA), Dijon, France (Online conference), 1 December 2020.

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Philippe, K., Feyen, V., Roger, A., Issanchou, S., Monnery-Patris, S. Comment les parents déterminent les tailles de portions destinées à leur enfant ? Approche sociologique. ***Journées Francophones de Nutrition***, Lille, France, 10-12 November 2021.

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Philippe, K. Poster award Forum des Jeunes Chercheurs (€50). Université de Bourgogne Franche-Comté. 2019.

Philippe, K. Poster award Journées des doctorants. Centre des Sciences du Goût et de l'Alimentation. 2019.

Philippe, K. Conference travel grant (€500). Université de Bourgogne. 2020.

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Philippe, K. (2019). Get to know the early stage researchers – interview with Kaat (ESR7).

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Philippe, K. (2021). New paper: Child eating behaviors, parental feeding practices and food shopping motivations during the COVID-19 lockdown in France: (How) did they change?

Philippe, K. (2021). Secondment at the MAPP centre, Aarhus University, Denmark – Kaat Philippe (ESR7).

Philippe, K. (2021). New paper: Are food parenting practices gendered? Impact of mothers' and fathers' practices on their child's eating behaviors.

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COMPORTEMENTS ALIMENTAIRES DES ENFANTS : LE RÔLE DES PARENTS

→ PSYCHOLOGIE

KAAT PHILIPPE est jeune chercheuse en psychologie au Centre des Sciences du Goût et de l'Alimentation, à Dijon. Les chercheurs de son équipe étudient le comportement alimentaire, des bébés jusqu'aux personnes âgées. Kaat s'intéresse aux comportements alimentaires des enfants âgés de 2 à 6 ans. Quel rôle jouent les parents dans le développement de ces comportements ? C'est ce qu'elle cherche à savoir grâce à des questionnaires et des entretiens.

« Grandir n'est pas toujours facile, ni pour l'enfant ni pour les parents. En tant que psychologue et chercheuse, j'essaie de mieux comprendre les comportements des deux et leurs interactions, pour pouvoir les soutenir au besoin. »

Kaat Philippe

En grandissant, les enfants apprennent à manger des aliments variés, et tous n'ont pas les mêmes habitudes et préférences. Les parents jouent un rôle important dans cet apprentissage, et leurs pratiques éducatives en matière d'alimentation peuvent être très différentes. Par exemple, certains parents sont stricts, obligent leur enfant à manger à table, toujours à la même heure. Ils mettent de la pression pour que leur enfant goûte les aliments ou pour qu'il finisse son assiette. D'autres, par contre, sont très permissifs. Comment ces différentes pratiques éducatives sont liées aux comportements alimentaires des enfants ? C'est ce que cherche Kaat.

Elle étudie les enfants entre 2 et 6 ans parce qu'à cet âge-là, les repas sont souvent un moment de conflit : beaucoup d'enfants refusent les aliments qu'ils ne connaissent pas. Les chercheurs appellent ce comportement « néophobie alimentaire ».

Par ailleurs, certains enfants sont aussi très sélectifs vis-à-vis des aliments proposés : ils les refusent à cause de leur texture ou de leur goût. Souvent, les enfants rechignent à manger les fruits et légumes alors que ces aliments sont conseillés pour rester en bonne santé.

Pour mener ses recherches, Kaat a diffusé des questionnaires détaillés à plus de 800 mères et pères. Ils répondaient à différentes questions sur les comportements de leur enfant et sur leurs pratiques éducatives et leurs propres habitudes alimentaires. Elle utilise ensuite des calculs statistiques sur son ordinateur pour relier entre eux ces différents aspects.

Ses résultats permettront de mieux comprendre le rôle des parents dans le développement des habitudes alimentaires des enfants et de proposer des recommandations aux parents.

LES OBJECTIFS

- Etudier les liens entre les comportements alimentaires des jeunes enfants et les pratiques éducatives des parents en matière d'alimentation
- Comparer les pratiques françaises et danoises : elles pourraient être différentes à cause de différentes cultures alimentaires (*Kaat fera un séjour de 6 mois au Danemark*)

L'EXPÉ www.experimentarium.fr L'EXPÉ www.experimentarium.fr

Philippe, K. Les habitudes alimentaires des familles françaises pendant le confinement lié au COVID-19 : (comment) ont-elles changé ? **Nuit européenne des chercheur·e·s**, Online event, 27 November 2020. See also: https://blog.u-bourgogne.fr/nuit-des-chercheurs/2020/10/26/chercheurs-dijonnais-participant-au-speed-searching-de-la-nuit-2020/

Philippe, K. Les habitudes alimentaires des familles françaises pendant le confinement lié au COVID-19 : (comment) ont-elles changé ? **L'Expérimentarium**, Online event, 28 March 2021. See also: https://www.experimentarium.fr/evenements/lexperimentarium-tient-salon-domicile-0

Philippe, K. Pratiques éducatives des pères et mères en matière d'alimentation en France et au Danemark. Nouveaux résultats. **Nuit européenne des chercheur·e·s**, Dijon, 24 September 2021. See also : https://www.inrae.fr/actualites/retour-nuit-europeenne-chercheures-2021-dijon

Other

CERIN, a French nutritional research and information centre has published two French summaries of studies by Kaat Philippe on their website, based on her conference presentations:

CERIN. (2020). JFN 2020 : Covid-19, confinement et conséquences nutritionnelles. https://www.cerin.org/breves-scientifiques/jfn-2020-covid-19-confinement-et-consequences-nutritionnelles/

CERIN. (2021). BFDG 2021 : pratiques éducatives parentales et comportements alimentaires des enfants. https://www.cerin.org/actualites/bfdg-2021-pratiques-educatives-parentales-et-comportements-alimentaires-des-enfants/?fbclid=IwAR0rjh3vccnp5rO1CX6fzRKvMj0rdreC9WaeKKyPIcyMx89X5B-KWSxQfnE

List of courses and training

2018

Sensibilisation to the transversal competences of a PhD @ Université de Bourgogne, Dijon (FR)

2019

Edulia PhD seminar & Training school @ Wageningen University & Research, Wageningen (NL)
Communication workshops, Sensory practice workshop, Theoretic courses

Data protection course @ Université de Bourgogne, Dijon (FR)
Protecting your research in the digital age

Statistics course @ INRA, Dijon (FR)
Working with R software

Ethics course @ Université de Bourgogne, Dijon (FR)
Research ethics in social sciences: qualitative and quantitative surveys

First aid at work @ INRA, Dijon (FR)

Ethics course @ Université de Bourgogne, Dijon (FR)
Synergy between ethics and research - Consent to research

Research methods course @ INRA, Latresne (FR)
Systematic literature review and meta-analysis

Language course @ Université de Bourgogne & INRA, Dijon (FR)
French, advanced level

2020

Edulia PhD seminar & Training school @ INRAE, Dijon (FR)
Ethics course, Career perspectives, Theoretic courses, School canteen visits

Research communication course @ Université de Bourgogne, Dijon (FR)
Expérimentarium: communicating your research to different audiences

Economic Psychology @ Aarhus University, Aarhus (DK)

Language course @ A2B, Aarhus (DK)
Danish, level 1 & 2

2021

Edulia PhD seminar & Training school @ University of Florence, Florence (IT) (online)
Gender studies, Statistics courses, Food labelling, Theoretic courses

Early-Career Researcher Event @ British Feeding and Drinking Group, Leeds (UK) (online)
Career perspectives, Conducting research online, Reviewing articles

Preface

This doctoral project is part of the European project Edulia (Innovative Training Networks Marie Sklodowska-Curie, grant agreement No 764985). This project "*responds to the urgent need of the EU society to find new ways to tackle the escalating issue of obesity, through promoting healthier eating from childhood, within the context of choice. Based on the relations between sensory perception, pleasure, food choice and food behaviour, the project aimed to look for new approaches to drive children to like and actively choose healthy foods, developing healthier dietary habits."* (Edulia, 2017, p. 75)

Edulia is a multi-disciplinary and inter-sectorial network. Eleven doctoral students were appointed in six countries (France, Italy, the Netherlands, Denmark, Norway, and Uruguay) to study how multiple factors act as barriers for children's healthy eating and how to tackle them. The project consists of eight work packages, each with their own specific goals and predefined deliverables (see Figure 1).

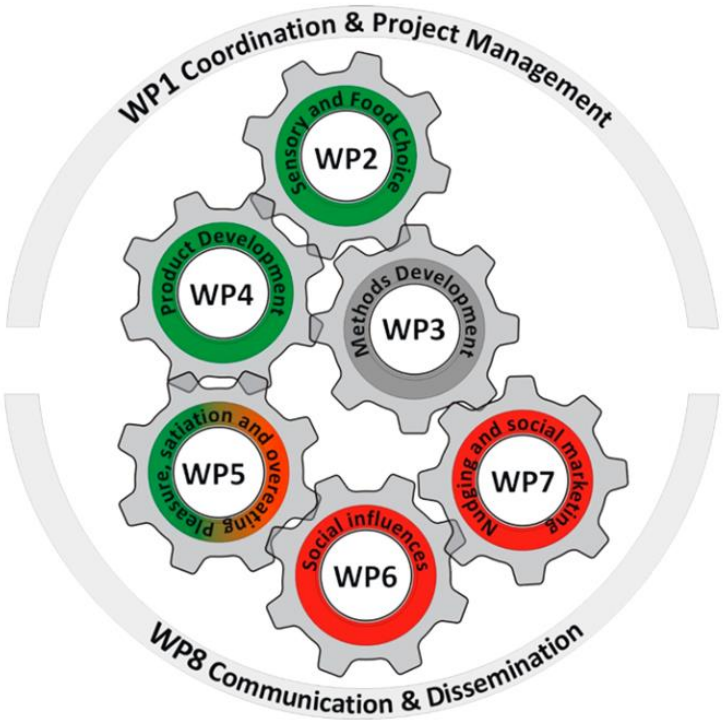

Figure 1. Structure of the Edulia Research Programme including eight work packages. In red (WP5-7) are the work packages that relate to social sciences, in green (WP2-5) those that relate to natural sciences. (in Edulia, 2017, p.131)

My doctoral project is part of work package 6 which aimed to study the role of psychosocial factors (parents, other caregivers, siblings and peers) and of cognitive factors influencing pre-schoolers' and

pre-adolescents' eating behaviour. My main task was to study the influence of parents, and more particularly **to study the links between the parental feeding practices and pre-schoolers' eating behaviours and intake regulation**. Ideally, the results could then provide indications on how we can best assist parents in feeding their child and in creating a positive and healthy eating environment for the child (e.g., through practical recommendations, interventions, etc.).

Moreover, ITN projects require periods of secondments in laboratories other than the main host laboratory. I was mainly based in Dijon, France at the Centre for Taste and Feeding Behaviour (CSGA), where I conducted most of my research (presented in **Chapter II – V**) under supervision of Sylvie Issanchou and Sandrine Monnery-Patris. Despite the COVID-19 pandemic, I also managed to complete two secondments during my doctoral project.

The first secondment took place from September to October 2019 at the Research Centre of the Paul Bocuse Institute (IPB, Ecully, France). Here, I was part of the cognitive science team that focuses on different cognitive mechanisms involved in the relationship between man and food. I had the opportunity to work together with Abigail Pickard, a fellow doctoral student in the Edulia project, on an experimental study that investigated the development of French pre-schoolers' thematic categorization abilities and the links with food rejections (under supervision of Jérémie Lafraire). This study resulted in a joint paper, submitted to Child Development, but will not be discussed in this doctoral thesis.

A second secondment took place from August 2020 to January 2021 at the MAPP centre for Research on Value Creation in the Food Sector of the University of Aarhus (Denmark). Here, I prepared a study to investigate possible predictors of mothers' and fathers' feeding practices in Denmark, with support of Alice Grønhøj and Jessica Aschemann-Witzel (presented in **Chapter VI**).

The multi-disciplinary project Edulia and my experiences during my research stays stimulated a broader view of my subject and research.

CHAPTER I. General introduction

This doctoral thesis will predominantly focus on the period of early childhood (2-6 years), the eating behaviours of children during this period and influencing factors on different levels.

In this general introduction, children's eating behaviours in early childhood will first be described on the basis of literature (**Section 1.1.**). Attention will be paid to both qualitative (e.g., food rejection, food enjoyment) and quantitative aspects of children's eating (e.g., self-regulation of food intake).

Then, possible influencing factors will be introduced using a systemic approach (**Section 1.2.**). As children in early childhood are highly dependent on their parents for their food intake, this doctoral thesis will be mainly devoted to studying the influence of parents. The diversity of parents and cultural differences will be taken into account.

1.1. Eating behaviours in early childhood

At the start of early childhood, around the age of two years, children show a growing desire for autonomy and independence. They want to make decisions about their actions and want to perform them autonomously (e.g., for dressing, drawing, playing). Therefore, they will often show resistance against other people's help and instructions ("no", oppositional behaviour), which can be challenging to handle for caregivers. Children show rapid changes in their development at this age: both physically, cognitively, emotionally, socially and in terms of their language development (Berk, 2010). Nevertheless, they often want to do more than they are actually capable to do physically and mentally, which can be very frustrating for them and can result in tantrums.

This growing desire for autonomy and independence is also expressed for eating, and the early childhood period is generally known as a challenging period for feeding. Children's mobility increases and fine motor skills develop rapidly in early childhood: e.g., at 2-3 years they manage to use a spoon effectively, at 4-5 years a fork, and at 5-6 years they are able to properly use a knife to cut soft foods. They want to eat as autonomously as possible and they clearly express their likes and dislikes for the types of food presented, both verbally and behaviourally.

The early childhood period is an interesting period for studying eating behaviours, because different processes and evolutions take place at this age. This period is, for example, characterized by a peak in children rejecting food (Dovey et al., 2008; Nicklaus & Monnery-Patris, 2018; Rioux et al., 2017) and by a deterioration of children's capacities to self-regulate their intake (Birch et al., 2003). At the age of two years, children's growth also slows down after a growth spurt in infancy and toddlerhood,

meaning that they need fewer calories and may show a decrease in appetite (Graber, 2021). In early childhood, pleasure also plays a central role in eating because children's cognitions related to food and intake are not yet that developed and they are less determinant of food choices than later in life (Nicklaus, 2016).

Moreover, early childhood is not only an interesting period regarding children's eating behaviours, but also an important developmental period for eating. Studies have shown that eating habits (e.g., food preferences, food variety, dietary intake, eating traits) established early in life can track into adolescence and adulthood (Nicklaus et al., 2005; Nicklaus & Remy, 2013). If we want to promote a healthy eating habits in people, it can thus be effective to start early and to stimulate healthy eating behaviours in children from an early age. Furthermore, since the 1980s, the prevalence of overweight and obesity in children and adolescents has increased in many countries all over the world (GBD 2015 Obesity Collaborators, 2017). According to a recent meta-analysis (Garrido-Miguel et al., 2019) including 32 studies with data from 27 European countries, about 17.8% of children aged 2-7 years is overweight or has obesity. This is a worrying trend knowing that childhood obesity has been linked with many social, psychological, emotional and health effects both in the short and long term (for reviews see Kelsey et al., 2014; Pulgarón, 2013; Rankin et al., 2016; Reilly et al., 2003). Moreover, normally, the adiposity rebound, which is the point at which the body mass index (BMI) increases after a nadir, takes place at the end of the early childhood period (around age 6 years) (Dietz, 1997). An early onset of the adiposity rebound has been considered a predictor of obesity in later childhood and adulthood (Cole, 2004; Rolland-Cachera & Cole, 2019; Whitaker et al., 1998). Taken together, efforts should be made at an early age in order to prevent overweight and obesity in children, and the promotion of healthy eating behaviours at a young age can play an important role here.

In this section, we will therefore take a closer look at a number of eating behaviours that are of particular interest in early childhood and for the purpose of this doctoral thesis (food rejections, food enjoyment, self-regulation of food intake). Definitions and methods to measure these behaviours will be discussed here.

1.1.1. Food rejection

Food rejection is a common phenomenon during early childhood with highest prevalence from age two to five years (Cardona Cano et al., 2015). The two main kinds of food rejection are food neophobia and food pickiness. In the literature, food neophobia is usually defined as a fear of novel, unknown foods (Pliner & Hobden, 1992) or the reluctance to eat unfamiliar foods (Dovey et al., 2008). From an evolutionary point of view, this behaviour is believed to have a protective function, as it may prevent

young children that are increasingly autonomous, from ingesting possibly toxic substances (Birch, 1999). Meanwhile, inconsistent definitions exist in the literature for food pickiness, sometimes also referred to as food fussiness. Main characteristics of food pickiness are the consumption of a limited variety of foods, the consumption of inadequate quantities of food, and the rejection of foods based on their sensory aspects (e.g., their appearance, odour, flavour and texture) (Boquin et al., 2014; Dovey et al., 2008; Rydell et al., 1995). In short, pickiness can be described as the rejection of certain familiar and unfamiliar foods (Rioux et al., 2017). This definition indicates an overlap between food neophobia and food pickiness, and studies have indeed shown that these two concepts are highly linked (Galloway et al., 2003; Rigal et al., 2012). This may have contributed to these two concepts being used interchangeably in past research. Yet, it is suggested that they are behaviourally distinct (Dovey et al., 2008) and predicted by different sets of factors (Galloway et al., 2003), which could call for the need to study them separately.

Food neophobia and food pickiness are considered normal eating behaviours during early childhood, but some caution is needed as these behaviours can have a great impact on children's diet quality in the short and possibly long term. Higher levels of food rejections have, for example, been associated with a lower intake of fruits, vegetables, meat and fish (Cooke et al., 2003; Galloway et al., 2003; Siegrist et al., 2013) and with poorer health outcomes (Perry et al., 2015; Ventura & Worobey, 2013).

For children in early childhood, parent-reports are most commonly used for measuring food neophobia and food pickiness (Alley, 2018). However, many well-known scales, such as the Food Neophobia Scale for Children (FNSC; Pliner, 1994), are aimed at children aged 5 and over. For younger children, who are experiencing the peak of food rejection, options have been more limited. The Child Eating Behavior Questionnaire (CEBQ; Wardle et al., 2001) is a widely validated scale for children aged 2-9 years, however its dimension "food fussiness" does not differentiate between food neophobia and food pickiness. Therefore, two questionnaires have been developed recently in France to be able to measure these two behaviours distinctively and in a population of younger children. The first one is Children's Eating Difficulties Questionnaire (CEDQ; Rigal et al., 2012), and the second one is the Child Food Rejection Scale (CFRS; Rioux et al., 2017) which has also been validated in English (Rioux et al., 2019).

1.1.2. Food enjoyment

In research, food enjoyment or food pleasure often refers to people's interest in eating and the extent to which they desire to eat and love/enjoy eating (Wardle et al., 2001). Food enjoyment is a strong

driver of food intake (Drewnowski, 1997; Yeomans et al., 2004), and possibly even more in infancy and early childhood when children's cognitions related to food and intake are not yet that developed (Nicklaus, 2016).

In many studies, food enjoyment has been associated with negative behaviours or outcomes in the child, such as a higher consumption of palatable and energy-dense foods and a higher weight (e.g., Webber et al., 2009). This may be due to children's exposure to an obesogenic environment in which energy-dense foods are easily accessible and their food pleasure can induce overeating (Booth et al., 2005).

Nevertheless, knowing that food likes and dislikes are learned, it has also been suggested that food pleasure may be a window of opportunity to promote healthy eating in children (Marty et al., 2018; Nicklaus, 2016). For this, it can be crucial to expose children to a diversity of foods from a very young age so that they learn to appreciate these flavours (Nicklaus, 2016). Ideally, this happens before the onset of food neophobia (before the age of 2 years), when children are likely to learn to like new foods.

In early childhood, the CEBQ (Wardle et al., 2001) is a commonly used instrument to measure children's enjoyment of food. The French Children's Eating Difficulties Questionnaire (CEDQ; Rigal et al., 2012) also contains a dimension to measure children's low food enjoyment, as parents report it as a common difficulty in infancy and early childhood.

1.1.3. Self-regulation of eating

Generally speaking, young children are believed to have an innate capacity to self-regulate their food intake, by listening to their internal signals of hunger and fullness (e.g., Birch & Deysher, 1986). As they grow older, environmental factors, such as inappropriate portion sizes, the availability of energy-dense foods and controlling food parenting practices could divert children from their internal signals and could cause them to overeat, resulting in an increased risk for weight gain (Birch et al., 2003; Fisher & Kral, 2008; Frankel et al., 2014; Kral et al., 2012; Monnery-Patris et al., 2019).

Self-regulation of eating is an overarching term that refers to children's capacities to adjust their energy intake to their bodies' needs. Different eating behaviours have been identified as related to this general concept. For example, the CEBQ (Wardle et al., 2001) contains six dimensions that can be related to self-regulation of eating (Carnell & Wardle, 2007): food responsiveness (i.e., always wanting to eat regardless of sensations of fullness), satiety responsiveness (i.e., whether food intake is reduced to compensate for a prior snack), desire to drink (i.e., always wanting to drink), food enjoyment (i.e., desire to eat, enjoyment of eating), emotional overeating and emotional undereating (i.e., eating

more/less food during negative emotional states). Two other well-studied behaviours reflecting self-regulation of eating are eating in the absence of hunger (EAH) and eating compensation ability. EAH refers to children's susceptibility to eating when satiated if presented with palatable energy-dense foods (Cutting et al., 1999; Fisher & Birch, 2002) and thus reflects children's responses to external cues in the environment. Eating compensation ability refers to children's ability to adjust their energy intake after a preload and thus reflect responses to internal cues. Originally, these behaviours have been measured in laboratory settings in well controlled conditions where the energy intake is measured carefully. Experimental studies in a laboratory setting are, however, costly and time-consuming, and their ecological validity has been questioned (Madowitz et al., 2014). As a response to these challenges, several questionnaires have been developed to measure these behaviours more easily and rapidly, and on a larger scale. For example, a French questionnaire for parents has been developed to measure the degree of EAH and eating compensation ability in children aged 1-5 years (Monnery-Patris et al., 2019). Tan and Holub (2011) also developed a parent-report scale to measure children's (aged 3-9 years) energy regulation with similar items.

1.2. Influencing factors

In order to promote healthy eating in children from a young age, it is important to understand which factors contribute to the early development of eating behaviours and food preferences in children.

It is known that a person is a product of its genes/biological predisposition and its environment, and there is evidence that eating behaviours have strong heritabilities. Reviews by Wood (2018a, 2018b) indicated that these heritabilities can range between 49-74% during the first year of life, and between 62-75% in early childhood. Nevertheless, there is also evidence that implicates that heritable traits or their expression can still be influenced by the child's environment (Wood et al., 2020).

A systemic approach will be applied in this section to identify factors inherent to the child and in the environment of the child that may influence his/her eating behaviours. Bronfenbrenner's ecological systems theory (1979) seems very suitable for this, and this theory will therefore be described first in this section. Then, factors of interest in relation to children's eating behaviour will discussed.

1.2.1. Bronfenbrenner's ecological systems theory

According to an old saying, "it takes a village to raise a child": children do not grow up in isolation, but are exposed to many relationships (with immediate family, extended family, neighbours, teachers etc.) and external factors that can influence their development and life course. Urie Bronfenbrenner conceptualized a developmental theory that maps these different influences. According to his

ecological systems theory (1979) and his later bioecological model of human development (1994, 2005, 2006), children's biological dispositions (e.g., their temperament, physical characteristics etc.) and many factors in children's environment join to influence their development in unique ways. He states that children grow up in a complex system of relationships which are influenced by multiple levels in the environment, ranging from children's immediate home environment to their larger environment encompassing culture, norms and values. Bronfenbrenner divided a child's environment in five levels or so-called nested systems: the micro-, meso-, exo-, macro- and chronosystem (Figure 2).

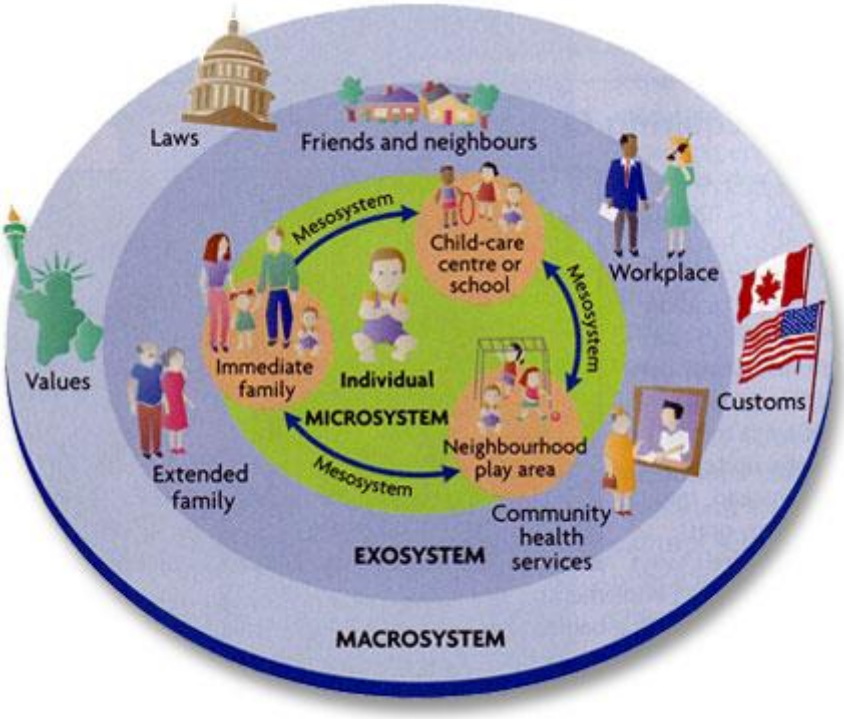

Figure 2. Visual presentation of Bronfenbrenner's ecological systems theory, including the micro-, meso-, exo- and macrosystem. The chronosystem which represents the temporal dimension of the model is not pictured (in Berk & Roberts, 2009, p.28).

The microsystem is the innermost level of the child's environment according to Berk (2010, p.24); it consists of activities and interaction patterns in the child's immediate surrounding. For a child, this is, for example, the immediate family, the school environment and leisure activities. All relationships on this level are assumed to be bidirectional: children are influenced by their parents, siblings, teachers and peers but children and their biological and social characteristics also affect their environment's behaviours.

The second level, the mesosystem, encompasses the links between a child's microsystems. This can, for example, refer to the interactions between parents and the child's school.

The third level, the exosystem, consists of social settings that do not contain the child but nevertheless affect his/her experiences in immediate settings (Berk, 2010, p.25). For example, a parent's workplace and its policies (flexible work hours, parental leave, etc.) can influence this parent's interactions with the child.

The fourth, outermost level is called the macrosystem. This system refers to the large context in which a child develops, including the customs, laws, cultural values and norms. A country that provides high-quality childcare or financial support to parents can for example influence their childrearing practices.

The fifth level, the chronosystem, embodies the temporal dimension of Bronfenbrenner's model. It builds on the idea that a person's environment is not static but ever-changing. Changes in a person's environment can arise from both within a person (e.g., changing schools) or can be exposed externally (e.g., loss of a parent).

In conclusion, according to Bronfenbrenner, a person's development results from the complex interplay between an individual, its characteristics (e.g., biological dispositions) and its environment. A person's environment is dynamic and ever-changing and every person is both a product and a producer of its own environment.

With regard to the development of children's eating behaviours, we can therefore also assume that influencing factors may be situated both within the child (e.g., temperamental traits) and in the environment of the child: in the child's direct environment but also in more distal, indirect systems around the child. Concerning influences in the environment, special attention will be paid to the child's microsystem in this doctoral thesis, in particular to parents, and to the child's macro- and chronosystem which influence parents and thus indirectly also the child.

1.2.2. Children's temperament

Factors within the child, such as temperament (i.e., the biologically based individual differences in behavioural and emotional responses to the environment (Rothbart, 2007)), have been found to influence eating behaviours and weight status. For example, infant temperament (e.g., distress to limitations, low negative affectivity, poor general self-regulation, self-soothing ability) has been found to relate to adiposity later in infancy (Bergmeier et al., 2014; Slining et al., 2009) and in early childhood (Bergmeier et al., 2014; Hittner et al., 2016). In children and adolescents, temperamental traits underlying general self-regulation have also been of great interest when studying eating behaviours and adiposity. Inhibitory control, which refers to the ability to inhibit a dominant behaviour or to

engage in behaviour required for an activity (Posner & Rothbart, 2000), is one of these traits of interest. In previous research, a lower inhibitory control in children has been associated with a higher BMI or more weight problems (e.g., Graziano et al., 2010; Houben et al., 2014; Nederkoorn et al., 2006, 2012). Moreover, it has been linked with binge eating behaviours in adolescents (Ames et al., 2014; Kittel et al., 2017), with higher increases in food enjoyment and food responsiveness over a 1-year period in middle childhood (Groppe & Elsner, 2015), and with lower abilities to self-regulate food intake in children aged 3-9 years (Tan & Holub, 2011). In some studies, child temperament was not directly related to adiposity or child eating behaviours, instead it was identified as a moderating factor. This means that certain links between parental feeding practices and child eating behaviours or adiposity, or links between child eating behaviours and adiposity depended on the temperament of the child. For example, in a study of Tate et al. (2016), emotional eating increased the risk of overweight in children with a difficult temperament but decreased the overweight risk for children with an easy temperament. Rollins et al. (2014) observed that more parental restriction for snacks was associated with higher increases in eating in the absence of hunger from age five to seven years, but only in girls with a lower inhibitory control.

A wide variety of methods exist to measure temperamental traits in early childhood. A classic method is a parent- or teacher-report scale such as the Children's Behavior Questionnaire (CBQ; Rothbart et al., 2001; different variants), which assesses fifteen dimensions of temperament. Observational measures and behavioural tasks are also commonly used measures; e.g., the Go/No-Go task or the Stroop test are popular tasks for measuring inhibitory control (Francis & Riggs, 2018).

1.2.3. Children's microsystem: parents

Children aged 2-6 years are almost exclusively dependent on others for their food intake. It has already been widely demonstrated that parents and their feeding practices and styles play a key role in shaping children's eating patterns and preferences (Birch, 1999; Ventura & Birch, 2008).

Parental feeding practices

Parental feeding practices (or food parenting practices) can be defined as the behavioural strategies parents use to control what, how much, when, where and how the child eats (Ventura & Birch, 2008). A wide range of parental feeding practices have already been described and studied in past research. To provide a clearer overview of the different existing practices, Vaughn et al. (2016) proposed a content map. Here, they categorized parental feeding practices in three higher-order groups: coercive control, structure, and autonomy support practices. Coercive control practices refer to feeding practices

that are rather parent-centred such as restrictive practices, using pressure to make a child eat more, and using rewards and bribes. These practices have often been associated with less favourable eating behaviours in the child; e.g., more food rejections and worse capacities to self-regulate food intake. Structure practices refer to feeding practices that are also controlling but in a non-coercive way: parents provide certain rules and boundaries (e.g., about where, when and what to eat) in order to organize children's environment and to facilitate their competences by modelling eating behaviour, guiding food choices, and setting meal routines. Finally, autonomy support practices refer to offering choices to the child and allowing age-appropriate independent exploration, for example by using reasoning or involving child in food-related activities. Structure and autonomy support practices have usually been linked to more favourable eating behaviours and outcomes in the child. For instance, parental modelling, parental encouragement and the availability of fruits and vegetables at home has consistently been positively associated with children's dietary intake (Pearson et al., 2009). Rules about where and what to eat have been found to be negatively linked to food fussiness/pickiness and emotional over- and undereating in children (Jansen et al., 2014).

Many instruments have been developed during the last decades to measure parental feeding practices (Vaughn et al., 2013). Two well-known and widely used instruments are the Child Feeding Questionnaire (CFQ; Birch et al., 2001) and the Comprehensive Feeding Practices Questionnaire (CFPQ; Musher-Eizenman & Holub, 2007), which encompass a wide range of feeding practices and have been translated and validated in different languages.

Parent-reported parental feeding practices are found to be stable and continuous in early childhood (Faith et al., 2004; Farrow & Blissett, 2012; Powell et al., 2018). These findings also add to the reliability of the measures used in these studies (CFQ and CFPQ) over time.

Parental feeding styles

Beside parental feeding practices, parental feeding styles have also been studied in relation to child eating behaviours. Parental feeding styles are more general and stable across time and context compared to feeding practices: they reflect the overarching emotional climate in which parental practices take place (Darling & Steinberg, 1993). Parental feeding styles are usually determined by two dimensions: the level of parental demandingness (i.e., how much parents encourage eating), and the level of parental responsiveness (i.e., how responsive parents are when encouraging eating) (Hughes et al., 2005). This results in four feeding styles: authoritarian (high demanding, non-responsive), authoritative (high demanding, responsive), permissive/indulgent (low demanding, responsive), and neglectful/uninvolved (low demanding, non-responsive). The authoritative feeding

style has generally been associated with the most beneficial outcomes for the child, while the permissive/indulgent feeding style has often been linked with a higher child BMI (e.g., Patrick et al., 2005; Rigal et al., 2012; review by Shloim et al., 2015).

Compared to a wide choice of instruments for measuring parental feeding practices, the choice is far more limited for measuring parental feeding styles in early childhood. The most known and used scale is probably the self-report Caregiver's Feeding Style Questionnaire (CFSQ; Hughes et al., 2005). In France, the Feeding Style Questionnaire (FSQ; Rigal et al., 2012) has been developed to examine the extent to which parents have an authoritarian, authoritative and permissive/indulgent response when presented with seven feeding situations. This questionnaire conceptualizes feeding styles as dimensional rather than categorical.

Parental food portioning practices

As described in **Section 1.1.3.**, it has been found that when children grow older, environmental factors could increasingly divert them from their internal signals of hunger and fullness and cause them to overeat. One of these environmental factors are portion sizes of foods and beverages. There is consistent evidence about a "portion size effect" in children; meaning that when children are served larger portion sizes, they also tend to increase their energy intake (see review by Birch et al., 2015). Knowing that parents are mainly responsible for feeding the child in early childhood, they can play an important role in determining appropriate portion sizes and thus in avoiding excessive energy-intake in the child. However, interestingly, relatively little is known about parental food portioning practices (i.e., how parents portion foods and beverages for their child) (Faith et al., 2012; Kairey et al., 2018), in particular compared to the extensive literature on parental feeding practices and styles. In 2018, Kairey et al. published a systematic literature review on this matter, including 14 quantitative studies (mostly observational studies) and 14 qualitative studies (focus groups or interviews). They found, for example, that determinants for child portion sizes are perceived child hunger, parental portion sizes, and parent and child body size. Parents are generally also confident about knowing the "right amount" for their child.

Mothers and fathers

Relatively little is also known about the role of fathers in feeding and the effects of their practices and styles in relation to children's eating behaviours. In past child feeding research, mothers and their feeding practices and styles have been the main focus, supported by, for example, the idea that mothers are the primary caregiver of the child or primarily responsible for feeding. However, this focus neglects the role of fathers in feeding and provides an incomplete picture of the child's family feeding

environment. In the scant research with fathers, differences in maternal and paternal feeding practices have been reported: fathers were, for example, found to use more coercive control practices than mothers (for a review, see Khandpur et al., 2014). In addition, fathers' practices have also been found to be predictive for child eating and adiposity, underlining the importance of including fathers in feeding research (for a review, see Litchford et al., 2020).

Bidirectional influences between parent and child?

Bronfenbrenner (1979) stated that in the microsystem of the child, all interactions are bidirectional; children are influenced by their environment and simultaneously also influence this environment. In terms of research on eating behaviour in children, there is also an ever-growing consensus that parents influence their child's eating behaviour, but also that children influence parental practices (e.g., Jansen et al., 2018; Jansen et al., 2017). Surprisingly, however, very few longitudinal studies exist that have examined causal effects between the two. Most studies in feeding research are cross-sectional, and the majority of studies build on the idea that parents influence their child's eating behaviour.

1.2.4. Children's macro- and chronosystem: cultural and societal influences

Not only children's direct environment can have an important impact on the development of their eating behaviours and food preferences, also the larger environment can have an impact in an indirect way.

Food culture

People are often not aware of cultural influences because they are part of it. They are thus often unaware that their country's culture, its values and norms (macrosystem) strongly determine people's habits and behaviours, including their dietary behaviours. To illustrate, many cultural differences exist with regard to what, where, when and with whom we eat and with regard to food attitudes (Rozin et al., 1999; Rozin et al., 2002). For example, French and Belgians have been found to be very food-pleasure-oriented when asked about their beliefs and thoughts about food, while Americans have been found to be very food-health-oriented (Rozin et al., 1999). Cultural differences in parental feeding practices have also been observed (e.g., Blissett & Bennett, 2013; Schwartz et al., 2013); for example, French parents have been found to use higher levels of monitoring and restriction for weight control, whereas American parents were found to use higher levels of food as reward and child control over feeding (de Lauzon-Guillain et al., 2009; Musher-Eizenman et al., 2009). What parents do in one country should thus not automatically be generalized to parents in other countries, and even cultural

differences exist with regard to parental practices of different ethnical groups within a country (e.g., Blissett & Bennett, 2013).

Work conditions, laws, regulations

The laws and regulations of a country (macrosystem) can also have a substantial impact on children's eating habits. A country's work culture (work hours, parental leave policies etc.) can, for example, allow parents to spend more or less time with their child and more or less time planning, buying, preparing food and eating with their child. Time spent in paid employment has, for example, been found to be inversely related to time spent cooking by mothers (Etilé & Plessz, 2018) and with how frequently fathers ate meals with their child (Mallan et al., 2014).

Situational factors: the unseen COVID-19 pandemic

People's eating behaviours consist predominantly of habits, *i.e.*, automatic associations between specific context cues and responses, and these are often hard to change (Wood & Rünger, 2016). However, according to Bronfenbrenner's theory, a person's environment is ever-changing, both due to actions of the person him-/herself and due to external influences (chronosystem). Changes in a person's environment could therefore induce changes in people's habits as they have to engage in a new non-automatic process of decision making (Verplanken & Wood, 2006). The same can be true for eating habits.

An interesting case of an externally imposed change in people's environment is the recent COVID-19 pandemic. From the end of 2019, the contagious and deathly coronavirus SARS-CoV-2 started to spread in many countries worldwide, forcing governments to protect their inhabitants by imposing strict rules. In many countries, lockdowns took place: schools were closed, remote working was imposed (if possible), and people's public life was mostly on hold. Leaving your home was allowed only under certain conditions. This had an inevitable impact on children's and adults' habits, and most likely also on their eating habits.

1.3. Research aims and thesis outline

The general aim of this doctoral project was "**to study the links between parental feeding practices and pre-schoolers' eating behaviours and intake regulation**". After a literature review at the start of the project, summarized in the sections above, a number of topics were identified that seemed interesting and particularly relevant in relation to the general aim of the project and in relation to the European project Edulia:

- The literature review revealed that the number of studies about fathers and feeding is still limited, generally but also especially in France. Therefore, a first focus of this project would be on **fathers' feeding practices** and **possible gender differences between mothers and fathers** regarding feeding their child. Moreover, since a secondment and according study was planned in Denmark, where fathers are culturally more involved in feeding than in many countries in Europe, the topic of fathers and feeding appeared very relevant for this doctoral project.
- A second focus would be on **parental portioning practices** used for pre-schoolers, as we discovered that the literature on this topic was rather limited thus far and still unexplored in France. Little is known about motivations underlying parental decisions when determining portion sizes for their child, the division of responsibility between parent and child when determining portions, and about parental use of information sources and recommendations on this topic.
- In addition, a third focus would be on **factors influencing parental feeding and portioning practices**, which could help us to better understand the use of these practices and to identify possible barriers and facilitators for changing these practices. Following the idea of Bronfenbrenner's systems theory, we assumed that these factors could be situated in different systems around the child and the parents. For example, knowing that cultural specificities may exist around eating and child feeding, we considered **(food) culture** (macrosystem) to be an interesting theme for interpreting the results throughout this project. The participation in the European project Edulia, the research in France and during the secondment in Denmark also made it possible to investigate this to a certain extent.

Finally, it is important to frame this project in the circumstances that took place. Much research of this project was conducted during the **COVID-19 pandemic**. On the one hand, this provided a unique opportunity to investigate this unseen situation and according changes in people's habits in relation to children's eating behaviours and parental eating and feeding behaviours (impact chronosystem). On the other hand, this meant that the timing and methods of several studies had to be adapted to the possibilities of the situation (e.g., favouring the use of online questionnaires and telephone interviews).

This resulted in four comprehensive studies, of which three were conducted in France and one in Denmark. The overall goal of each study was to gain more insight into the parental feeding practices used for pre-schoolers. Some studies focused rather on links of these practices with child eating behaviours, while other studies focused rather on factors in different systems influencing parental practices. Each study had a specific focus and study aim, which made it possible to investigate certain topics in more depth. Together, these studies form an interesting whole that sheds light on several aspects that complement each other in understanding the use and effects of parental feeding practices. Table 1 lists all studies and articles resulting from these studies with their characteristics (population, country, method, main aim(s), and system Bronfenbrenner). The detailed research questions and hypotheses for each of the studies will be presented in the corresponding articles that will follow in the next chapters.

Taken together, there were three main questions guiding the research in this doctoral project:

1. **How do maternal and paternal feeding practices and styles relate to pre-schoolers' eating behaviours and intake regulation?**
2. **Which factors (in which systems) influence parents' feeding and portioning practices?**
3. **Are there gender differences with regard to parental involvement in feeding related tasks, parental perceptions of children's eating behaviours, parental feeding practices, and predictors of feeding practices?**

There was also one additional question guiding our research:

4. **Which child factors relate to (changes in) children's eating behaviours?**

In the following chapters, we will present the research conducted during the doctoral project in the form of six articles. This will be followed by a general discussion in the final chapter.

Table 1. Overview of the studies and articles resulting from the doctoral project and their characteristics.

Study/Article + Chapter	Population	Country	Method	Main aim(s)	System Bronfenbrenner
Study 1 – Article 1 **Chapter II**	105 mothers and 105 fathers (105 couples) of children aged 2-6 years	France	Questionnaire with closed-ended questions	- To identify possible gender differences regarding parental feeding practices/styles and parental perceptions of the child's eating behaviours. - To assess the associations between maternal and paternal feeding practices/styles and child eating behaviours.	Microsystem
Study 1 – Article 2 **Chapter III**	621 mothers of children aged 2-6 years	France	Questionnaire with closed-ended questions	- To assess the influence of variables related to children's eating behaviour, EAH and appetite, on children's BMI z-score, and the influence of child inhibitory control and maternal controlling feeding practices on EAH.	Microsystem
Study 2 (interviews) –Article 3 **Chapter IV**	32 mothers and 5 fathers of children aged 3-5 years	France	Semi-structured telephone interviews + short survey	- To capture the variety of parental food portioning practices used for French pre-schoolers and to identify factors that underlie these practices.	Microsystem Mesosystem Macrosystem
Study 3 (COVID-19) – Article 4 (quantitative part) **Chapter V**	357 mothers and 141 fathers of children aged 3-12 years	France	Questionnaire with closed-ended and open-ended questions	- To evaluate changes in children's eating behaviours, in parental eating and cooking behaviours, in parental feeding practices, and in parental food shopping motivations during the lockdown, compared to the period before the lockdown.	Microsystem Exosystem Macrosystem Chronosystem
Study 3 (COVID-19) – Article 5 (qualitative part) **Chapter V**	357 mothers and 141 fathers of children aged 3-12 years	France	Questionnaire with closed-ended and open-ended questions	- To explore which food-related changes parents perceived as positive during the lockdown (1), which changes they perceived as negative (2), and which changes they would like to maintain after the lockdown (3).	Microsystem Exosystem Macrosystem Chronosystem
Study 4 (Denmark) – Article 6 **Chapter VI**	261 mothers and 321 fathers of children aged 3-6 years	Denmark	Questionnaire with closed-ended questions	- To identify possible gender differences regarding parental feeding practices, parental involvement in child feeding and possible related factors. - To identify predictors of parental feeding practices.	Microsystem Mesosystem Exosystem Macrosystem

CHAPTER II.

Maternal and paternal feeding practices in France: similarities/differences and links with child eating behaviours

This chapter will be presented in the form of an article published in *Appetite*.

Article 1

Are food parenting practices gendered? Impact of mothers' and fathers' practices on their child's eating behaviors.

Philippe, K., Chabanet, C., Issanchou, S., & Monnery-Patris, S.

2021

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Introduction:

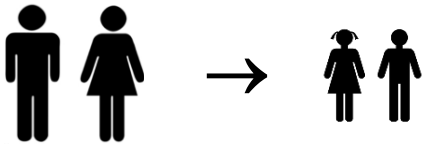
So far, fathers have received little attention in studies about child feeding. Little is also known about concordant/discordant feeding practices within families and links with child eating behaviours.

Objectives:

The first objective was to identify possible gender differences regarding parental feeding practices and styles and parental perceptions of the child's eating behaviours.

The second objective was to assess the associations between maternal and paternal feeding practices and styles and child eating behaviours, and to study possible effects of concordant/discordant feeding practices in families.

Focus:



The links between *maternal* and *paternal* feeding practices/styles and *children*'s eating behaviours (food rejection, appetite, food enjoyment, self-regulation of eating).

System(s) Bronfenbrenner:

Microsystem (parents)

Are food parenting practices gendered? Impact of mothers' and fathers' practices on their child's eating behaviors.

Abstract: Past research has mainly focused on the links between child eating behaviors and maternal food practices. The impact of fathers and of concordant/discordant food parenting practices within families has received much less attention. To fill this gap, both parents of 105 French children aged 2.01-6.51 years (54 boys, M_{age}= 3.88 years, *SD*=1.40) filled in a survey with items from validated questionnaires. Results showed that fathers and mothers perceived their child's eating behaviors in similar ways (Pearson correlations between 0.34 and 0.78; *M*=0.60), despite mothers taking significantly more meals with their child than fathers. Fathers reported using significantly more pressure to eat and food as reward, but reported lower levels of "family meal setting" than mothers. Moderate to high correlations were observed between mothers' and fathers' feeding practices and styles. Regression analyses showed that both maternal and paternal practices and styles were predictors for child eating behaviors. One interaction effect was observed: in households where both parents used higher levels of pressure to eat, the child showed a significantly lower food enjoyment than expected if the effects were additive. Our findings underline the importance of studying the individual role of each parent in child feeding research and that both parents within families should avoid using coercive practices. This could finally stimulate new interventions and recommendations addressed to both parents.

Keywords: preschoolers, parental feeding practices, parental feeding styles, child eating behaviors, fathers

1. Introduction

The period between the ages of 2-6 years is known as a sensitive period in feeding. On the one hand, this period is characterized by a deterioration of children's ability to self-regulate their food intake under the influence of the external environment (Fisher & Birch, 2002). Children are born with an innate ability to self-regulate their food intake. As they grow older, external stimuli like controlling food parenting practices (e.g., pressure to eat) and inappropriate portion sizes, can divert children from their internal feelings of hunger and satiation (Birch, Fisher, Davison, 2003; Fisher & Kral, 2008; Frankel, O'Connor, Chen, Nicklas, Power, Hughes, 2014; Monnery-Patris, Rigal, Peteuil, Chabanet, Issanchou, 2019). This could cause them to overeat and could induce weight gain (Kral, Allison, Birch, Stallings, Moore, Faith, 2012; Monnery-Patris et al., 2019).

On the other hand, this period is characterized by a peak in food rejections in children (Nicklaus & Monnery-Patris, 2018; Rioux, Lafraire, Picard, 2017). Two important kinds of food rejections are food neophobia, defined as a fear of novel, unknown foods (Pliner & Hobden, 1992), and food pickiness. Despite inconsistent definitions in the literature, key characteristics of food pickiness are the consumption of a limited amount and type of foods, and the rejection of foods based on their texture or sensory aspects (Boquin, Moskowitz, Donovan, Lee, 2014; Dovey, Staples, Gibson, Halford, 2008). Food neophobia and food pickiness are highly linked (Galloway, Lee, Birch, 2003; Rigal, Chabanet, Issanchou, Monnery-Patris, 2012) and these two concepts have often been used interchangeably in past research. Yet, it is suggested that they are behaviorally distinct (Dovey et al., 2008) and predicted by different sets of factors (Galloway et al., 2003), which could call for the need to study them separately. These two dimensions are considered as normal eating behaviors during early childhood with highest prevalence from age two to five years (Cardona Cano et al., 2015). For some children, however, these

behaviors are expressed to a far greater degree, which can be linked to poorer health outcomes (Perry, Mallan, Koo, Mauch, Daniels, Magarey, 2015; Ventura & Worobey, 2013). In the same way, low food enjoyment in children and a low appetite are reported as common eating difficulties in early childhood (Rigal et al., 2012).

Knowing that eating habits established during early years contribute to the development of subsequent eating habits (Nicklaus, Boggio, Chabanet, Issanchou, 2005), it is important to promote healthy eating in children from a young age. It is well documented that parents and their food parenting practices and styles play a key role in shaping children's eating patterns and preferences (Birch, 1999). Moreover, children aged 2-6 years are still highly dependent on their parents for their food intake and consume most of their energy intake at home (Poti & Popkin, 2011). Vaughn and colleagues (2016) identify three "overarching, higher-order food-parenting constructs": coercive control, structure, and autonomy support. Coercive control refers to feeding practices that are rather parent-centered (e.g., restriction, pressure to eat, and the use of rewards and bribes), and are often linked to negative outcomes for the child. Structure refers to food practices that are also controlling but in a noncoercive way: parents provide certain rules and boundaries in order to organize children's environment and to facilitate their competences by modelling eating behavior, guiding food choices, and setting meal routines. Finally, autonomy support refers to offering choices to the child and allowing age-appropriate independent exploration (e.g., use of reasoning, child involvement).

Parental feeding styles are overarching and determined by two dimensions: parental demandingness (*i.e.*, how much the parents encourage eating), and responsiveness (*i.e.*, how responsive parents are when encouraging eating) (Hughes, Power, Fisher, Mueller, Nicklas, 2005). This results in four feeding styles: authoritarian (high demanding, non-responsive), authoritative (high demanding, responsive), permissive/indulgent (low demanding, responsive), and neglectful/uninvolved (low demanding, non-responsive). The authoritative feeding style has generally been associated with the most beneficial outcomes for the child, the permissive/indulgent feeding style has often been linked to a higher child body mass index (e.g., Patrick, Nicklas, Hughes, Morales, 2005; Rigal et al., 2012; review by Shloim, Edelson, Martin, Hetherington, 2015).

Maternal feeding practices and styles have been the predominant focus in past research, supported by the idea that mothers are the primary caregiver of the child (Patrick et al., 2005) or primarily responsible for feeding (Blissett, Meyer, & Haycraft, 2006). However, this focus neglects the role of fathers in feeding and provides an incomplete picture of the child's family feeding environment. To illustrate this point, one can refer to a study conducted in the United States in which 72% of fathers living with their children reported feeding their child under the age of five daily or eating meals with them (Jones & Mosher, 2013). In the scant research with fathers, differences in maternal and paternal feeding practices were noted: e.g., fathers used more pressure to eat than mothers (Daniels, Mallan, Jansen, Nicholson, Magarey, Thorpe, 2020; Hendy, Williams, Camise, Eckman, Hedemann, 2009; Loth, MacLehose, Fulkerson, Crow, Neumark-Sztainer, 2013; Tschann et al., 2013) and more restriction (Daniels et al., 2020; Musher-Eizenman, Holub, Hauser, Young, 2007), but less reasoning and praise (Orrell-Valente, Hill, Brechwald, Dodge, Pettit, Bates, 2007), and fathers placed less limits on snacks (Hendy et al., 2009). Father's practices were also found predictive for child eating and adiposity, underlining the importance of including fathers in feeding research (for reviews, see Khandpur, Blaine, Fisher, Davison, 2014; Litchford, Savoie Roskos, Wengreen, 2020). The role of family feeding interactions has also been studied to a very limited extent. Only a few studies explored the associations between concordances/discordances between maternal and paternal feeding practices

and child eating behaviors. Harris and colleagues (2018) found that food fussiness was less reported in children when mothers and fathers were concordant in avoiding nonresponsive feeding practices in the household. In interviews, fathers also expressed that dissimilarities in food parenting practices at home were linked to more child food rejections and tantrums (Khandpur, Charles, & Davison, 2016).

As a contribution to filling this gap in the literature, this study had two objectives. The first objective was to identify possible differences and similarities in maternal and paternal food parenting practices, and in maternal and paternal perceptions of the child's eating behaviors. In order to obtain a more complete picture of the role of the mothers and fathers in feeding in our sample, the division of feeding related tasks in the families and the number of meals parents take with their children were also explored. Our second objective was to assess the associations between maternal and paternal feeding practices and child eating behaviors, and to study possible effects of concordant/discordant feeding practices in families. Based on the results of the literature described above, we hypothesized to observe some gender differences in food parenting practices. We also hypothesized that families where one or both parents use coercive practices would report more problematic eating behaviors in children (less food enjoyment, more food neophobia and food pickiness, more eating in the absence of hunger, and a poorer eating compensation ability) than families where parents concordantly avoid coercive practices.

2. Methods

2.1 Ethics and Recruitment

This study was part of a bigger study project with several separate study objectives. An ethical approval (n°19-591) was granted by the Institutional Review Board (IRB00003888, IORG0003254, FWA00005831) of the French Institute of Medical Research and Health, and a study registration was done by the data protection service involved (CNRS).

In day care centers and preschools in Dijon, parents of children aged two to six years old received an envelope with two identical exemplars of a questionnaire (one for *Parent 1*, one for *Parent 2*). They were invited to independently complete the questionnaires and to return them to the teacher/caregiver. Some day care centers and preschools preferred to hand out flyers or to send an e-mail with the link to the online version of the questionnaire (available on the platform SurveyMonkey). In addition, parents all over France were recruited online with the use of social media (Facebook, Twitter), e-mails to contacts working with children, and through our internal database (ChemoSens Platform's PanelSens, CNIL no.1148039). They were all invited to fill in the online version of the questionnaire. All caregivers fulfilling a parent role for a child aged 2-6 years were eligible to fill in the questionnaire. Participation was voluntary and no compensation was offered. The questionnaire was pretested with three mothers and a father, whose responses were not included in the present analyses.

2.2 Measures

2.2.1 Sociodemographic characteristics

The sex of the child, some letters of the child's name and his/her date of birth were completed in order to ensure correct matching of both parents of the same child later on. This was necessary as parents were asked to fill in their questionnaire without full identification and independently from their (ex-)partner. After the matching procedure, possible identifying information of the children (*i.e.*, letters of their name and birth date) were replaced by a child code and by the child's age. Parents were also asked to report demographic characteristics about themselves: their relation to child, age, employment

status, perception of financial status, family composition, number of children in the household, and county of residence in France.

2.2.2 Number of shared meals, division of feeding related tasks in the household

Parents were asked to report the number of breakfasts, lunches, and dinners generally taken with the child per week (ranging from 0-7 for each meal). Taking a meal with the child was defined as either eating with the child or feeding the child. Parents were also asked to report who was the main person responsible for three feeding related tasks (*i.e.*, grocery shopping, cooking, feeding/eating with child). The answer options were "Predominantly/ Always me", "Predominantly/ Always my partner", "Both at equal parts", and "Not applicable".

2.2.3 Child eating behaviors

Child food rejection

The Children Food Rejection Scale (CFRS; Rioux, Lafraire, & Picard, 2017) was used to measure the child's food pickiness (five items; e.g., *My child sorts his/her food on the plate*) and food neophobia (six items; e.g., *My child is suspicious of new foods*), the two main kinds of food rejection in children. Caregiver's agreement with each item was rated on a five-point Likert scale (*Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree*). Higher scores indicated higher levels of food pickiness and neophobia.

Low appetite and low food enjoyment

The Children's Eating Difficulties Questionnaire (CEDQ; Rigal et al., 2012) was used to measure the child's levels of low appetite (three items; e.g., *My child eats small quantities (even if the food is liked)*) and low food enjoyment (three items; e.g., *My child looks forward to mealtimes* (Reversed item)). Parents were asked to rate their agreement with each item on a five-point Likert scale (*Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree*), according to their child's eating behavior. Higher scores indicated a lower appetite and a lower food enjoyment in the child.

Self-regulation of eating

A questionnaire proposed recently by Monnery-Patris and colleagues (2019) was used to measure two dimensions of children's self-regulation of eating: eating in the absence of hunger (EAH), which may reflect responses to external cues, and eating compensation ability, which may reflect responses to internal cues. The child's EAH was measured with six items, his/her eating compensation ability with four items. For some items, parents had to rate their answer on a five-point scale ranging from "Never" to "Always" (e.g., for eating compensation ability: *My child eats less at meal times when s/he has eaten something before the meals).* For other items, parents had to choose one out of three options to describe their child's behavior: e.g., for the item: "After s/he has finished his meal, if candies are available and I let him/her" (EAH), they could choose either the answer (1) "s/he doesn't eat them", (2) "s/he eats one or two to taste them", or (3) "s/he eats many of them". All items are presented in Appendix 1. Higher scores indicate a worse self-regulation, meaning higher levels of EAH and a poorer ability of eating compensation.

2.2.4 Food parenting practices

Snacking/flexibility and feeding on a schedule

Six items from the questionnaire presented before (Monnery-Patris et al., 2019) were also used to measure to what degree caregivers allow snacking/flexibility in eating for their child (e.g., *After being physically active (walking, swimming, ..), my child has something to eat*). Answers were rated on a five-point scale ranging from "Never" to "Always". Higher scores indicated more snacking/flexibility in eating. The present questionnaire also used Baughcum and colleagues' (2001) dimension feeding on a schedule retrieved from the Infant Feeding Questionnaire (three items, e.g., *During the week, do you make him/her eat at set times?*). Monnery-Patris and colleagues (2019) validated the use of this dimension for French parents of children aged one to six years old. Parents were asked to rate their agreement on a five-point scale ranging from "Never" to "Always". Higher scores indicated stricter times for eating.

Family meal setting

In order to measure the dimension family meal setting, a single item "My child eats the same meals as the rest of the family" from the Feeding Practices and Structure Questionnaire (FPSQ-28; Jansen, Williams, Mallan, Nicholson, Daniels, 2016) was used. Parents were asked to rate their agreement on a five-point scale ranging from "Never" to "Always". Jansen and colleagues propose to use this item as a single item indicator since they found that it was wholly representative of the latent variable family meal setting.

Coercive control practices

The Comprehensive Feeding Practices Questionnaire (Musher-Eizenman & Holub, 2007) was used to measure four dimensions indicating coercive control: food as reward (three items, e.g., *I offer my child his/her favorite foods in exchange for good behavior*), pressure to eat (four items, e.g., *My child should always eat all of the food on his/her plate*), restriction for health (four items, e.g., *If I did not guide or regulate my child's eating, he/she would eat too many junk foods*), and restriction for weight control (eight items, e.g., *I often put my child on a diet to control his/her weight*). Parents were asked to rate their agreement with each item on a five-point scale ranging from "Strongly disagree" to "Strongly agree", or from "Never" to "Always". The psychometric properties of this questionnaire have been demonstrated in both US and French samples, and for the use with mothers and fathers (Musher-Eizenman & Holub, 2007, Musher-Eizenman, de Lauzon-Guillain, Holub, Leporc, & Charles, 2009). Higher scores indicated higher levels of coercive control.

2.2.5 Parental feeding styles

The Feeding Style Questionnaire (Rigal et al., 2012) was used to measure the three most reported parental feeding styles: authoritarian, authoritative and permissive/indulgent style. This questionnaire conceptualizes feeding styles as dimensional rather than categorical. Parents were presented with seven feeding situations (e.g., *Your child wants to eat pasta when you intended to cook vegetables*) and were asked to rate the probability of each of three possible practices (an authoritarian response, an authoritative, and a permissive response) on a four-point scale from "Very unlikely" to "Very likely". Scores were calculated for each of the three parental feeding styles by averaging the items associated with each style.

In addition to the measures on parental feeding practices and styles, we asked parents if they thought they had similar feeding practices and ideas with regard to feeding their child as their (ex-)partner. Parents could either choose "Rather yes", "Rather no", or "Not applicable".

2.3 Statistical analyses

R version 3.6.1 (R Core Team, 2019) was used to clean and analyze the data. The significance level was set at $p < 0.05$ for all analyses.

2.3.1 Data cleaning

As this study is part of a bigger study project, the data cleaning was performed on the entire sample of the project (n = 1197 parents). Questionnaires were excluded when the child's sex or date of birth were missing, when the child was younger than 2 years or older than 6.9 years, when the child had an illness susceptible of influencing his/her eating (*e.g.,* food allergies), when the child was born premature (< 37 weeks of gestation) or when this information was missing. This resulted in a cleaned sample of 790 questionnaires: 621 filled in by mothers and 169 filled in by fathers.

For the current study we are only interested in children of whom two parents filled in the questionnaire. Among the remaining questionnaires (n = 790), 121 children were identified with completed questionnaires of both parents (n = 242 parents). One couple filled in the questionnaire for two of their children, the questionnaires corresponding to the second child were deleted. For four children, the items measuring child eating behaviors and parental feeding practices/styles were found exactly identical for both mother and father. This indicated that the questionnaires were not filled in independently, and they were consequently deleted. For eleven other children, these items were almost identical for both parents (between 82-99% identical), thus these questionnaires were also deleted. The threshold of 82% was determined with a stem and leaf used to visualize the distribution of the percentage of identical responses. Finally, 105 children were retained (n = 210 parents).

2.3.2 Preliminary analyses

Confirmatory factor analyses (CFA) with a structural equation modeling approach (Bollen, 1989; Kaur et al., 2006) were performed on the data set of the whole study project, first on the mothers' data set (n = 621), then on the fathers' only data set (n = 169 fathers). Some minor differences were found between the acceptable factor structures for mothers and fathers, and it was decided to retain the items that presented a good fit for the fathers' sample as they also presented an acceptable fit for the mothers' sample. These factor structures were used for the analyses of the data subset corresponding to the present study (n = 210 parents: 105 mothers, 105 fathers). Cronbach's alphas were calculated with the retained items to report the internal consistency of the dimensions. For fathers in the current study, they ranged between 0.55 (pressure to eat) and 0.88 (low child food enjoyment), for mothers between 0.49 (permissive feeding style) and 0.87 (low child appetite). More details are available in Appendix 2.

2.3.3 Primary analyses

Scores were calculated for child eating behaviors and for food parenting practices and styles by averaging the scores on the corresponding items. Pearson correlations were calculated to determine the associations between mothers' and fathers' perceptions of their child eating behaviors. Paired-sample *t*-tests were also performed to study if maternal and paternal ratings of the child's eating behaviors were significantly different or not. The results indicated that parental perceptions of their child's eating behaviors were significantly correlated, and no significant differences in mean scores were observed between mothers and fathers. Therefore, the scores of the child eating behaviors were averaged between mother-father pairs to create composite child scores.

Then, Pearson correlations were calculated to determine the associations between mothers' and fathers' feeding practices and styles. Paired-sample *t*-tests were performed to identify significant differences between maternal and paternal involvement in meals with the child, and in their feeding practices and styles. Regressions were performed to study the effects of maternal and paternal feeding practices or styles on each child eating behavior. Each regression model explained one child eating behavior by one food parenting practice or style, namely the mother's practice or style, the father's practice or style and the interaction between both:

$$\text{Child eating behavior} = \beta o + \beta_1 \text{ practice mother} + \beta_2 \text{ practice father} + \beta_3 \text{ interaction practice mother : practice father}$$

Mothers' practices and styles were always put upfront in the model as mothers were found to spend more meals with the child than fathers. The effects of paternal feeding practices were consequently always adjusted for the maternal effects. When a significant interaction was found, it was checked that the conclusion did not change if the most influent observation(s) (the highest absolute df beta value(s)) was/were deleted. If the significance of the interaction was merely the result of one or a few highly influent observations, the interpretation was finally based on the model with no interaction. For each child eating behavior, we selected those food parenting practices and styles we hypothesized to be influential based on previous studies. For low food enjoyment, food neophobia and food pickiness, the assumed influential practices were: pressure to eat, family meal setting and the three feeding styles. For EAH and poor eating compensation ability, these were restriction for health, restriction for weight control, food as reward and the three feeding styles.

3. Results

3.1 Participants

Both caregivers of 105 children aged 2.01-6.51 years (54 boys and 51 girls, mean age = 3.88 years, *SD* = 1.40) participated in this study. The characteristics of the caregivers can be found in Table 1. Most children lived with both parents, one child was in a co-parenting situation, and one child lived with his mother and her partner. This partner filled in the questionnaire as a father figure, and will always be referred to as "father" in this study.

Table 1.
Characteristics of the parents who completed the questionnaire.

	Mothers	Fathers
Number of participants	105	105
Hardcopy/Online participation	79/26	79/26
Age, mean (*SD*)	34.52 (4.18)	36.37 (4.95)
Level of education [ratios]:		
No diploma	0.02	0.03
A level or a high-school diploma/degree	0.04	0.09
Diploma of higher education or 12th grade	0.12	0.15
Three-year university degree	0.18	0.16
Master's degree or Master 2	0.39	0.35
Higher than a Master 2 (PhD, medical studies)	0.25	0.23
Work status [ratios]:		
Working (part-time or full-time)	0.81	0.96
Unemployed, job seeker	0.06	0.02
Student	0.01	0.01
Other (e.g., parental leave, parent at home)	0.13	0.01
Perception of financial situation [ratios]:		
You can't make ends meet without going into debt	0.01	0.01
You get by but only just	0.05	0.07
Should be careful	0.16	0.18
It's OK	0.53	0.47
At ease	0.25	0.26

3.2 Concordance in perceptions of child eating behaviors

Mother-father pairs perceived their child's eating behaviors similarly (Table 2): strong correlations were observed for the child's low appetite (r = 0.78), low food enjoyment (r = 0.74), food neophobia (r = 0.74), and food pickiness (r = 0.59). Moderate but significant correlations were observed for the child's eating in the absence of hunger (r = 0.39) and poor eating compensation ability (r = 0.34), the two dimensions of self-regulation of eating. Additionally, all paired-sample t-tests indicated no significant differences between fathers' and mothers' perception of their child's eating behaviors, highlighting the congruent mother-father perception of children's eating behaviors.

Table 2.
Pearson correlations between mothers and fathers for the dimensions representing child eating behaviors and food parenting practices/styles.

Dimension	Pearson correlation mothers - fathers
Child eating behaviors:	
Low appetite	0.78
Low food enjoyment	0.74
Food neophobia	0.73
Food pickiness	0.59
Poor eating compensation ability	0.34
Eating in the absence of hunger	0.39
Food parenting practices and styles:	
Pressure to eat	0.37
Restriction for health	0.46
Restriction for weight control	0.60
Food as reward	0.55
Snacking/flexibility	0.64
Feeding on a schedule	0.50
Family meal setting	0.58
Authoritative feeding style	0.30
Authoritarian feeding style	0.33
Permissive feeding style	0.44

3.3 Mothers vs. fathers: meals, food parenting practices and styles, feeding related tasks

Paired-sample *t*-tests showed that fathers reported taking significantly fewer meals (breakfast, lunch and dinner) with their child than did mothers (Table 3). Meanwhile, they reported higher levels of the use of pressure to eat and of food as reward, but a lower level of family meal setting than did mothers.

When parents in our study were asked if they thought they had similar feeding practices and ideas concerning feeding their child as their (ex-)partner, 95% of mothers and 91% of fathers responded "Rather yes". There was a 93% agreement rate between fathers and mothers for this question. Furthermore, significant correlations were observed between fathers' and mothers' feeding practices and styles (Table 2). For parental feeding practices, correlations ranged between 0.37 (pressure to eat) and 0.64 (food as reward); for parental feeding styles, they ranged between 0.30 (authoritative style) and 0.44 (permissive/indulgent style).

The agreement between mothers and fathers was high for their answers regarding the division of the feeding related tasks: they had an agreement rate of 86% for food shopping, of 78% for cooking, and of 78% for eating with the child. In approximately half of the households, mothers were mainly responsible for cooking (in 53% of households according to mothers; in 47% according to fathers), in some households, fathers were mainly responsible for cooking (in 14% of households according to mothers; in 18% according to fathers), and in some it was a shared responsibility (in 33% of households according to mothers; in 36% according to fathers). Eating with the child was a shared responsibility in most households (in 76% of households according to both mothers and fathers). It was mainly the mother or both parents at equal parts who were responsible for grocery shopping (in respectively 45% and 37% of households according to mothers, 41% and 42% according to fathers).

Table 3.
Number of meals taken with the child, and food parenting practices and styles: means, standard deviations, and significance levels of differences between mothers and fathers (paired-sample *t*-tests).

	Mothers			Fathers	
Number of meals (0-7), mean (SD):					
Number of breakfasts per week	5.42	(1.97)	***	4.22	(2.18)
Number of lunches per week	3.15	(1.67)	**	2.68	(1.41)
Number of dinners per week	6.10	(1.50)	*	5.76	(1.78)
Food parenting practices and styles (scores between 1-5), mean (SD):					
Pressure to eat	2.53	(1.06)	*	2.79	(1.00)
Restriction for health	3.07	(1.00)		3.10	(0.91)
Restriction for weight control	1.67	(0.72)		1.75	(0.75)
Food as reward	1.67	(0.65)	**	1.86	(0.78)
Snacking/flexibility	1.95	(0.58)		1.97	(0.64)
Feeding on a schedule	4.33	(0.67)		4.30	(0.72)
Family meal setting	4.49	(0.74)	*	4.33	(0.85)
Authoritative feeding style	3.33	(0.61)		3.30	(0.53)
Authoritarian feeding style	2.15	(0.72)		2.23	(0.74)
Permissive feeding style	2.07	(0.62)		2.03	(0.64)

Significance levels: *$p < 0.05$; ** $p < 0.01$, *** $p < 0.001$

3.4 Effects of food parenting practices and styles on child eating behaviors

3.4.1 Explaining child low food enjoyment

Maternal pressure to eat ($F(1, 101) = 66.31$, $p < 0.001$), paternal pressure to eat ($F(1, 101) = 9.30$, $p < 0.01$), and the interaction between maternal and paternal pressure to eat ($F(1, 101) = 13.55$, $p < 0.001$, $\beta = 0.17$) all significantly predicted low food enjoyment in the child. More pressure to eat was linked to a lower food enjoyment in the child, and this effect was even significantly larger than expected if the effects were additive when both mother and father used higher levels of pressure to eat (Fig. 1 illustrates this result).

Mothers who were more authoritarian also reported having children with a lower food enjoyment and a parental interaction effect was initially found. However, neither the mother effect nor the interaction effect remained significant after removing the most influent observation ($F(1, 99) = 1.30$, $p = 0.26$; $F(1, 99) = 0.76$, $p = 0.39$) respectively).

The other regressions (effects of family meal setting, authoritative style and permissive style) resulted in non-significant results.

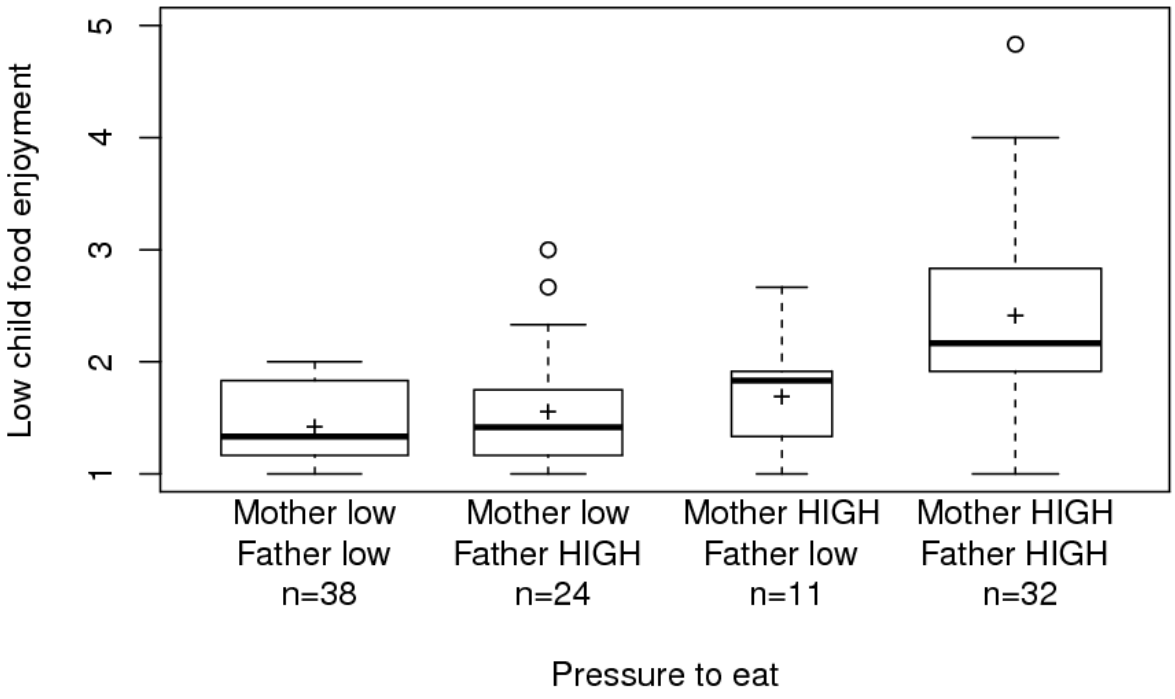


Fig. 1 Boxplots illustrating the links between the child's low food enjoyment and maternal and paternal pressure to eat. Median splits were used to divide mothers and fathers in high scoring and low scoring groups on pressure to eat. The higher the number of observations, the larger the boxes.

3.4.2 Explaining child food pickiness

For the models explaining child food pickiness, no mother-father interaction was observed. Meanwhile, higher maternal pressure to eat ($F(1, 101) = 14.23$, $p < 0.001$) and higher permissiveness in mothers ($F(1, 100) = 14.42$, $p < 0.001$) were linked to more food pickiness.

The other regressions (effects of family meal setting, authoritarian style and authoritative style) resulted in non-significant results.

3.4.3 Explaining child food neophobia

Higher maternal pressure to eat ($F(1, 101) = 21.12$, $p < 0.001$) and higher maternal authoritarianism ($F(1, 100) = 9.45$, $p = 0.003$) were linked to more food neophobia. Higher levels of family meal setting in mothers predicted less food neophobia ($F(1, 100) = 17.09$, $p < 0.001$). Fathers who were more authoritative were found to have children being significantly less neophobic ($F(1, 101) = 4.76$, $p = 0.031$). It is interesting to note that higher paternal pressure to eat ($F(1, 101) = 9.06$, $p = 0.003$) also significantly predicted higher child food neophobia, but only when it was not adjusted for the effect of maternal pressure to eat (adjusted for the mother's effect: $F(1, 101) = 2.02$, $p = 0.158$). No significant effect of maternal or paternal permissive style or an interaction effect was observed.

3.4.4 Explaining child eating in the absence of hunger

For the models explaining children's eating in the absence of hunger (EAH), restriction for health, restriction for weight control, and authoritative feeding style were significant predictors. Regarding restriction for health, both mothers' ($F(1, 101) = 22.56$, $p < 0.001$) and fathers' ($F(1, 101) = 9.48$, $p =$

0.003) restriction significantly predicted higher levels of eating in the absence of hunger in the child. There was no significant interaction effect.

For the model with restriction for weight control, a significant interaction was initially found. After deletion of four observations that showed a high df beta measure of influence regarding the interaction, the interaction was found to be no longer significant. Without these four influential observations, only mothers' restriction for weight control ($F(1,97) = 6.14$, $p = 0.01$) significantly predicted higher levels of EAH in children.

Lastly, mothers who were more authoritative reported children expressing more EAH ($F(1, 101) = 7.79$, $p = .006$). Although no maternal effect of food as reward on EAH was observed, it is interesting to note that a paternal effect of food as reward on EAH was observed ($F(1, 101) = 5.14$, $p = 0.026$), but only when not adjusted for maternal effect.

The other regressions (effects of authoritarian style and permissive style) resulted in non-significant results.

3.4.5 Explaining child eating compensation ability

No significant predictors were found for children's eating compensation ability.

4. Discussion

With data from both parents of 105 children, this study first mapped the division of feeding related tasks in French families and the number of meals fathers and mothers take with their children. Then, gender differences in food parenting practices and in parental perceptions of the child's eating behaviors were explored. Finally, associations between maternal and paternal feeding practices and child eating behaviors, and possible effects of concordant/discordant feeding practices in families were assessed.

First, the results indicated that even though fathers in this sample took significantly less meals with their children than mothers, they still take on average six dinners and four breakfasts a week with their child. Both fathers and mothers take only a few lunches a week with their child, which is not surprising knowing that between 50-70% of French preschoolers frequently take their lunch at school (Math, 2019). When children are taking their meals at home, they are thus often accompanied by both their parents, especially in the evening. Our questions regarding the division of feeding-related tasks confirm this: in most households, mothers and fathers stated that they were equally responsible for eating with the child (76%). Approximately half of the fathers were also either equally (35%) or mainly responsible for cooking (15%). For food shopping, it was mainly both parents who were responsible at equal parts (in approx. 40% of households) or only the mother (in approx. 40% of households). Taken together, these results show that many fathers in France take an active part in feeding their child or eating with them, and thus highlight the importance of including them in research related to food parenting practices. This was previously also highlighted by researchers in the United States (Jones & Mosher, 2013) and in Australia (Mallan et al., 2014), as they found that many fathers have daily meals with their child, and that many are responsible for organizing meals for their preschoolers.

Since most parents reported that they are equally responsible for eating with their child, and are both present at many eating occasions together, we can assume they share the same experiences. This might explain why we found moderate to high correlations between fathers' and mothers' perceptions of their child's eating behaviors. Pearson correlations were especially high for child low appetite, low food enjoyment, food neophobia, and food pickiness (r's between 0.59 and 0.78), corresponding to the correlation found by Harris and colleagues (2018) for mother-father reports of child food fussiness (r =

0.74). In the present study, Pearson correlations were lower for mother-father perceptions of the child's eating in the absence of hunger and low eating compensation ability (r = 0.39 and 0.34), two facets of children's self-regulation of eating. We assume that it could be possible that parents find it more difficult to evaluate (and thus agree on) children's ability to self-regulate because this is based on children's inner sensations of hunger and satiety, which may not always be easy to read, especially among very young children with limited verbal abilities. Another possible explanation is that parents highly limit situations where children have free access to preferred foods after mealtimes or situations in which children eat something just before the meal. Therefore, parents are less likely to be exposed to situations in which they could observe the expression/behavior of children's regulation of food intake. In this study, the mean scores of restriction for health (limiting unhealthy foods the child likes) and feeding on a schedule (eating at set times) were quite high, which could support that parents highly limit the previously described situations and are thus less exposed to observing their child's self-regulation capacities. Finally, we can also hypothesize that French parents are more attentive to "qualitative" aspects of their child's eating, like their food pleasure and food rejections/ food diversity because they represent important values in the French food culture (Ducrot et al., 2018; Riou, Lefèvre, Parizot, Lhuissier, Chauvin, 2015). In contrast, "quantitative" aspects of eating, such as self-regulation of food intake and portion sizes, are less embedded in the French food culture and receive far less attention in nutritional recommendations. Parents may thus be less attentive to these "quantitative" aspects and may experience more difficulties in adopting an attitude towards them and in deciding what values or behaviors to pass on to their child.

Unlike the studies of Blissett and Haycraft (2008) and of Haycraft and Blissett (2011), but in accordance with other studies (Daniels et al., 2020; Hendy et al., 2009; Loth et al., 2013; Tschann et al., 2013), we found that French fathers reported using significantly more pressure to eat for their child than mothers. They also reported using significantly more food rewards than mothers (as in the study of Harris et al., 2018). Fathers also reported lower levels of the practice "family meal setting" than mothers (i.e., the child eats the same meals as the rest of the family). However, it must be noted that the mean score of both mothers and fathers for this practice was very high (4.49 and 4.33 respectively, on a scale from 1-5). Pressure to eat and food rewards are both coercive control practices and have often been associated with less favorable child eating behaviors and outcomes (e.g., Galloway, Fiorito, Francis, Birch, 2006; Monnery-Patris et al., 2019). Our study seems to confirm this, as we found that higher levels of maternal and/or paternal pressure to eat were significantly linked to less favorable eating behaviors in children (higher levels of food pickiness and food neophobia, and lower levels of food enjoyment). A higher use of food as reward in fathers was linked to more eating in the absence of hunger in the child. Restriction, another coercive control practice, and a permissive or authoritarian feeding style in mothers were also linked to less favorable eating behaviors in children. On the contrary, an authoritative feeding style in fathers was found to be linked to less child food neophobia. The review of Vollmer and Mobley (2013) previously identified the authoritative feeding style as the most protective feeding style for the child, but stressed the need for studies with fathers. Our results seem to confirm that, also in fathers, the authoritative feeding style has a protective function. Finally, the practice family meal setting in mothers was found protective against child food neophobia, which may confirm that it is of importance that parents decide on what the child eats (Satter, 1990; Vaughn et al., 2016) but also that food acceptance in young children is stimulated by seeing others eating the same foods (Addessi, Galloway, Visalberghi, Birch, 2005). Overall, we found that several links between child eating behaviors and paternal feeding practices or styles were significant and still significant even after

controlling for the effect of maternal feeding practices or styles, confirming the need for studying both mothers' and fathers' food parenting practices in relation to child eating behaviors.

Following the results of Harris and colleagues (2018), we further hypothesized that families where one or both parents use coercive practices would report more problematic eating behaviors in the child. We could not replicate Harris and colleagues' results regarding child food fussiness/pickiness; *i.e.*, that concordant low levels of persuasive feeding (a construct linked to pressure to eat) in parents are linked to less food fussiness. This is possibly due to the selection of different measures, to the statistical method, and/or to our smaller sample size. In our study, we only found one interaction effect: for the link between parental pressure to eat and child food enjoyment. When both parents used higher levels of this coercive feeding practice, lower levels of food enjoyment were observed in the child.

Even though we only found one interaction effect, our results support what Harris and colleagues suggested: that it is important to encourage a lower use of coercive, nonresponsive food practices in both mothers and fathers. Both parents should be included in feeding interventions in order to create an optimal eating environment for the child.

5. Strengths and limitations

An important strength of this study is the inclusion of both mothers and fathers. Literature reviews examining fathers' role in feeding highlighted the key role of fathers in influencing child eating behaviors and the need for more studies with fathers (reviews of Khandpur et al., 2014; Litchford et al., 2020). The separate questionnaires we used for fathers and mothers made it possible to obtain information on fathers' independent view on their child's eating behaviors, their own feeding practices, and the division of the feeding related tasks in the household. This is a valuable addition to the research where maternal feeding practices and their effects were often exclusively assessed or used as proxy for both parents. Moreover, to our knowledge, there are currently almost no studies investigating paternal feeding practices in France (except e.g., Musher-Eizenman et al., 2009) and no French studies examining the links between these paternal practices and child eating behaviors. For a more comprehensive understanding, we think it is important to conduct studies on fathers and feeding in different countries and contexts because cultural differences exist with regard to eating habits, food attitudes (e.g., Rozin, Fischler, Imada, Sarubin, Wrzesniewshi, 1999; Rozin, Kurzer, Cohen, 2002) and to food parenting practices (Musher-Eizenman et al., 2009; Schwartz et al., 2013). We think that our results are therefore also a valuable addition to studies on fathers in other countries than France.

A limitation of this study, however, is its cross-sectional design, limiting the findings to mere associations between food parenting practices and styles and child eating behaviors. Longitudinal studies are needed to study the causality of these relationships. Recent literature suggests that the relationships between child eating behaviors and parental feeding practices are likely to be bi-directional (e.g., Jansen et al., 2017; Mallan et al., 2018). Furthermore, maternal and paternal feeding practices and styles were self-reported here and may be subject to social desirability bias even though the questionnaires were anonymous. Children's eating behaviors were also parent-reported and thus reflected parental perceptions of these behaviors. Powell and colleagues (2018) questioned the validity of parental reports of food parenting practices in their study as they could not validate these reports with independent observations. Haycraft and Blissett (2008) found that fathers', but not mothers' self-reports of mealtime practices were reliable. On the other hand, Powell and colleagues (2018) validated parental reports of children's eating behaviors in their study. This is supported by the high concordances between

fathers and mothers' independent reports we found in our study. Further, Cronbach's alphas were below 0.60 for the dimensions pressure to eat ($\alpha = 0.55$ for both mothers and fathers), authoritative feeding style (0.58 for fathers) and permissive feeding style (0.49 for mothers), indicating a weak internal reliability. Lastly, it must be noted that the sample size in our study was not very large and the sample included many high-educated parents. The parents who (voluntarily) filled in the questionnaire were possibly also those fathers and mothers who are generally interested and involved in feeding, and may already pay attention to their feeding practices. This makes it difficult to draw comprehensive and representative conclusions. Nevertheless, our results are coherent with results and ideas that have been reported in previous studies.

6. Conclusions and perspectives

This study showed that mothers and fathers perceived their child's eating behaviors in similar ways, and that both maternal and paternal feeding practices and styles were significant predictors for child eating behaviors. Fathers reported using significantly more pressure to eat and food as reward than mothers, two practices that were associated with less favorable eating behaviors in children. Moreover, when both parents used higher levels of pressure to eat, the effect on child low food enjoyment was stronger than a simple additive effect. Overall, our findings underline the importance of studying the individual role of each parent in child feeding research, and that it is important that both mothers and fathers avoid the use of coercive feeding practices at home. This may have implications for future studies, interventions and recommendations: they should strive to focus on both parents in order to create an optimal eating environment for the child.

More research is recommended: studies with bigger sample sizes and more diverse populations are needed to draw more comprehensive conclusions. Studies investigating feeding coparenting among parents (i.e., how mothers and fathers cooperate with regard to feeding their child; Tan, Domoff, Pesch, Lumeng, Miller, 2019; Tan, Lumeng, Miller, 2019) but also studies with divorced/separated parents can be of interest. Furthermore, it is important to keep in mind that including fathers in feeding research and interventions can be challenging (e.g., Jansen, Harris, Daniels, Thorpe, Rossi, 2018). There is an urgent need for targeted recruitment strategies, tailored intervention messages and materials, and validated outcome measures and methods. It is essential to find ways to engage fathers and to account for diversity among fathers (Daniels et al., 2020; Peeters, Davison, Ma, Haines, 2019).

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Authors Contributions

KP, SI and SM-P conceptualized the study. KP and CC conducted all analyses. KP drafted a first version of the manuscript, all authors thereafter contributed to editing the manuscript. All authors read and approved the final version of the manuscript.

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Appendix 1. Items for measuring the child's self-regulation abilities dimensions, used in this study.

Items and related dimensions	Answer modality
Child's self-regulation abilities dimensions	
Eating in the absence of hunger [a]	
eah1. If my child is no longer hungry and I offer him something s/he particularly likes, s/he eats it.	5-point scale ranging from (1) "Never" to (5) "Always"
eah2. If my child is no longer hungry and I offer him something s/he particularly like, s/he takes them in order to have them later. [b]	5-point scale ranging from (1) "Never" to (5) "Always"
eah3. After s/he has finished his meal, if candies are available and I let him/her, s/he eats it.	5-point scale ranging from (1) "Never" to (5) "Always"
eah4. After s/he has finished his meal, if candies are available and I let him/her, s/he takes them in order to have them later. [b]	5-point scale ranging from (1) "Never" to (5) "Always"
eah5. If my child is no longer hungry and I offer him something s/he particularly likes… (*Tick your answer*)	(1) S/he does not want it (2) S/he eats a few bites, just to taste it (3) S/he eats it
eah6. After s/he has finished his meal, if candies are available and I let him/her… (*Tick your answer*)	(1) S/he does not take any (2) S/he takes one or two just to taste them (3) S/he takes a lot
Poor eating compensation ability	
cc1. My child gets full before his/her meal is finished. [b]	5-point scale ranging from (1) "Never" to (5) "Always"
cc2. My child eats less at meal times when s/he has been at a birthday party or snacked at a friend's house.	5-point scale ranging from (1) "Never" to (5) "Always"
cc3. My child eats less at meal times when s/he has eaten something before the meals.	5-point scale ranging from (1) "Never" to (5) "Always"
cc4. If my child eats, let us say, a bun or a muffin, one hour before the meal… (*Tick your answer*)	(1) S/he is not hungry when it is time for the meal (2) S/he is hungry when it is time for the meal but eats less than usual (3) S/he eats as s/he usually does

[a] The original items of this dimension (Monnery-Patris et al., 2019) were modified for this study. The modifications were based on new insights and on suggestions of the reviewers. The two original items were: eah1: "If my child is no longer hungry and I offer him something s/he particularly likes … *(Tick your answer)"* with the answer options (1) S/he does not want it, (2) S/he asks if s/he can have it later, (3) S/he eats a few bites, just to taste it, (4) S/he eats it up.
eah2: "After s/he has finished his meal, if candies are available and I let him/her … *(Tick your answer)*" with the answer options (1) S/he does not take any, (2) S/he takes them in order to have them later, (3) S/he takes one our two just to taste it, (4) S/he takes a lot.
[b] Confirmatory factor analyses indicated that it was better to delete these items (eah2, eah4, cc1).

Appendix 2. Cronbach's alphas for dimensions child eating behaviors and food parenting practices/styles for the retained items following confirmatory factor analyses (CFA).

Dimension (retained items)	Cronbach's alpha mothers (n=105)	Cronbach's alpha fathers (n=105)
Child eating behaviors		
Low appetite (app1, app2, app3)	0.87	0.87
Low food enjoyment (enjoy1, enjoy2, enjoy3)	0.86	0.88
Food neophobia (neo1, neo2, neo3, neo4, neo5, neo6)	0.84	0.86
Food pickiness (pick1, pick2, pick3, pick4, pick5)	0.72	0.73
Poor eating compensation ability (cc2, cc3, cc4)	0.73	0.58
Eating in the absence of hunger (eah1, eah3, eah5, eah6)	0.68	0.68
Food parenting practices and styles		
Pressure to eat (pres2, pres4)	0.55	0.55
Restriction for health (restr.h2, restr.h3, restr.h4)	0.71	0.61
Restriction for weight control (restr.w1, restr.w2, restr.w3, restr.w6, restr.w8)	0.81	0.80
Food as reward (fr1, fr2, fr3)	0.64	0.79
Snacking/flexibility (flex1, flex3, flex5, fs3)	0.61	0.70
Feeding on a schedule (fs1, fs2)	0.81	0.76
Family meal setting (sett1)	/	/
Authoritative feeding style (dem3, dem5, dem6)	0.75	0.58
Authoritarian feeding style (aut3, aut5, aut6)	0.74	0.71
Permissive feeding style (per3, per5, per6)	0.49	0.65

CHAPTER III.

A focus on children's eating in the absence of hunger: links with child temperament, BMI, and maternal feeding practices

This chapter will be presented in the form of an article published in

***Frontiers in Psychology*.**

Article 2

Young children's eating in the absence of hunger: links with child inhibitory control, child BMI, and maternal controlling feeding practices

Philippe, K., Chabanet, C., Issanchou, S., & Monnery-Patris, S.

2021

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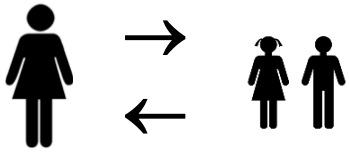
Introduction:

Children's abilities to self-regulate their food intake have been associated with their weight status. Furthermore, these abilities, such as the extent to which children eat in the absence of hunger (EAH), are assumed to be influenced by factors inherent to the child (temperament) and in the child's environment (parental controlling feeding practices). The literature about this topic is divers with contradictory findings. It also has not been largely studied in France.

Objectives:

The main objective of this study was to assess the relationship between EAH and children's weight status, and to assess variables that could influence EAH in children. More precisely, this study wanted to assess the influence of variables related to children's eating behaviour, EAH and appetite, on children's BMI z-score, and the influence of child inhibitory control and maternal controlling feeding practices (food as reward, restriction for weight, and restriction for health) on EAH.

Focus:



The links between *maternal* feeding practices and *children*'s eating behaviours (eating in the absence of hunger, appetite), BMI and temperament.

System(s) Bronfenbrenner:

Microsystem (parents)

Young children's eating in the absence of hunger: links with child inhibitory control, child BMI, and maternal controlling feeding practices

Abstract: This study aimed to gain a better understanding of the associations between young children's eating in the absence of hunger (EAH), inhibitory control, body mass index (BMI) and several maternal controlling feeding practices (food as reward, restriction for health, restriction for weight control). In addition, to more properly assess the relationship between children's and maternal variables, the link between EAH and restriction was explored separately in two directionalities: "child to parent" or "parent to child". To do this, mothers of 621 children aged 2.00-6.97 years (51% boys, *M* = 4.11 years, *SD* = 1.34) filled in a questionnaire with items from validated questionnaires. Structural equation modeling was used to analyze the data. The results showed, whatever the directionality considered, a positive association between children's eating in the absence of hunger and their BMI z-scores. Restriction for health and restriction for weight control were differently linked to EAH and to children's BMI z-scores. Namely, low child inhibitory control, food as reward and restriction for health were identified as risk factors for EAH. Restriction for weight control was not linked to EAH, but was predicted by child BMI z-scores. Interventions aiming to improve children's abilities to self-regulate food intake could consider training children's general self-regulation, their self-regulation of intake, and/or promoting adaptive parental feeding practices.

Keywords: parental feeding practices, preschoolers, self-regulation of food intake, executive functioning, restriction, food rewards, structural equation modeling

1. Introduction

The prevalence of overweight and obesity in children and adolescents has increased in a large number of countries since the 1980s (GBD 2015 Obesity Collaborators, 2017). In 2018, WHO reported that on average almost one in eight children aged seven to eight has obesity in Europe. This is a reason for concern given that childhood obesity has been associated with social, psychological, emotional and health effects both in the short and long term (for reviews see Kelsey et al., 2014; Pulgarón, 2013; Rankin et al., 2016; Reilly et al., 2003). Stimulating healthy eating habits from an early age could be an important way to prevent overweight and obesity in children, especially as it is known that eating habits established during childhood can persist into adolescence and adulthood (Nicklaus & Remy, 2013).

Young children are believed to have an innate capacity to self-regulate their food intake, by following their internal signals of hunger and fullness (e.g., Birch & Deyscher, 1986). As they grow older, environmental factors, such as inappropriate portion sizes, the availability of energy-dense foods and controlling food parenting practices could divert children from their internal signals and could cause them to overeat, resulting in an increased risk for weight gain (Birch et al., 2003; Fisher & Kral, 2008; Frankel et al., 2014; Kral et al., 2012; Monnery-Patris et al., 2019). Many studies have examined how the use of controlling feeding practices, in particular restriction and pressure to eat but also food as reward, influences child eating behaviors (e.g., Fisher & Birch, 2002; Frankel et al., 2012; Johnson & Birch, 1994; Powell et al., 2017; Remy et al., 2015). Overall, the results of these studies indicated a counterproductive effect of these practices as they were linked to or resulted in less adaptive child eating behaviors.

Not only environmental factors, but also children's temperamental traits play a role in their ability to self-regulate food intake and their weight status. Inhibitory control is an executive functioning process that has been studied extensively in relation to eating behaviors. Inhibitory control refers to the ability to inhibit a dominant behavior or to engage in behavior required for an activity (Posner & Rothbart, 2000). A wide variety of methods exist to measure children's inhibitory control: both behavioral tasks (e.g., general or food-specific Go/No-Go task, Stroop test, Stop signal task, Peg tapping task) and scales such as the Children's Behavior Questionnaire (Rothbart et al., 2001) and its variants. In previous studies with children and adolescents, a lower inhibitory control has been linked with binge eating behaviors (Ames et al., 2014; Kittel et al., 2017), with higher increases in food enjoyment and food responsiveness (Groppe & Elsner, 2015), with lower abilities to self-regulate intake (Tan & Holub, 2011), and with a higher body mass index (BMI) or more weight problems (e.g., Graziano et al., 2010; Houben et al., 2014; Nederkoorn et al., 2006; 2012).

An eating behavior reflecting self-regulation of intake that is of interest in relation to children's weight status is "eating in the absence of hunger" (EAH). EAH refers to children's susceptibility to eating when satiated if presented with palatable energy-dense foods (Cutting et al., 1999; Fisher & Birch, 2002), and has been associated with increased energy intake (Fisher & Birch, 1999, 2000) and weight status (Fisher & Birch, 2002; Kral et al., 2012; Monnery-Patris et al., 2019). EAH has originally been measured in laboratory settings where children have *ad libitum* free access to foods after a meal and after having reported they were full. EAH referred to the energy intake (number of calories) consumed during the free-access session (Fisher & Birch, 1999). This paradigm is, however, costly and time-consuming, and the ecological validity of the paradigm has been questioned (Madowitz et al., 2014). As a response to these challenges, several questionnaires have been developed to measure EAH in a less costly and more efficient way, and to facilitate longitudinal studies. For example, the Eating in the Absence of Hunger Questionnaire for Children and Adolescence (EAH-C; Tanofsky-Kraff, 2008), a self-report for youth aged 6-19 years old, and a parallel version for parents (EAH-P; Shomaker et al., 2013) have been proposed for English-speaking populations. A French questionnaire for parents has been developed to measure the degree of EAH in children aged 1-5 years (Monnery-Patris et al., 2019). Another concept that is of interest in relation to children's weight status is their appetite (Carnell & Wardle, 2008; Godefroy et al., 2016). Appetite is usually defined as a desire for food, and children with a low appetite usually have a lower weight than children with a high appetite (e.g., Lee & Song, 2007).

Some studies have already investigated possible links between EAH, and the previously mentioned environmental (parental controlling feeding practices) and temperamental factors (inhibitory control). For instance, Rollins and colleagues (2014) observed that the link between parental controlling feeding practices and EAH was moderated by girls' level of inhibitory control: more parental restriction for snacks was associated with higher increases in EAH from age five to seven years, but only in girls with a lower inhibitory control. In a longitudinal study with assessments at age 5, 7, 9, 11, 13, and 15 years, Anzman and Birch (2009) identified parental restriction as a moderator between girls' inhibitory control and their BMI: here, a lower inhibitory control was associated with a higher BMI, and this relation was stronger in the presence of higher parental restriction. However, inconsistent results have been reported in the literature for the links between EAH, weight status and controlling feeding practices, and many questions remain. On the one hand, this might be due to the use of different measures for these constructs, as discussed above for EAH and inhibitory control. Different measures have also been used for studying parental controlling feeding practices. To illustrate, in the Child

Feeding Questionnaire (Birch et al., 2001), the dimension "restriction" combines the constructs restriction and food as reward, while the Comprehensive Feeding Practices Questionnaire (Musher-Eizenman & Holub, 2007) contains separate dimensions to refer to food as reward and restriction, and even distinguishes between parental motivations/ concerns behind the use of restrictive practices; resulting in the dimensions "food as reward", "restriction for health" and "restriction for weight control". On the other hand, inconsistent results might be found due to differences in authors' hypotheses and the associated statistical models and analyses. In fact, in some studies, parental controlling feeding practices were hypothesized to be the explaining variable, while in other studies they were the explained variable or a moderating variable. Small sample sizes in certain studies could also be problematic (Francis & Riggs, 2018).

Due to its assumed relation with children's weight status, it is crucial to gain a better understanding of factors that are linked to children's EAH. Therefore, this study aimed to assess the relationship between EAH and children's weight status, and to assess variables that could influence EAH in children (see Figure 1). More precisely, this study wanted to assess the influence of variables related to children's eating behavior, EAH and appetite, on children's BMI z-score, and the influence of child inhibitory control and maternal controlling feeding practices (food as reward, restriction for weight, and restriction for health) on EAH. In previous literature, maternal restriction has been considered as a cause (Birch et al., 2003) or a consequence (Tan & Holub, 2011) of children's EAH/ self-regulation of eating. Therefore, to take into account these possibilities, both directionalities were considered in this study: an effect of "parent to child", or of "child to parent".

It was hypothesized, based on previous studies, that higher levels of EAH and appetite would be linked to higher BMI z-scores in children (e.g., Carnell & Wardle, 2008; Monnery-Patris et al., 2019), and that a lower inhibitory control in children (Nederkoorn et al., 2006, 2012), a higher use of food as reward (Remy et al., 2015), of restriction for health and of restriction for weight control in mothers (Birch et al., 2003; Tan & Holub, 2011) would be linked to higher levels of EAH in children.

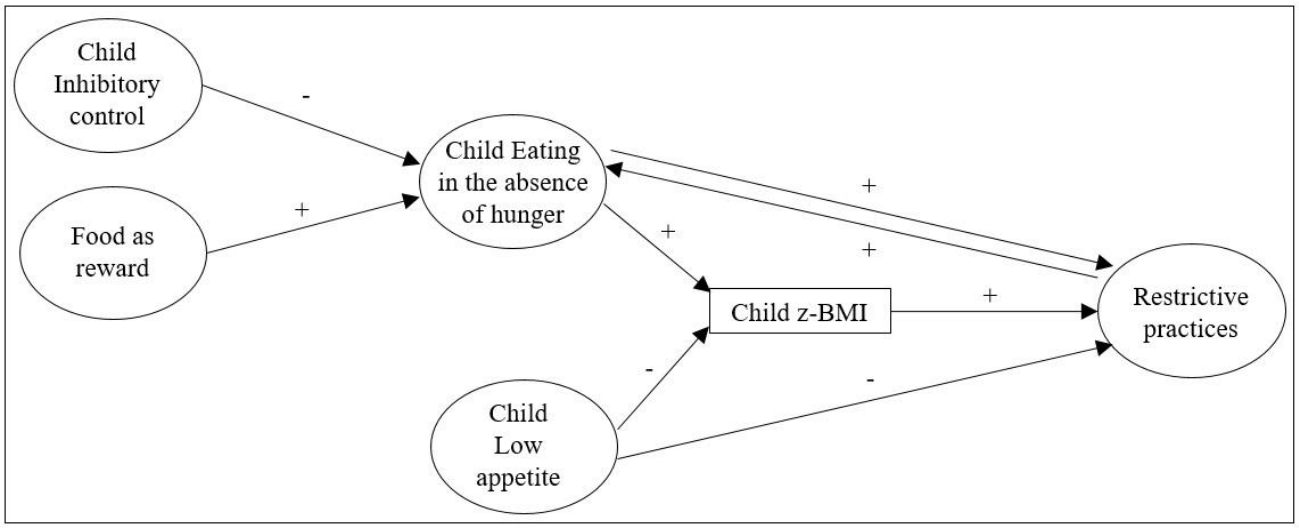


Figure 1. Conceptual model of the study representing the hypotheses. A plus (+) indicates an expected positive relation between constructs, a minus (-) indicates an expected negative relation. The double arrow between EAH and restrictive practices represents two hypotheses that will be tested separately.

2. Material and Methods

2.1 Participants' recruitment and procedure

The recruitment of participants took place as part of a project whose overall aim was to study parental feeding practices and their links with child eating behaviors in France, and which encompassed several research objectives (see e.g., Philippe et al., 2021). Caregivers were recruited via daycare centers and preschools in France, with the use of social media (Facebook, Twitter) and through our internal database (ChemoSens Platform's PanelSens, CNIL no.1148039). They were invited to complete a hard copy version of the questionnaire or the online version, available on the platform SurveyMonkey. For the study presented in this article, all caregivers fulfilling a mother role for a child aged 2-6 years were eligible to participate. They were informed that their participation was voluntary and without compensation. An ethical approval (n°19-591) was granted for the large project by the Institutional Review Board (IRB00003888, IORG0003254, FWA00005831) of the French Institute of Medical Research and Health, and a study registration was done by the data protection service involved (CNRS).

2.2 Measures

Questionnaires were used to collect data because of several reasons. First of all, they can be used easily in large-scale studies: to recruit a high number of people that are living in different areas. Moreover, a questionnaire may be more relevant than a laboratory setting, since it allows to take into account not only the eating behavior and adjustment of intake during one meal (i.e., short-term compensation), as in experimental settings, but also the pattern over a time period that is longer than just one meal. The same is true for children's temperament/behavior and parental feeding practices. For this study, questionnaires were selected that were already validated in French for parents of young children.

2.2.1 Child eating behaviors

Low appetite

The child's low appetite was measured with three items of the Children's Eating Difficulties Questionnaire (CEDQ; Rigal et al., 2012). Mothers had to rate their agreement with each of the items (e.g., *My child eats small quantities (even if the food is liked)*) on a five-point Likert scale ranging from (1) "Strongly disagree" to (5) "Strongly agree". All items are presented in Table 1. A score was calculated for each child by averaging the scores on the three items; a higher score indicated a lower appetite.

Eating in the absence of hunger

The child's eating in the absence of hunger (EAH) was measured with six items of a recent French questionnaire (Monnery-Patris et al., 2019). Some original items of this dimension and their answer modalities were slightly modified for this study, aiming to enable more precise answers (all items and additional information are presented in Table 1). For four items in this study, mothers had to rate their answer on a five-point scale ranging from (1) "Never" to (5) "Always" (e.g., *If my child is no longer hungry and I offer him something s/he particularly likes, s/he eats it.).* For the two other items, mothers

had to identify one of the three answer options that best suited their child's behavior: e.g., for the item: "After s/he has finished his meal, if candies are available and I let him/her", they could choose between the options (1) "s/he does not take any", (2) "s/he takes one or two just to taste them", or (3) "s/he takes a lot". The answers to these two last items were recoded to (1), (3), (5) to match the answers of the other items (5-point scale). A score was calculated for each child by averaging the scores on all items; a higher score indicated a higher level of EAH and thus a poorer self-regulation.

2.2.2 Child inhibitory control

The child's inhibitory control was measured with five items of the Children's Behavior Questionnaire Short Form (CBQ; original English version: Putnam & Rothbart, 2006; French-Canadian version: Lemelin et al., 2020). Originally, this Short Form contains six items to measure inhibitory control (e.g., *My child can wait before entering into new activities if s/he is asked to.*). Based on feedback from parents who pretested the questionnaire used for the current study, it was decided to deleted one item (*i.e., My child prepares for trips and outings by planning things s/he will need*.). Parents declared that this item was not fully adapted to age range of the children in the current study, as the CBQ was developed for children aged 3-8 years while we included children aged 2-6 years in the study. Mothers were asked to rate their agreement with each item on a seven-point Likert-like scale ranging from (1) "Very untrue" to (7) "Very true", according to their child's behavior. All items are presented in Table 1. A score was calculated for each child by averaging the scores on all items; a higher score indicated a higher level of inhibitory control.

2.2.3 Maternal controlling feeding practices

Maternal use of controlling feeding practices was measured with the Comprehensive Feeding Practices Questionnaire (Musher-Eizenman & Holub, 2007). For this study, the practices of interest were restriction for health (four items, e.g., *If I did not guide or regulate my child's eating, he/she would eat too many junk foods*), restriction for weight control (eight items, e.g., *I often put my child on a diet to control his/her weight*), and food as reward (three items, e.g., *I offer my child his/her favorite foods in exchange for good behavior*). All items are presented in Table 1. Mothers had to rate their agreement with each item on a five-point scale ranging from (1) "Strongly disagree" to (5) "Strongly agree", or from (1) "Never" to (5) "Always". The psychometric properties of this questionnaire have been demonstrated in French samples (Musher-Eizenman & Holub, 2007, Musher-Eizenman et al., 2009). A score was calculated for each parent for each of the three feeding practices by averaging the scores on the corresponding items; a higher score indicated a higher use of the corresponding controlling practice.

2.2.4 Anthropometric data

Mothers were instructed to report the most recent measurements from the child's medical health book which were carried out by health professionals. If no recent measurements were available, or if the measurements of height and weight were not carried out within a short time span, mothers were instructed to measure and/or weigh the child in light clothes. Children's body mass index (BMI; kg/m^2) was calculated and normed BMI z-scores were calculated using French growth standards for children (Rolland-Cachera et al., 1991, 2002). The child's birth date was used for a precise calculation of the child's age.

2.3 Statistical analyses

R version 3.6.1 (R Core Team, 2019) was used to clean and analyze the data. The significance level was set at $p < 0.05$ for all analyses.

2.3.1 Data cleaning and preliminary analyses

Questionnaires of mothers were excluded if the child was not aged 2-6.99 years, if the child was born premature (< 37 weeks of gestation), if the child had an illness susceptible of affecting his/her eating behavior (e.g., swallowing problems, food allergies) or if information about one of these aspects was missing. Questionnaires were also excluded if the child's sex was not provided, if a mother already completed a questionnaire for a sibling, or if there was a high number of missing items. This resulted in the exclusion of 389 questionnaires. A total of 621 questionnaires were maintained for the analyses of the present study: 190 hard copies and 431 online copies.

Confirmatory factor analyses (CFA) with a structural equation modeling (SEM) approach (Bollen, 1989; Kaur et al., 2006) were performed to verify the internal consistency of the scales. First, before conducting the CFA's, imputation by predictive mean matching was used to account for missing data of the items of interest (the proportion of missing data was lower than 1% for each item). Then, different CFA measurement models were fitted: one for the child eating dimensions, one for child inhibitory control, and one for the maternal feeding practices. According to the fit indices and the estimated loadings, a few items had to be removed: two items for the dimension EAH, one item for restriction for health and two items for restriction for weight control. Finally, Cronbach's alphas were calculated with the retained items to report the internal consistency of the dimensions; they ranged between 0.66 (EAH; inhibitory control) and 0.85 (appetite). All Cronbach's alphas, final item loadings in the CFAs and removed items are presented in Table 1.

Table 1.
Cronbach's alphas for dimensions and final item loadings in confirmatory factor analyses (CFA).

Items and related dimensions	Loading
Dimensions concerning the children	
Appetite[a] **(Cronbach's alpha = 0.85)**	
app1. My child eats small quantities (even if the food is liked).	0.77
app2. My child is a small eater (whatever is served, bad or good).	0.86
app3. My child has a big appetite. (Reversed item)	0.95
Eating in the absence of hunger[e] **(Cronbach's alpha = 0.66)**	
eah1. If my child is no longer hungry and I offer him something s/he particularly likes, s/he eats it.[b]	0.65
eah2. If my child is no longer hungry and I offer him something s/he particularly like, s/he takes them in order to have them later.[b] (Reversed item)	**Removed**
eah3. After s/he has finished his meal, if candies are available and I let him/her, s/he eats it.[b]	0.71
eah4. After s/he has finished his meal, if candies are available and I let him/her, s/he takes them in order to have them later.[b] (Reversed item)	**Removed**
eah5. If my child is no longer hungry and I offer him something s/he particularly likes… (*Tick your answer*)[c]	0.69
eah6. After s/he has finished his meal, if candies are available and I let him/her… (*Tick your answer*)[d]	0.73
Inhibitory control[f] **(Cronbach's alpha = 0.66)**	
ic1. My child can easily stop an activity when s/he is told "no."	0.64
ic2. My child can wait before entering into new activities if s/he is asked to.	0.82
ic3. My child has trouble sitting still when s/he is told to (at movies, etc.). (Reversed item)	0.42
ic4. My child is capable to follow instructions.	0.61
ic5. My child approaches places s/he has been told are dangerous slowly and cautiously.	0.49
Dimensions concerning the mothers	
Food as reward[b] **(Cronbach's alpha = 0.76)**	
fr1. I offer my child his/her favorite foods in exchange for good behavior.	0.84
fr2. I withhold sweets/dessert from my child in response to bad behavior.	0.72
fr3. I offer sweets (candy, ice cream, cake, pastries) to my child as a reward for good behavior.	0.85
Restriction for weight control[a] **(Cronbach's alpha = 0.75)**	
restr.w1. I encourage my child to eat less so he/she won't get fat.	0.76
restr.w2. I give my child small helpings at meals to control his/her weight.	0.85
restr.w3. If my child eats more than usual at one meal, I try to restrict his/her eating at the next meal.	0.71
restr.w4. I restrict the food my child eats that might make him/her fat.	**Removed**
restr.w5. I have to be sure that my child does not eat too many high-fat foods.	**Removed**
restr.w6. There are certain foods my child shouldn't eat because they will make him/her fat.	0.72
restr.w7. I don't allow my child to eat between meals because I don't want him/her to get fat.	**Removed**
restr.w8. I often put my child on a diet to control his/her weight.	0.61
Restriction for health[a] **(Cronbach's alpha = 0.71)**	
restr.h1. I have to be sure that my child does not eat too many sweets (candy, ice cream, cake, or pastries).	**Removed**
restr.h2. If I did not guide or regulate my child's eating, s/he would eat too much of his/her favorite foods.	0.72
restr.h3. I have to be sure that my child does not eat too much of his/her favorite foods.	0.63
restr.h4. If I did not guide or regulate my child's eating, he/she would eat too many snacking foods type cookies, bars chips, sugary foods...	0.80

[a] Answer modalities: 5-point scale ranging from (1) "Strongly disagree" to (5) "Always".
[b] Answer modalities: 5-point scale ranging from (1) "Never" to (5) "Always".
[c] Answer modalities: (1) S/he does not want it, (2) S/he eats a few bites, just to taste it, (3) S/he eats it. Scores have been recoded to (1), (3), (5) to match the scores of items eah1-eah4 (5-point scale).
[d] Answer modality: (1) S/he does not take any, (2) S/he takes one or two just to taste them, (3) S/he takes a lot. Scores have been recoded to (1), (3), (5) to match the scores of items eah1-eah4 (5-point scale).
[e] Some original items of this dimension and their answer modalities (Monnery-Patris et al., 2019) were modified for this study, aiming to enable more precise answers. The two original items were: eah1: "If my child is no longer hungry and I offer him something s/he particularly likes… *(Tick your answer)"* with the answer options (1) S/he does not want it, (2) S/he asks if s/he can have it later, (3) S/he eats a few bites, just to taste it, (4) S/he eats it up. ; eah2: "After s/he has finished his meal, if candies are available and I let him/her… *(Tick your answer)*" with the answer options (1) S/he does not take any, (2) S/he takes them in order to have them later, (3) S/he takes one our two just to taste it, (4) S/he takes a lot.
[f] Answer modalities: 7-point scale ranging from (1) "Very untrue" to (5) "Very true".

2.3.2 Main analyses

Scores were calculated for child behaviors and for maternal feeding practices by averaging the scores on the corresponding items. Correlations were calculated to explore the links between the dimensions related to maternal feeding practices (food as reward, restriction for health, restriction for weight control), child's inhibitory control, child's EAH, and child's BMI z-scores. Simple regressions were also performed to study possible effects of child age and sex on children's behaviors and maternal practices.

Thereafter, structural equation modeling (SEM) analyses were conducted to assess the structure between these different dimensions, based on our hypotheses derived from past literature. SEM methodology was chosen because it enables to formulate several hypotheses in a global model and to test if the data are in line with the hypotheses. Following the idea that children's eating behavior influences their BMI z-scores, we hypothesized that EAH (the focus in this study) and appetite would be direct predictors of child BMI z-scores. Then, we assumed that maternal feeding practices (e.g., Birch et al., 2003) and child inhibitory control (Nederkoorn et al., 2006, 2012) could influence children's EAH, but not their appetite since this is considered as a fairly stable eating trait in children (Farrow & Blissett, 2012). In addition, previous studies have pointed out that children's EAH and (maternal perceptions of) their weight status and appetite could also predict maternal restrictive practices (Tan & Holub, 2011; Webber et al., 2010). We thus considered that restriction could be either a cause or a consequence of EAH. Finally, since we expected a stronger link with child BMI z-scores for restriction for weight control than for restriction for health, these two forms of restriction were considered in separated models.

Thus, we ran separate models for restriction for weight control and restriction for health, and two types of models were estimated to take into account the possible different directionalities between EAH and maternal restriction (effects of "child to parent" and of "parent to child"). This resulted in four separate models: (1A) "child to parent" with restriction for weight control, (1B) "parent to child" with restriction for weight control, (2A) "child to parent" with restriction for health, and (2B) "parent to child" with restriction for health.

All SEM analyses were conducted using the R package lavaan 0.6-7 (Rosseel, 2012). All items except child BMI z-score were declared as ordered. For all models, only data of participants without missing child BMI z-score were used. The root means square error of approximation (RMSEA), the comparative fit index (CFI) and the Tucker-Lewis Index (TLI) were used to evaluate the fit of each model. A low RMSEA and high CFI and TLI indicate a good fit (cut-offs: acceptable fit: 0.08 for RMSEA, 0.95 for CFI and TLI; good fit: 0.05 for RMSEA, 0.97 for CFI and TLI) (Schermelleh-Engel et al., 2003). As models 1B and 2B present cyclic structures (with a loop between EAH - z-BMI - restriction - EAH), the R package SEMID_0.3.2 was used to verify if these structures were identifiable. The codes used in R for the SEM analyses can be consulted on Zenodo (https://zenodo.org/record/4436613#.X_8IeuhKi71), together with the data set generated for this study, and the French items used. A metadata file provides information about the published data set and accompanying documents.

3. Results

3.1 Participants' characteristics

Mothers of 621 children aged 2.00-6.97 years (51% boys, mean age = 4.11 years, *SD* = 1.34) participated in this study. The characteristics of the mothers can be found in Table 2. According to maternal reports of child weight and height, 11% of children in our sample were underweight (z-BMI < -2), 71% had a normal weight (-2 ≤ z-BMI < 1), 10% were at risk for overweight (1 ≤ z-BMI < 2), 5% had overweight (2 ≤ z-BMI < 3), and 2% had obesity (z-BMI > 3) (weight categories according to WHO, 2006). Most children (87%) lived with both parents, 5% of children were in a co-parenting situation, and 8% of children lived with their mother only or with their mother and her partner.

Table 2.
Mothers' characteristics.

Characteristics	**Mothers (N = 621)**	
	N	**%**
Hard copy / Online participation	**190 /431**	**31 / 69**
Age, mean (SD)	**35.26 (4.50)**	
Weight status[a]:		
Underweight (BMI < 18.5 kg/m2)	27	4
Normal weight (18.5 ≤ BMI < 25 kg/m2)	368	61
Overweight (25 ≤ BMI < 30 kg/m2)	132	22
Obesity (BMI ≥ 30 kg/m2)	77	13
Level of education:		
No diploma	8	1
A level or a high-school diploma/degree	44	7
Diploma of higher education or 12th grade	77	13
Three-year university degree	122	20
Master's degree or Master 2	225	37
Higher than a Master 2 (PhD, medical studies)	135	22
Work status:		
Working (part-time or full-time)	477	78
Unemployed, job seeker	41	7
Student	9	1
Other (e.g., parental leave, parent at home)	50	14
Perception of financial situation:		
You can't make ends meet without going into debt	6	1
You get by but only just	37	6
Should be careful	152	25
It's OK	276	46
At ease	135	22

[a] Mothers' height and weight, needed for body mass index (BMI) calculations (kg/m^2), were self-reported.

3.2 Descriptive statistics

Mean scores of the study variables, standard deviations, as well as Spearman correlation coefficients between each other are presented in Table 3. Significant positive correlations were observed between the three maternal controlling feeding practices (food as reward, restriction for health, restriction for

weight control). EAH of the child was positively linked to food as reward, restriction for health, child BMI z-score, and negatively linked to child inhibitory control. No significant link was observed between EAH and restriction for weight control. Both types of restrictions and child low appetite were significantly linked to the child's BMI z-score.

In addition, the mean scores indicated that restriction for health is a commonly used feeding practice among French mothers of children aged 2-6 years, food as reward and restriction for weight control are used to a lesser extent.

Table 3.
Spearman correlations, means and standard deviations (SDs) for study variables.

		Variables							
		1	2	3	4	5	6	7	Mean (SD)
Maternal feeding practices:									
Food as reward[a]	1	-							1.68 (0.75)
Restriction for health[a]	2	0.22***	-						3.08 (1.00)
Restriction for weight control[a]	3	0.18***	0.37***	-					1.66 (0.64)
Child eating behaviors:									
Low appetite[a]	4	0.05	0.02	-0.05	-				2.52 (1.08)
Eating in the absence of hunger[a]	5	0.18***	0.38***	0.04	-0.07	-			3.10 (0.86)
Child inhibitory control[b]	6	-0.09*	-0.16***	-0.07	0.04	-0.15***	-		5.06 (1.01)
Child BMI z-score	7	0.08	0.10*	0.17***	-0.19***	0.09*	-0.07	-	-0.22 (1.49)

[a]Answer scale ranges from 1-5.
[b]Answer scale ranges from 1-7.
Significance levels: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

Furthermore, simple regression analyses indicated that child sex and child age were significant predictors for a number of child behaviors and maternal feeding practices. Girls showed higher levels of inhibitory control than boys ($\beta = +0.31$; $t = 3.86$; $p < 0.001$), and a lower appetite ($\beta = +0.34$; $t = 3.94$; $p < 0.001$). Children's inhibitory control increased significantly with age ($\beta = +0.10$; $t = 3.34$; $p < 0.001$), children showed a lower appetite with age ($\beta = +0.11$; $t = 3.32$; $p < 0.001$), and mothers reported using more food as reward ($\beta = +0.06$; $t = 2.77$; $p = 0.006$) and restriction for weight control ($\beta = +0.05$; $t = 2.39$; $p = 0.017$) with an increasing age of the child.

3.3 Structural equation models

Four different structural models were evaluated, of which two models included restriction for weight control (model 1A and 1B) and two models included restriction for health (model 2A and 2B). The A-models included the effect of "child (EAH) to parent (restriction)", while the B-models included the effect of "parent (restriction) to child (EAH)". For these models, the data of 541 participants were used (80 children had a missing BMI z-score).

Figure 2 and 3 represent the structural part of the models, that is to say the links between the latent variables, respectively with restriction for weight control and with restriction for health. The corresponding parameters (regressions and covariances) are presented in Tables 4 and 5 for models 1A and 1B, and in Tables 6 and 7 for models 2A and 2B. All models were identifiable and showed a good fit (see footnote Table 4-7), so neither of the two directionalities hypothesized could be rejected.

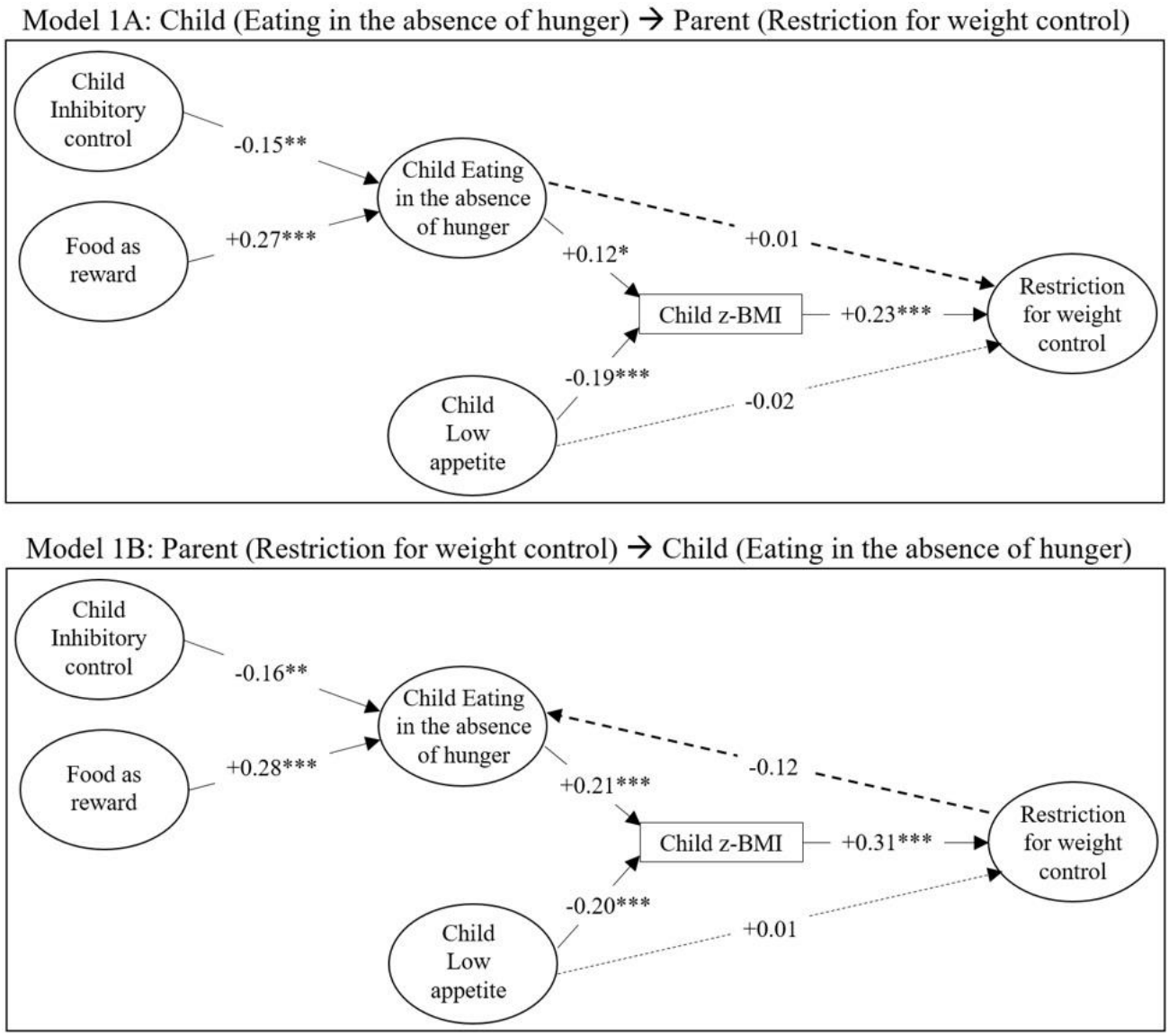


Figure 2. Structural models for the associations between parental feeding practices (restriction for weight control, food as reward), child inhibitory control, child eating in the absence of hunger (EAH), child low appetite and child body mass index z-score. Numbers indicate standardized coefficients, solid lines indicate significant coefficients (*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$), and dashed lines indicate non-significant coefficients. The correlations between the exogenous latent variables (food as reward, inhibitory control, low appetite) are not visualized here. Model 1A: model from child's EAH to mother's restriction for weight control. Model 1B: model from mother's restriction for weight control to child's EAH.

Table 4.
SEM model 1A: parameter estimates, standard errors (SE), *z*-values, *p*-values and standardized estimates (*i.e.*, completely standardized solutions) for regression parameters, and correlations between exogenous latent variables.

Structural regression coefficients	**Estimate**	**SE**	***z*-value**	***p*-value**	**Std. estimate**
Eating in the absence of hunger ~					
Child inhibitory control	-0.144	0.050	-2.857	0.004	-0.150
Food as reward	0.211	0.044	4.789	<0.001	0.274
Child z-BMI ~					
Eating in the absence of hunger	0.283	0.113	2.498	0.012	0.120
Low appetite	-0.344	0.079	-4.379	<0.001	-0.189
Restriction for weight control ~					
Child z-BMI	0.126	0.027	4.740	<0.001	0.234
Low appetite	-0.015	0.048	-0.321	0.748	-0.016
Eating in the absence of hunger	0.009	0.074	0.120	0.905	0.007
Correlations between exogenous latent variables					
	Food as reward	**Child inhibitory control**	**Low appetite**		
Food as reward	-				
Child inhibitory control	-0.113	-			
Low appetite	0.098	0.077	-		

Robust model fit indexes: RMSEA [90% C.I.] = 0.050 [0.044; 0.056], CFI = 0.957, TLI = 0.950

Table 5.
SEM model 1B: parameter estimates, standard errors (SE), *z*-values, *p*-values and standardized estimates (*i.e.*, completely standardized solutions) for regression parameters, and correlations between exogenous latent variables.

Structural regression coefficients	**Estimate**	**SE**	***z*-value**	***p*-value**	**Std. estimate**
Eating in the absence of hunger ~					
Child inhibitory control	-0.149	0.051	-2.929	0.003	-0.155
Food as reward	0.216	0.044	4.892	<0.001	0.281
Restriction for weight control	-0.094	0.050	-1.871	0.061	-0.119
Child z-BMI ~					
Eating in the absence of hunger	0.475	0.131	3.636	<0.001	0.205
Low appetite	-0.354	0.079	-4.506	<0.001	-0.198
Restriction for weight control ~					
Child z-BMI	0.166	0.031	5.312	<0.001	0.305
Low appetite	0.013	0.049	0.275	0.783	0.014
Correlations between exogenous latent variables					
	Food as reward	**Child inhibitory control**	**Low appetite**		
Food as reward	-				
Child inhibitory control	-0.113	-			
Low appetite	0.101	0.076	-		

Robust model fit indexes: RMSEA [90% C.I.] = 0.048 [0.042; 0.055], CFI = 0.960, TLI = 0.953

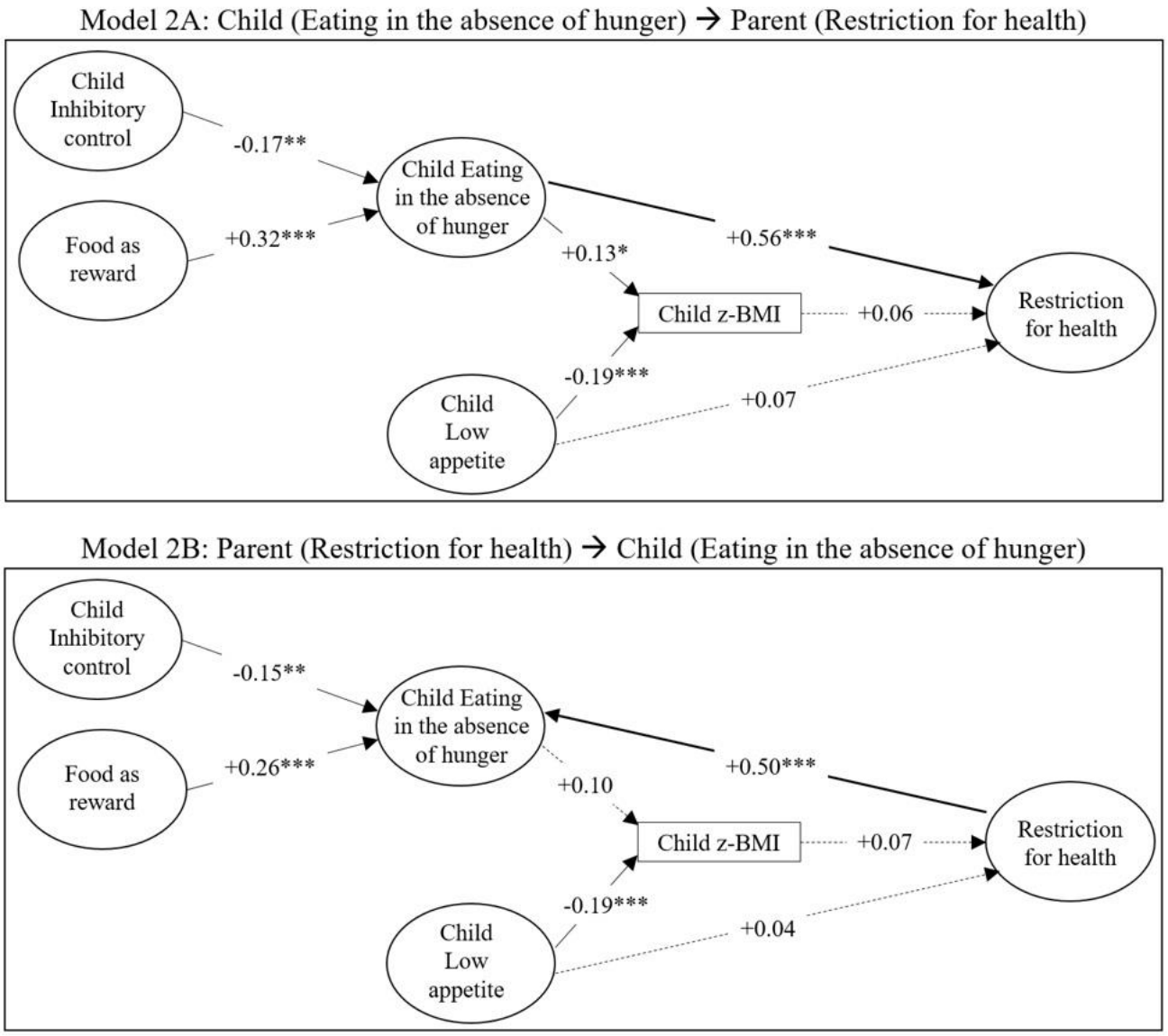


Figure 3. Structural models for the associations between parental feeding practices (restriction for health, food as reward), child inhibitory control, child eating in the absence of hunger (EAH), child low appetite and child body mass index z-score. Numbers indicate standardized coefficients, solid lines indicate significant coefficients (*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$), and dashed lines indicate non-significant coefficients. The correlations between the exogenous latent variables (food as reward, inhibitory control, low appetite) are not visualized here. Model 2A: model from child's EAH to mother's restriction for health. Model 2B: model from mother's restriction for health to child's EAH.

Table 6.
SEM model 2A: parameter estimates, standard errors (SE), *z*-values, *p*-values and standardized estimates (*i.e.*, completely standardized solutions) for regression parameters, and correlations between exogenous latent variables.

Structural regression coefficients	Estimate	SE	*z*-value	*p*-value	Std. estimate
Eating in the absence of hunger ~					
Child inhibitory control	-0.157	0.047	-3.306	0.001	-0.174
Food as reward	0.235	0.042	5.530	<0.001	0.323
Child z-BMI ~					
Eating in the absence of hunger	0.316	0.122	2.593	0.010	0.126
Low appetite	-0.345	0.078	-4.400	<0.001	-0.190
Restriction for health ~					
Child z-BMI	0.032	0.022	1.472	0.141	0.063
Low appetite	0.062	0.044	1.429	0.153	0.068
Eating in the absence of hunger	0.708	0.082	8.635	<0.001	0.555
Correlations between exogenous latent variables					
	Food as reward	**Child inhibitory control**	**Low appetite**		
Food as reward	-				
Child inhibitory control	-0.114	-			
Low appetite	0.108	0.073	-		

Robust model fit indexes: RMSEA [90% C.I.] = 0.044 [0.037; 0.051], CFI = 0.972, TLI = 0.966

Table 7.
SEM model 2B: parameter estimates, standard errors (SE), *z*-values, *p*-values and standardized estimates (*i.e.*, completely standardized solutions) for regression parameters, and correlations between exogenous latent variables.

Structural regression coefficients	Estimate	SE	*z*-value	*p*-value	Std. estimate
Eating in the absence of hunger ~					
Child inhibitory control	-0.137	0.048	-2.848	0.004	-0.149
Food as reward	0.191	0.042	4.549	<0.001	0.258
Restriction for health	0.391	0.049	8.016	<0.001	0.497
Child z-BMI ~					
Eating in the absence of hunger	0.253	0.137	1.855	0.064	0.103
Low appetite	-0.347	0.078	-4.438	<0.001	-0.191
Restriction for health ~					
Child z-BMI	0.038	0.028	1.372	0.170	0.074
Low appetite	0.039	0.049	0.797	0.425	0.041
Correlations between exogenous latent variables					
	Food as reward	**Child inhibitory control**	**Low appetite**		
Food as reward	-				
Child inhibitory control	-0.113	-			
Low appetite	0.113	0.072	-		

Robust model fit indexes: RMSEA [90% C.I.] = 0.059 [0.053; 0.066], CFI = 0.949, TLI = 0.939

In all four models, a negative association was found between child inhibitory control and child EAH, meaning that higher levels of inhibitory control were linked to less EAH. Food as reward was also consistently positively associated with EAH. Furthermore, child low appetite was consistently negatively associated with child BMI z-score, and EAH was positively associated with child BMI z-score, except in model 2B (standardized estimate = 0.15; $p = 0.064$).

Figure 2 shows that restriction for weight control was only significantly associated with child BMI z-score: a higher BMI z-score was linked to more restriction for weight control. In contrast, Figure 3 shows that restriction for health was unrelated to child BMI z-score. While a strong association was observed between restriction for health and child EAH in both the "child to parent" (2A) and the "parent to child" (2B) model (Figure 3), restriction for weight control was not significantly associated

with EAH. Thus, for restriction for weight control, only an indirect link was observed with child EAH via child BMI z-score.

4. Discussion

Using a large sample of French mothers, this study attempts to unravel the associations between preschoolers' EAH, inhibitory control, BMI z-score and different maternal controlling feeding practices. The SEM models aiming to estimate these associations were so constructed based on the idea that child weight is a result of children's eating behavior, and that children's eating behavior (EAH) is influenced by parental feeding practices and child temperament (Davison & Birch, 2001). In separate models, this study also wanted to take into account the possibility that parental feeding practices are influenced by child eating behavior (Birch et al., 2003; Jansen et al., 2018).

In line with previous studies (Fisher & Birch, 2002; Kral et al., 2012; Monnery-Patris et al., 2019), we observed a significant positive link between children's EAH and their BMI z-scores. This suggests that as early as the preschool period, poorer abilities to self-regulate food intake could be associated with overeating and could represent a risk for weight gain and for overweight or obesity in the longer run. We also observed that children's temperament can play a role in their vulnerability toward difficulties with self-regulation of eating. Previous studies have already linked the children's level of inhibitory control with their eating behavior and self-regulation of intake (e.g., Tan & Holub, 2011), even though the results have sometimes been inconsistent (Francis & Riggs, 2018). Our results seem to confirm that higher levels of inhibitory control could act as a protective factor in relation to eating in the absence of hunger, or vice versa that lower levels of inhibitory control could induce a vulnerability.

The results further indicated that environmental factors, specifically parental feeding practices, were linked to child EAH: both food as reward and restriction for health were significantly positively associated with EAH. One could argue that food as reward is mainly a parent-centered feeding practice; meaning that parents use food rewards in exchange for good behavior of the child, regardless of the child's eating behavior or eating temperament. For restriction for health, we explored the relation with EAH in two directions ("child to parent" or "parent to child"). In both models, and thus both directions, a significant association was observed. These results could suggest a bidirectional relationship, beyond the scope of the present paper, according to which poor self-regulation in the child might stimulate parents to impose restrictive measures, which in turn, could reinforce the child's poor self-regulation and divert them from their sensitivity to satiety cues. This bidirectional link was previously already suggested by Bergmeier and colleagues (2014). Longitudinal studies are, however, needed to further explore these possible bidirectional links between controlling feeding practices and children's self-regulation of eating. For restriction for weight control, no direct link with EAH was observed in this study, only an indirect link via child BMI z-scores. Based on this finding, we think that restriction for weight control could be mainly a child-centered practice: this practice could be dominantly implemented by parents based on the child's weight status and parental concerns related to this. Accordingly, Musher-Eizenman and Holub (2007) reported that restriction for weight control was significantly linked with parental concerns about the child being overweight (positive link) and concerns about the child being underweight (negative link). The absence of a link between restriction of weight control and EAH is in line with the results of Tan and Holub (2011), but not with those of Musher-Eizenman and Holub (2006), who found that maternal restriction for weight control

significantly predicted preschoolers' EAH. These mixed results could be due to sampling differences, but also due to the use of different measures for children's self-regulation of eating. For this study and the study of Tan and Holub (2011), parent-reported questionnaires were used, while Musher-Eizenman and Holub (2006) used a behavioral external eating task in a childcare center. This could indicate that both types of measures might tap into different aspects of children's self-regulation of eating (Tan & Holub, 2011). Moreover, we found that restriction for health was linked to EAH whereas restriction for weight control was not. Even if we cannot give a definite explanation, it is interesting to mention that the items representing restriction for health tap mainly into the types of foods that are restricted (i.e., unhealthy, well-liked foods), while the items representing restriction for weight control (after the removal of certain items based on the fit indices of the CFA's) tap mainly into the restriction of the amount of the foods (see Table 1). In our study, not only the motivations linked to restriction were thus different, but also the type of restriction. This could indicate that limiting the access to certain types of foods has a stronger link with self-regulation of eating than limiting merely the amount of intake of these foods. Accordingly, previous studies found that prohibiting the intake of certain types of foods leads to an increased desire for and consumption of these foods when granted access to (Jansen et al., 2007; 2008).

Overall, our results seem to indicate that factors on both child and parent level contribute to children's self-regulation of eating (EAH) and associated weight status, and this already at preschool age. They give rise to the idea that, for children, it could be important to guide them from a very young age in maintaining (or developing) adaptive self-regulation abilities for food intake and to avoid EAH. Parents and schools could play an important role in encouraging children to listen to their inner sensations of hunger and fullness for intake and in modeling these strategies. A limited number of intervention programs exist for children to promote a better self-regulation of eating. They include, for example, appetite awareness trainings, teach concepts of hunger and fullness (e.g., Bloom et al., 2013; Boutelle et al., 2011; Johnson, 2000), or they combine educational materials for parents with an interactive character-based technology platform for the child (Reich et al., 2020). Some studies also suggest that children could benefit from interventions that train their inhibitory control (e.g., Jiang et al., 2016). However, studies with preschoolers are scarce (e.g., Graziano & Hart, 2016; Lumeng et al., 2017) and with varying results, especially in relation to the food domain (self-regulation of eating) and weight status. More research is needed in this domain. Furthermore, for parents, our results suggest that it is preferable to limit the use of controlling feeding practices, which is in accordance with conclusions in previous studies (Vaughn et al., 2016). In addition to discouraging the use of controlling practices in parents, it could be beneficial to stimulate the use of alternative feeding practices, such as structure-related practices (Rollins et al., 2016; Vaughn et al., 2016). These practices present a certain type of parental control, but in a non-coercive way: they encompass consistent rules and boundaries around eating (e.g., about what, when and where to eat), and are believed to facilitate children's competences and to promote the adoption of healthy eating behaviors (Jansen et al., 2014; Vaughn et al., 2016). They have also been found beneficial for children's self-regulation of eating (Frankel et al., 2018). A certain level of parental control in the form of limits, structure and routines could enable children to act autonomously within these predefined boundaries, which might stimulate them to maintain or adopt adaptive strategies to self-regulate their intake.

Limitations and strengths

Several limitations should be noted for the current study. First, the cross-sectional design limits the results to mere associations. Longitudinal studies are necessary for studying the causality of the relationships. It is worthy to note, though, that this study did not aim to draw conclusions regarding causality between restriction and EAH, but merely wanted to take into account the possibility of a "child to parent" or a "parent to child" effect. Second, maternal controlling feeding practices were self-reported and might be subject to a social desirability bias. Third, child inhibitory control and EAH were not observed directly but were mother-reported, and might thus be influenced by parental beliefs and perceptions. In two studies, mothers were found to rate the self-regulation of eating of their child higher than fathers did, suggesting the vulnerability to subjectivity of parent-reports of self-regulation (Frankel & Kuno, 2019; Frankel et al., 2018). Parents might have difficulties to report on aspects of self-regulation of eating because these behaviors reflect children's inner sensations which could be difficult to read. Last, children's weight and height were mother-reported and the researchers did not know if the measurements were performed by health professionals or not. The quality of the measurements could therefore vary. Taken together, these limitations should be kept in mind when interpreting the results of this study. It would be interesting to conduct a study with data gathered at different time points to properly assess the directionality between the parent and child constructs. In addition, it would be preferable to combine observational and declarative measures to cross-validate the measures. It is also good to take into account the fact that a model is always a simplified representation of the relationships between different variables. For the aim of this study, a number of variables were selected in order to discuss how they relate to each other. Obviously, there are other variables (e.g., maternal weight status, sociodemographic variables) that could be of interest in relation to parental practices and child EAH and BMI. These associations could be explored in future studies.

This study also presents a number of strengths. A first and important strength of this study is its large sample size. Second, this study presents results of a French population which expands the results of studies mainly conducted in the USA. Third, distinct dimensions were used for different parental controlling practices (food as reward, restriction for health, restriction for weight control) which, sometimes, have been used in combined, overarching dimensions in the past resulting in mixed results. These distinctions enabled us to obtain a better understanding of the relations between these practices and child behaviors and BMI, and clearly showed that these restrictive practices should be studied as separate dimensions. Last, this study is original in its design by combining temperamental and environmental dimensions that could be linked to child self-regulation and BMI, and by exploring possible different directionalities in separate SEM models.

Conclusion

In sum, the results of the current study showed a link between young children's self-regulation of eating and their body mass index, identifying EAH as a possible risk factor for the development of weight problems. Both temperamental traits (inhibitory control) and environmental factors (maternal controlling feeding practices) were associated with EAH, and restriction for health and restriction for weight control were linked differently to EAH and to children's BMI z-scores. Beyond the scope of this study, we think that interventions could focus on improving children's abilities to self-regulate intake, on promoting inhibitory control or on promoting adaptive parental feeding practices. It could also be of interest to take on a systemic approach in future interventions in which different actions are

combined. These interventions could, for example, propose trainings for children to improve their general and food-related self-regulation. In addition, trainings could guide caregivers in adopting responsive behaviors to their children's appetite and satiation cues, and in using structure-related parental feeding practices.

This study provided some additional insights in the relationships between EAH, BMI, inhibitory control and different maternal feeding practices, but it is important to note that this study focused specifically on maternal feeding practices. Future studies with a large number of fathers are needed to replicate or refute the current results with mothers, as Frankel and Kuno (2019) showed that results regarding the relationship between restrictive feeding practices and children's self-regulation in eating from mother-only samples should not automatically be generalized to all parents.

Data Availability Statement

The datasets generated for this study can be found on Zenodo:
https://zenodo.org/record/4436613#.X_8IeuhKi71.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Author Contributions

KP, SI, SM-P and CC conceptualized the study. KP and CC conducted all analyses. KP is first author, she drafted a first version of the manuscript, all authors thereafter contributed to editing the manuscript. All authors read and approved the final version of the manuscript.

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CHAPTER IV.

Parental portioning practices in France and influencing factors

This chapter will be presented in the form of an article published in

***Nutrients*.**

Article 3

How do French parents determine portion sizes for their pre-schooler? A qualitative exploration of the parent-child division of responsibility and influencing factors.

Philippe, K., Issanchou, S., Roger, A., Feyen, V., & Monnery-Patris, S.

2021

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Introduction:

Children's abilities to self-regulate their food intake can be influenced by factors in the child's environment, such as parental feeding and portioning practices. To illustrate, when children are served larger portions, they tend to eat more (i.e., the "portion size effect"). However, little is known about parental portioning practices and drivers of these practices. In France, this topic is also rather unexplored.

Objectives:

The first objective of this study was to capture the variety of parental portioning practices used for French pre-schoolers, including the degree of autonomy granted to the child for serving food and determining portion sizes.

The second objective was to identify the factors that underlie parental portioning practices.

The third objective was to explore parental use of information sources and recommendations regarding the determination of portion sizes.

Focus:

Parental portioning practices and influencing factors.

System(s) Bronfenbrenner:

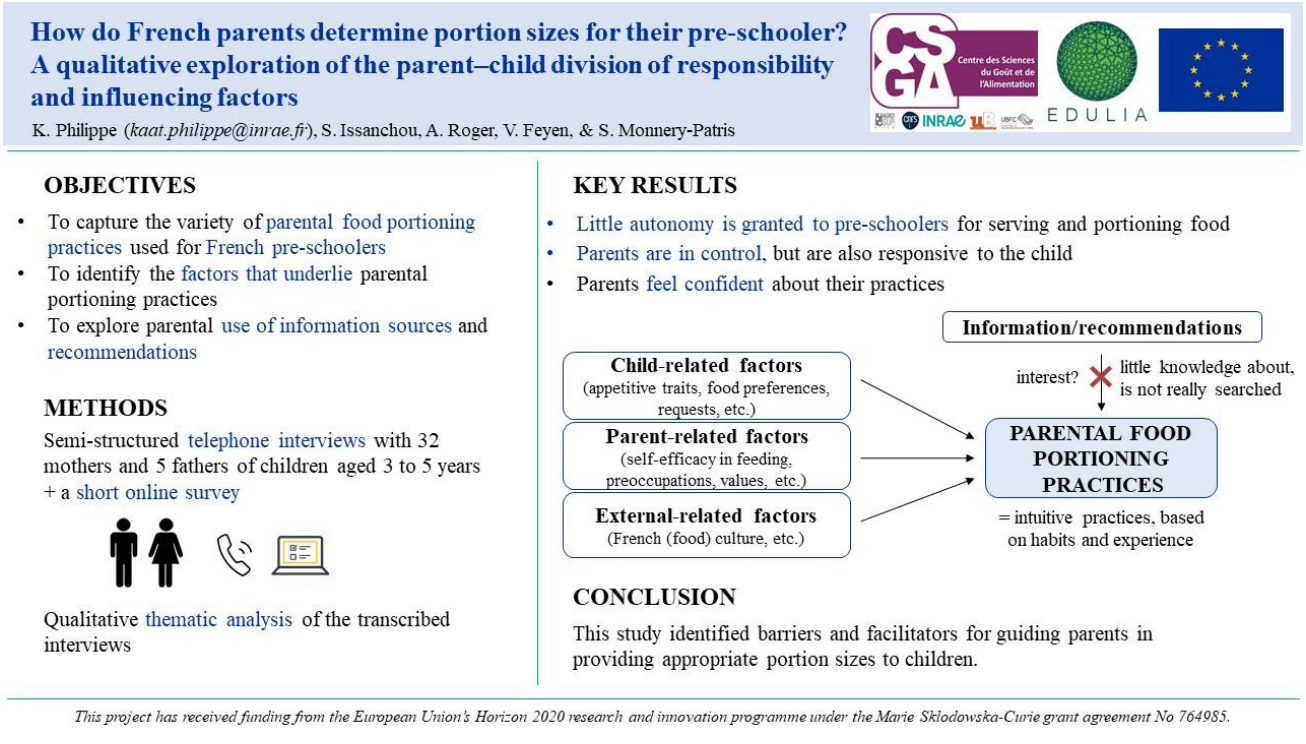
Microsystem (parents); Mesosystem (interactions family, paediatric doctor); Macrosystem (culture, values, norms)

How do French parents determine portion sizes for their pre-schooler? A qualitative exploration of the parent-child division of responsibility and influencing factors.

Abstract: Large portion sizes can make children overeat, alter their self-regulation abilities and induce weight gain. However, little is known about how parents determine portion sizes for their children. Using semi-structured interviews with 5 fathers and 32 mothers of pre-schoolers, this study examined French parents' food portioning practices. The division of responsibility between parent and child in deciding portion sizes was explored, as well as the influencing factors and possible sources of information. Parents described a wide range of practices. For most, determining portion sizes is an intuitive action that depends on habits and mainly arises from experiences with feeding their child and his/her appetitive traits. Few parents grant autonomy to their child for portioning and serving food, especially for the first serving. Many influencing factors were identified, including child-related (e.g., appetite, food preferences), parent-related (e.g., avoiding food waste), and external factors (e.g., influence of siblings, French food culture). Most parents do not search for information/recommendations to guide their practices. Stimulating optimal self-regulation of eating in children is important and parents can play a crucial role in this. This study identified barriers and facilitators to guide parents in providing appropriate portion sizes and help include children in this decision process.

Keywords: qualitative research; food portioning practices; children; parental feeding practices; food culture; autonomy

Graphical Abstract:



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1. Introduction

Parents play a key role in the development of young children's eating habits and preferences [1]. Parental feeding practices, or the behavioral strategies used to control what, how much, when, and where the child eats [2], constitute a possible means to prevent the emergence of "unhealthy" eating habits and obesity. According to the theory of division of responsibility in feeding [3], parents should be primarily responsible for the choice of foods served to the child (what), as well as where to and when to eat, while the child should decide on how much food to eat and whether to eat. This is based on the idea that children have the capacity to self-regulate their food intake according to their physiological needs, managed by their sensations of hunger and fullness [4]. In order to maintain optimal self-regulation of intake, the feeding relationship must be supportive and responsive to the child's needs and capacities [5,6]. There must be both autonomy granted to the child and leadership taken up by the parent—for example, by providing a social context for feeding and enforcing certain rules and boundaries.

In practice, however, parents do not seem to follow these recommendations; they tend to grant their child too much autonomy for deciding what to eat, but too little autonomy for deciding how much to eat [7]. It has been reported that if children rely on environmental factors for their intake (e.g., inappropriate portion sizes, controlling parental feeding practices, availability of palatable foods) rather than their internal signals of hunger and fullness, this could cause them to overeat, which in turn, if applied consistently, could result in an increased risk of overweight and obesity [8–12]. The "portion size effect" can illustrate this risk: when humans are served larger portions, they tend to eat more, and this has been demonstrated robustly and reliably in both adults (for a review, see [13]) and children (for a review, see [14]). A meta-analytic review by Zlatevska et al. [15] indicated that when a double portion size is served, energy intake in adults and children increases by 35% on average.

In addition, since young children are highly dependent on their parents for their food intake, it is important to gain additional insight into parental food portioning practices, the division of autonomy between parent and child in terms of determining portion sizes, and the drivers of these practices. Here, the term "parental portioning practices" refers to the decisions made by parents regarding the portion sizes of foods or beverages they serve to their child. In 2018, Kairey et al. [16] published a systematic literature review on this topic, including 14 quantitative and 14 qualitative studies with parents of children aged 2–12 years. The results of this review provide valuable insight into parental food portioning practices and the drivers of these practices, but it is important to note that the majority of the included studies were conducted in the USA (quantitative 11/14, qualitative 10/14). Knowing that cultural differences exist with regard to eating habits, food attitudes [17,18], and parental feeding practices [19,20], these results may not be automatically generalized to other countries and cultures. To our knowledge, no qualitative study has examined parental food portioning practices for pre-schoolers and the factors influencing them in France. The specificity of the meal structure in France, where lunch and dinner are usually composed of different components (i.e., starter, main course, dairy product, dessert) could, for example, give rise to specific parental portioning practices.

Therefore, the main aim of the present study is to capture the variety of parental portioning practices used for French pre-schoolers. Following the idea of Satter's theory of division of responsibility [3], the degree of autonomy granted to the child for serving food and determining portion sizes will be explored here. The current study is explorative, but we expect to observe a wide range of parental portioning practices, as well as differences in the degree of autonomy granted to children in terms of

deciding how much to eat. As observed by Loth et al. [7], we expect most parents to grant their child little autonomy in deciding how much to eat.

The second aim of this study is to identify the factors that underlie parental portioning practices (e.g., parental perceptions, cultural aspects). Finally, the third aim of this study is to explore parental use of information sources and recommendations regarding the determination of portion sizes and parents' perceptions and expectations about their use. This could be useful for identifying parents' need for guidance.

In the present study, parents of pre-schoolers aged 3 to 5 years will be targeted, as this period can be challenging due to the peak in children rejecting food at this age [21,22] and the deterioration in children's self-regulation of food intake [8,23]. Furthermore, parents with different educational levels and different family situations (two-parent vs. single-parent households, different birth order of the target child) will be included because it is known that parental practices can vary according to these characteristics. For example, a recent cross-sectional study in France [24] using questionnaires found that mothers with a lower level of education served larger portions to their child aged 8–11 years than mothers with a higher level of education.

2. Materials and Methods

2.1. Ethics Statement

Ethical approval (n°20-649) was granted for this study by the Institutional Review Board (IRB00003888, IORG0003254, FWA00005831) of the French Institute of Medical Research and Health. Study registration was conducted by the data protection service involved (CNRS).

2.2. Participants

Parents were eligible to participate if they were older than 18 years and if they had at least one child aged 3–5 years. They were not eligible if their child suffered from a condition that could influence his/her eating (e.g., swallowing difficulties, autism), as we estimated that this could impact the feeding interactions between parent and child. Parents were recruited from a research panel in Dijon (ChemoSens Platform's PanelSens, CNIL no. 1148039) via schools and via snowball sampling. A sampling matrix was used to select a sample of participants who were diverse in terms of parental sex, level of education, household composition, and birth order of the child. When conceptualizing this study, it was estimated that approximately 40 parents would be needed to ensure that there was a diverse sample of participants. However, a possible "saturation" effect of the data was evaluated during the data collection phase, meaning that the recruitment of a certain group of participants would be stopped if new interviews did not provide additional information to that found in previous interviews of this group.

Finally, a total of 37 parents (32 mothers, 5 fathers) were selected to participate in this study. Their characteristics and those of their children are presented in Table 1. Parents received a voucher of twenty Euros to thank them for their participation.

Table 1. Characteristics of participating parents (n = 37) and their children.

	n
Parents' Characteristics:	
Sex (female/male)	32/5
Age in years, mean (min.–max.)	33.9 (23–42)
Relationship status (couple/single parent)	30/7
Weight status:	
Underweight (BMI < 18.5)	4
Healthy weight (18.5 ≤ BMI < 25)	18
Overweight (25 ≤ BMI < 30)	9
Obesity (BMI ≥ 30)	4
Unknown	2
Level of education:	
Low (no diploma, high-school diploma, higher technology degree)	11
Middle (two or three-year higher education degree)	16
High (Master's degree or higher)	10
Work status:	
Working (part-time or full-time)	28
Unemployed, job seeker	3
Student	1
Other (e.g., parental leave, parent at home)	3
Unknown	2
Perception of financial situation:	
You can't make ends meet without going into debt	1
You get by but only just	0
Should be careful	8
It's OK	22
At ease	3
Unknown/Does not wish to answer	3
Children's characteristics:	
Age:	
3 years	17
4 years	12
5 years	8
Birth order:	
Firstborn or only child	20
Child with older sibling(s)	17
Weight status [a]:	
Underweight	5
Healthy weight	27
Overweight	3
Obesity	0
Unknown	2

[a] Weight categories for children corresponding to BMI-for-age percentiles based on growth charts for children and teens ages 2 through 19 years of the Centers for Disease Control and Prevention (CDC).

2.3. Data Collection

Data collection took place in summer 2020, right after the first COVID-19 lockdown in France. Due to ongoing infection risk at the time of data collection, it was not possible to conduct the planned interviews in person. All steps of data collection were therefore adapted so that they could be performed remotely, without physical presence.

2.3.1. Recruitment form and Informed Consent

Parents who were interested in participating were invited to complete an online recruitment form. In this form, they were asked to provide information about their sex, age, level of education, and household composition, as well as about their child's age, birth order, and possible illnesses influencing his/her eating behavior. Parents were also asked to state their availability for a possible interview and to provide their contact details.

When parents were selected to participate, they received a link to an online informed consent form. Information about this study and the data protection policy was provided here. Parents were asked to confirm that they understood and agreed with the information provided and that they agreed to have the interview recorded.

2.3.2. Interview Guide and Interview Procedure

Semi-structured telephone interviews were conducted in parents' native language (French). Interviews lasted an average of 43 min (from 23 to 78 min). They were conducted by a research engineer, a research technician and a Master's student in sociology with previous interview experience. All interviewers were trained by the first and last author, two psychologists (K.P. and S.M.-P.).

A semi-structured interview guide (available in Appendix A) was developed as a means of support for the interviewers. The guide was developed based on theory (e.g., theory of division of responsibilities, [3]) and previous studies (e.g., [7]), but tailored to this study's specific objectives and adapted to the French food culture. In France, it is, for example, common to consume a multiple-component lunch and dinner (starter, main dish, dairy product, dessert), and this could have implications for portioning practices. For children in France, the consumption of a mid-afternoon snack ("goûter") is also a common practice; it is even seen by many as an additional meal [25] (pp. 1–4).

The interviews always started with a short introduction of the interviewer and a brief review of the study information and data protection policy. Parents were asked to verbally confirm that they still agreed that an audio recording could be made and were asked to avoid the use of personal names, if possible. If parents had more than one child aged between 3 and 5 years, the interviewer specified which child would be the focus for the interview, chosen based on the child's age or birth order. The interview guide comprised four main topic sections: (1) meal organization and composition; (2) meal service and portion sizes; (3) family rules around eating; and (4) the child's appetite, satiation, and weight. For each section, there were a number of core questions, optional questions, and probes. To obtain realistic descriptions, the interviewer tried to limit the questions to a description of the meals and practices of the previous day, unless parents indicated that this day was very different from the family's usual eating habits. In addition, a number of questions did not focus on the previous day, but aimed to obtain a more general description of practices or eating behaviors (e.g., "How would you describe your child's appetite?"). At the end of the interview, parents were asked if the COVID-19 pandemic (still) had an impact on their current eating and feeding habits and thus if their descriptions during the interview differed from their usual habits. They were also invited to share additional information that had not yet been addressed and that they considered important. When they had nothing further to add, they were thanked for their time and the following steps of this study were explained to them.

The interview guide was pretested by inviting four parents (one father and three mothers) for a telephone interview. The interviews all went well and only minor adjustments to the guide were made,

such as changing the order of certain questions and adding some notes addressed to the interviewers. The data of these four parents were therefore also included in this study's analyses.

2.3.3. Final Survey

After the interview, parents received a web link to a final online survey with questions complementing the data of the recruitment form and the interview. Parents were asked to complete information about the child (birth date, sex, weight, height) and about themselves (weight, height, work status, financial status). Due to the COVID-19 situation at the moment of data collection, children's and parents' weight and height were parent-reported; for the child, they were retrieved from the child's health book or measured by the parent himself/herself. Parents were also asked to answer questions regarding the following topics.

Self-regulation of the child. To estimate how parents rate their child's capacity to decide appropriate portion sizes for themself, they were asked to complete the following phrase: "If I did not guide the portion size of my child at mealtime ...". Parents could choose between: (1) "… (s)he would be able to choose an appropriate portion size", (2) "…(s)he would serve too large portions", or (3) "…(s)he would serve too little".

Self-efficacy for identifying appropriate portion sizes. One item was used to estimate how parents rate their own capacity to decide appropriate portion sizes for their child ("I am confident that I know appropriate portion sizes for my child's meals"). They were asked to rate their answer on a 5-point scale ranging from "Do not agree at all" to "Totally agree". This item was selected from the self-efficacy scale of Fulkerson et al. [26] and translated to French for this study.

Information sources. Three questions were used to obtain insight into possible sources of information for parents regarding portioning practices. First, they were asked if they "looked or asked for advice for the determination of portion sizes" (no or yes + description if yes). Then, they were asked if they were "knowledgeable about recommendations regarding determining portion sizes for children" (no or yes + description if yes). Finally, they were asked if they were "interested in receiving recommendations or advice that could guide them in determining portion sizes for their child" (5-point scale ranging from "I'm not at all interested" to "I am very interested").

The survey also included items to study children's eating behaviors (appetite, food enjoyment, food neophobia, and food pickiness), parents' use of pressure to eat, their level of restrained eating, and their motivations when buying food for the child, but these results will not be presented in this paper.

2.4. Data Transcription and Data Analysis

Interview recordings were transcribed verbatim. A thematic analysis was conducted following the steps of Braun and Clarke [27]: (1) familiarization with the data, (2) initial coding generation, (3) searching for themes based on initial coding, (4) review of the themes, (5) theme definition and labelling, and (6) report writing.

The familiarization step (1) took place both throughout the data collection phase (listening to recorded interviews) and after (reading the transcribed interviews). This aided us in identifying preliminary patterns in the data and determining when the "saturation" of the data occurred, meaning that new interviews did not provide additional information to the data of the previous interviews. The first author had regular discussions with the interviewers about the interviews and the emerging patterns in the data. After the data familiarization phase, a group meeting (K.P. + S.M.-P. + V.F. + A.R.) took place to discuss the emerging themes. Then, three interviews were selected for independent

initial coding by all researchers who were present at the group meeting. A data-led approach was used, but coding was also partly guided by the topic sections of the interview guide. After the independent coding phase, which was conducted by three researchers (A.R. + V.F. + K.P.), the initial codes and associated themes and subthemes were discussed in the group until a consensus was reached, resulting in a coding template. This template was used for the subsequent coding of the interviews. When doubts or difficulties arose among the coders regarding the placement of quotes, new group discussions took place and the coding template for themes and subthemes was revised where needed until agreement was reached between the coders. When all the interviews were coded, K.P. and S.M.-P. reviewed, regrouped, and defined the themes and subthemes that were of particular interest for answering the research questions of the current study and discussed the results of this process with S.I.

2.5. Trustworthiness and Translation of Quotes

Member checking, a respondent validation technique, was applied in order to confirm the interpretation of the data and increase the trustworthiness of the data [28]. After each interview, a summary of the interview was written by the interviewer and discussed with the first author. The summary was sent to the participant for validation and participants were invited to share additional information that had come to mind after the interview [29]. In some cases, the research team added a specific question for the participant in order to obtain additional information about a certain topic or to make sure that they fully understood certain statements made by the participant.

A number of quotes were selected for this article to exemplify the results of the thematic analyses. They were translated from French to English by a native English linguist who is fluent in French and has been living in France for many years. The original French quotes with their translation are presented in Appendix B. Brackets with dots in a quote ("[…]") indicate that a number of words or sentences have been skipped.

2.6. Data Analysis of the Survey

Descriptive statistics were used to describe the participants' characteristics and quantify the responses to the questions asked at the recruitment stage and in the final survey.

3. Results

A variety of themes and subthemes emerged from the analysis; an overview is presented in Table 2. Details about the themes and subthemes are described below.

Table 2. Themes and subthemes resulting from the analysis.

Themes	Subthemes		
1. Food habits and composition of meals	1.1 French food culture	1.1.1 Different components meal	
		1.1.2 Nutritional values	
2. Parental portioning practices	2.1 Who serves/who decides on portion sizes?	2.1.1 First serve versus following serves	
		2.1.2 Different practices for different meals?	-Breakfast -Lunch -Mid-afternoon snack -Dinner -Milk bottle
		2.1.3 Conditioned autonomy child	
		2.1.4 Why does parent or child serve?	-Practical reasons -For the child, "it's a game" -Self-regulation capacity child -Child's demands -Influence other family members
	2.2 Portion sizes	2.2.1 Rules around serving and re-serving	-Quantity of food -Healthy vs. unhealthy foods
		2.2.2 Tricks to determine portion sizes	
		2.2.3 What guides parents when determining portion sizes?	-Child's physical activity/intake previous meal/expression of hunger -Child's food preferences -Parents' confidence in own portioning practices -Information sources
3. Family rules around eating	3.1 Meal timing		
	3.2 Pressure to eat/negotiating/bribing		
	3.3. Origins of feeding practices and inter-generational transmission	3.3.1 Own experiences in childhood	
		3.3.2 Educational goals	

3.1. Food Habits and Composition of Meals

Despite some minor deviations, all parents described that they follow the "French eating model" in their family: three meals a day (breakfast, lunch, dinner) and a mid-afternoon snack for the child. Meals are usually consumed at set times and at the table in the company of other family members.

A milk bottle, cereals with milk, and bread are common breakfast foods/drinks. Lunch and dinner usually consist of different components: a starter (salad), a main dish (proteins), cheese or yoghurt, and a dessert (fruit or a sweet dessert). For the mid-afternoon snack, food pleasure takes a central role in most families. Usually, something sweet is consumed, e.g., biscuits, cake, fruit compote, cream dessert, (drink) yoghurt.

Food habits may alter between weekdays and weekend days, but in most families the difference is fairly limited. If changes occur, they mostly concern the timing of the meals or the extent of the meal—i.e., they may be more elaborate or festive on weekend days, especially when guests are invited.

3.2. Parental Portioning Practices

3.2.1. Who Serves/Who Decides on Portion Sizes?

First Serve Versus Following Serves

In most families, a parent serves the pre-schooler and decides the portion size served. However, differences were found between the first serving and any subsequent servings. For the first serving, it is almost exclusively a parent who serves and decides. Most parents decide on a minimum portion the child should consume, then, if the child is still hungry or if he/she wants more, the child may receive or take another portion of the dish. At this point, the child usually has some say in how much is served, based on their expressions of hunger or their demands, or they may be allowed to serve themself.

Indeed, I decide on the first serve. And then, if he's still hungry, I serve again and I ask him how much he wants. (U065)

Often, we serve him the first time. Then after, if they want seconds, I suggest they help themselves. (TAL01)

Different Practices for Different Meals?

Differences in serving practices were observed between different meals. For lunch and dinner, parents are mostly in control and little autonomy is granted to the child in terms of serving themself and for determining portion sizes, especially for the first servings (as described above). However, children are often allowed to take some cheese or a yoghurt and a dessert themselves, which are mostly products with a predetermined quantity.

I'm the one who serves. Well, it's me or my husband. We serve the children, yes. (Y214)

Yes, like at lunchtime in fact, I serve up on plates and then dish them out to everyone. (C697)

However, I let her have her yoghurt, for example at lunchtime they can choose which yoghurt they want. So she can go and open the fridge when I tell her she's allowed to. (P078)

For breakfast, children participate more actively in serving themselves or in choosing what to eat (e.g., taking the food they want, pouring milk on their cereal), even though there were also some families where the parents prepare and serve breakfast for their child. According to some parents, what and how much the child eats at breakfast is strongly based on habits, which means that they have to exercise less control.

At a push, the moment he guides me the most is in the morning about the quantity of milk or cereals or regarding toast, he tells me what he wants in terms of quantities but not for the other meals, I'm the one who decides. (R863)

Well, in the morning, they get up and they can help themselves. Well, I check what they take, but as it's always the same thing and the same portion size, let's say I'm not surprised. They don't take advantage in terms of what they take, what she takes. (J086)

For the mid-afternoon snack, there is also more child autonomy, especially in terms of food choice. Children can often decide what they want to eat and are allowed to take it themselves.

Like in the morning, she chooses what she wants to eat, what she wants to drink. She helps herself to cakes in the cupboard, she'll ask me for a drink but generally I give her water. (S615)
After, it's true that I leave them more often than not to choose their own snacks at home. I mean, I put things on the table and then I sort of leave them to it. (TAL01)

Conditioned Autonomy Child

As illustrated above, some parents grant more autonomy to their child than others. This ranges from no autonomy (not for serving, not for determining portion sizes), to interaction and discussion with the child about the portion size served by the parent, to allowing the child to serve himself/herself. However, even when the child is invited to say how much (s)he wants to eat or when serving, the parent will always monitor and re-adjust when deemed necessary. The child is never granted full autonomy.

He helps himself, but I still keep an eye on him. (U065)
After, for everything else, I know pretty well how she eats, so I adapt, I ask her how much she wants and sometimes her eyes are "bigger than her belly", so I adapt by saying "eat this first and if you want more, you can, but I think it's already fine like that". (N675)

Why Does Parent or Child Serve?

When asked why it is the parent or child who serves, parents gave several reasons. The most common reason was "practicality". Parents serve, for example, because it is faster, because the cook prepares the plates in the kitchen for everyone, to avoid danger (e.g., child getting burned by hot foods or by hot pots and pans), to avoid messy situations (e.g., when foods are too liquid), or because the tools used to serve are not adapted to the child's size or motoric skills.

But still, most of the time we serve [...] yes, it's more practical and quicker to be honest with you. (TAL01)
Very often we serve her, we serve her because everything is the same ... Always because of dexterity. It's not easy to serve yourself from a dish [...] however, at the moment as we're eating quite a lot of raw vegetables, I let her serve herself. For example, when we eat radishes, she helps herself to the radishes. (R371)
So I'd say it depends in fact. I push him to be a bit independent and to do things for himself. But then, if things are too hot, or too runny, or not easy to serve, he doesn't help himself ... but if it's simple things, I don't know. If he wants to serve himself from the salad bowl and take the salad tongs and serve himself, I don't mind. (T261)

Here, it is interesting to note that some parents cite practical reasons to defend their habits, but also admit that they really just want to be in control.

I say to him "you help yourself but as it's really runny I'll do it with you" so I can control it too. (N675)

Another reason why parents serve their child, is because they say that for their child *"it's a game"*; the child does not take serving and portioning seriously. During the interview, parents were asked if they thought their child was capable of serving himself/herself or determining appropriate portion sizes. Most parents answered that they think their child would be able to serve the food, but not the right portion sizes or the right proportions (i.e., a balanced meal). They thought that children would

serve too much of the foods they like. One father explained that he thought his daughter *"has not yet acquired the notion of quantity*". Here, many parents admitted that their answer was a guess, that it is what they "*think*" would happen, because *"they haven't really tested it*" or "*they would be surprised*". In the final survey, parents were invited to answer a similar question. When presented with the statement "If I did not guide the portion size of my child at mealtime…", 12 parents chose the answer "… (s)he would be able to choose an appropriate portion size", 17 parents chose the answer "…(s)he would serve too large portions", and 7 parents chose "..(s)he would serve too little". There were no differences in answers when comparing different groups of parents, e.g., groups based on the child's age (3/4/5 years old), the child's birth order (first child or not), or the parent's level of education (low/middle/high).

Furthermore, some children are allowed to serve themselves simply because they request it:

When she asks, she serves herself, there's no problem. (E492)
No, it's him who asks. He wants to do it on his own. (TAL03)

One mother also explained that she serves the children because it was done that way in her childhood (inter-generational transmission):

I serve the eldest too. It's true that my parents served us when we were kids ... Well, my mother served us and it's true that it's ... Yes, I tend to serve everyone. (Y214)

3.2.2. Portion Sizes

Rules around Serving and Re-Serving

Many families have clear rules about whether or not children are allowed a second serving and what can be re-served, especially at lunch and dinner. As mentioned previously, for the first serving parents usually serve a small portion size which the child should finish, then the child can (be) re-serve(d) if they are still hungry. Parents prefer this approach because it contributes to avoiding food waste, and some parents also describe that a small first portion encourages the children to eat. If children are served too much food from the start, they are less likely to consume what is served.

I don't like throwing food away too much, so I generally give him a portion that I know he'll be able to eat. But I'd rather he asks me for more rather than leave it. So I don't serve too much. (T261)
I prefer to serve less and that he eats everything and then at the worst I give him more if he wants it, rather than serving a lot. I've noticed that if you serve a big amount straight away there are times when he'll look at his plate and then he'll have two bites and … Yes, he will stop. However, if we give him smaller quantities, he will eat more easily. He'll take them more easily. (Y214)

In contrast, one mother stated that she wants to teach her daughter to take the right quantity from the start at the first serving, as she does not want to create the habit of re-serving:

But when she helps herself [...] let's say she doesn't serve herself enough, sufficient quantities so that she'll want more. And that's something I don't want to teach her: to serve herself again. That's it. She helps herself once and that's it. (K122)

However, in most families, re-serving is allowed but under certain conditions. For example, re-serving is not unlimited, and a second or subsequent serving will always be smaller than the previous one.

Yes, it's me who decides, and when it's something she's really liked, she asks me for seconds [...] In general I give her a little less. (S615)
So I ask him if he is really sure [to want more] because I don't want him to waste food. And if he's sure, I give him a small portion more. I'd rather give him a little bit and then serve him again a few times, than give him too much and then he doesn't want it at all. (T411)

Moreover, there are not only rules regarding the size of any re-serving, but also about what can be re-served. Most parents allow their child to re-serve foods that they consider healthy, (e.g., vegetables, fruit), but not "unhealthy, sugary" foods. Some parents also described that they prefer to limit the re-servings of the main dish in favor of having a dairy product and a dessert afterwards, while other parents prefer more re-servings of the main dish and limiting or skipping the dairy product and/or dessert.

Yes, no, not dessert. If it's something really sweet, I won't give him more. A Danette or something like that ... because it's a dessert, full stop. But if he wants more pasta salad or vegetables, there's no hassle. (S986)
If he asks me for a second ice cream, no, that's out. If he asks me for another slice of cheese, I give him a slice of cheese. If he wants a piece of fruit, he'll get one. It depends on the food. If I think it's not bad for his health, I give him more. They are not overweight, so there you go ... If they're hungry, they're hungry. (Y023)
Sometimes when they want more, I tell them "yes, but there's something else, you can eat a yoghurt, fruit". (N675)
We already try to make sure that they eat their main course well, because that's the priority in terms of balancing their diet. And then we'll say that cheese and dessert are "extras". It's, if really he's still hungry, we try to balance it out so that he ... so there you go, the main course is enough for him and after, the dessert is a little more for pleasure. (B681)

Tricks to Determine Portion Sizes

Parents described using certain "tricks" when determining the appropriate portion sizes for their child. The most commonly used trick was serving the child's food on a small plate or bowl, which helps parents to serve smaller portions. One parent even described how every family member has a different size of tableware adapted to their age and size:

*At home, it's a bit like the three bears. *Laughter* There's the big bowl, the medium bowl and the small bowl. *Laughter* because it's true that they are 10, 6 and 4 years old so the portions are adapted according to their height. That's how I'd put it. It's true that the youngest one, I give him smaller portions. Even if this means I'll serve him again, well I prefer ... (TAL01)*

Other parents do not use different tableware for the child, but rather adjust the child's portions in proportion to the portions of other family members—for example, smaller portions than for older siblings, or half the portion of the parent.

I adapt his portion. Already, compared to his brother and sister, I give him a smaller portion. (L691)

It's about … what … I don't know … I mean, half of my plate. (Y023)

Another trick used by parents to limit portions, is buying individual packages of certain foods and drinks, e.g., compote, fruit juice, biscuits, cereal, yoghurt.

Yes, I buy a lot [of food] in individual portions for the children. Especially compotes, fruit juices, these are things that I buy in individual portions. Even cakes, I try to buy things in individual portions. If it's cookies that are packed in twos, things like that. It's easier to carry and easier to ration. (T261)

A very limited number of parents also determine portions sizes by counting the number of spoons:

So it's, let's talk in tablespoons, it might be easier. I would put two tablespoons in. I prefer to put less than he eats in one go and then at the worst I'll give him more if he wants it rather than serving a big amount. (Y214)

What Guides Parents When Determining Portion Sizes?

Only a few parents described that they adapt the child's first portion or the timing of the meals according to the child's physical activity that day, previous intakes during the day, expressions of hunger, or sickness or fatigue. Nevertheless, all parents explained that they know very well when their child is hungry and how they express this. Sensations of satiation are more difficult for parents to read and are often not expressed verbally, but rather through their behavior (e.g., stopping eating, pushing plate away).

Some parents also described that children's food preferences play a role in the portion size served. If the food served is a less well-liked, parents tend to give smaller portions of this food than foods that are well accepted or liked:

He likes carbs a lot, but he has trouble with tabbouleh. So if there's only tabbouleh and fresh, raw vegetables, I'm bound to use smaller quantities because I know he won't like it so he'll eat less. So that's it, but otherwise it's the same all the time. (S616)

When parents were explicitly asked how they know what "appropriate" portion sizes for their child are, most parents explained that the determination is made based on *"*their intuition" or "previous experience", or that it is based *"*on the feeling" or *"*on sight". Parents say that they know their child's appetite and how much the child normally eats, so based on these habits they know how much to give, as expressed by this parent: *"*it is based on what he eats regularly" (TAL05). Others described that they learned to adapt the portion sizes to their child based on their observations—for example, they learned to give larger portions because their child always asked for more food after the first portion.

As he gets older, we increase the quantities a bit more because we can see it, for example we'll try to … We'll give him a quantity as we used to and then we'll see that in the end he'll have several helpings and then we'll say "well, maybe the quantity is too small". (Y214)

Conversely, some parents know that portion sizes are good because the child does not ask for more food and is not hungry in between meals. Some parents also refer to their child's health status: the child is *"*in good health*"*, *"*not overweight*"*, or *"*full of energy*"*. The child's weight was not a preoccupation for the parents in this sample; to illustrate this, they referred to the child's position in the "growth curves" and as "being in the norms".

I know that the quantities of what she eats are adapted to her metabolism and that she doesn't take more than what she needs and not insufficient either, because she's healthy. (N675)

Some parents also feel confident about their portioning practices because they already have experience with the older siblings of the pre-schooler—for example:

*It's through experience ... yeah, it's my third one eh. So, I think I did well with the others. *laughter* so no change. (L691)*

Parents' explanations during the interview were also reflected in their answers to the following statement in the survey: "I am confident that I know appropriate portion sizes for my child's meals". Most parents (n = 26) indicated that they agreed, three parents totally agreed, six parents indicated they were neutral about this statement, and one parent did not totally agree.

The results of the survey also indicated that the majority of parents (n = 31) do not search or ask for information. Those who do either ask the doctor for advice (n = 3) or consult books or the internet (n = 3). In the next question, only seven parents expressed that they know about recommendations for determining portion sizes: they referred to the national health guidelines (PNNS) or knew about recommendations via their doctor, the internet, or an early childhood center. Finally, the majority of parents responded that they were interested (n = 16) or very interested (n = 10) in receiving recommendations or advice concerning determining portion sizes for their child. The other parents were either neutral (n = 6), not interested (n = 3), or not at all interested (n = 1).

3.3. Family Rules around Eating

3.3.1. Meal Timing

Most families eat at set times, especially during weekdays. When the child is hungry before mealtimes, parents usually explain that it is not time yet to eat and that they will have to wait. However, some exceptions exist. If it is very close to meal time, the child usually has to wait. If there is still a lot of time between the moment when the child expresses hunger and meal time, the timing of the meal is sometimes pushed forward or the child is given a little snack (e.g., bread, cheese, raisins):

Well, yes ... it all depends on the time. I explain to her that it's soon [mealtime] or I'm still attentive obviously about when she eats. If she's a bit hungry earlier, we can move her mealtime. (TAL06)

It depends on the time. If it's 10 min before the meal, no. If it's an hour before, yes I give her a little something (TAL07)

3.3.2. Pressure to Eat/Negotiating/Bribing

In addition to eating at set times, parents described a number of feeding practices that are used to make their child eat. As described previously, many parents serve their child a small first portion which the child should finish, then the child can (be) re-serve(d) if they are still hungry. Parents explained it is not always evident that the child will eat this first portion. If this is not the case, most parents will make an effort to encourage their child to eat a little more, and they will insist to a certain extent. Some will do so by saying how many spoons the child still needs to eat or by indicating the amount on the plate that they should finish. Others will negotiate with their child and some will bribe the child—for example, if the child does not eat the predetermined quantity there will be no dessert, or they cannot go for a walk together after the meal.

Yes, when there's a little bit left and I want him to eat more, I tell him "Well you eat two more spoons". And then you leave the rest … (TAL05)
In general, we try between brackets to blackmail him a bit, even if it doesn't necessarily work. We tell him there's only this to eat you see. We tell him there's only this to eat and if he doesn't eat, well there you go, there won't be any cheese or dessert. (B681)

In contrast, a limited number of parents indicated that they avoid urging their child to eat more. They maybe only insist on making their child taste the food offered:

*But there's no such thing as "you finish your meal and you get your dessert". But no, there isn't. No *laugh* yes, no no there is none of that. (PRTAL03)*
So I don't actually force him to finish the plate and eat. [...] In fact, except when I insist that he tastes something because I think it's important to taste. Afterwards I don't ask him to eat, I ask him to taste [...] When you're not hungry anymore, you're not hungry anymore [...] So I don't force him to finish. (T261)

3.3.3. Origins of Feeding Practices and Inter-Generational Transmission

According to several parents, their own or their partner's education in childhood has influenced the establishment of their current feeding practices. They learned from their own parents that it is important to at least taste the foods served, and/or to finish the plate and to avoid waste. They also want to transfer these rules and values to their own children.

*And then it was, yes we used to finish off our plates. My mother is like me, she doesn't really like it if there are leftovers, so we prepare just about the right quantity for the meal for everyone, so ... So yes, I think that's my way of doing it too *laughter* getting it from my family, my parents (C697)*

In addition to passing on rules and values from their own childhood, some parents also explained what they want to teach their child about meal timing. As described above, several parents teach their child to be patient and to wait to eat until it is time to eat. Related to this, some teach that it is time to eat when it is mealtime or when everyone is sitting at the table, and that is not good to eat or snack later when the table has been cleared.

Well, snacking ... That, to be sure, is out of the question. When she tells us she's hungry, we tell her, for example, "Well, you should have eaten earlier." (J086)

Several parents also teach their child that they should only ask for food when they are (still) hungry and that they should only ask for what they are able to eat. Here, it is important that the child learns to listen to his/her stomach, or to eat in compliance with their sensations of hunger.

I start from the principle that she has to work it out for herself—If she asks for something to eat, it's that she wants it or she is hungry (N675)
So for the quantity, we ask them at the end of the meal to listen to their bellies, if they want more or if it's just greediness, so by hearing it time and again I think they have understood the difference. (PRTAN01)

As cited above, some parents also explained that they want their child to differentiate between wanting to eat because they are hungry or because they want to treat themselves ("gourmandise"). One parent also explained the importance of transferring pleasure in eating to the child:

Well, she loves it, I'm not going to say no to her, no. […] I really want it to remain a pleasure to eat. Me, I love it, I love to eat, I love to cook and I really want it to be a pleasure for her. (K122)

4. Discussion

The results of this study provide insight into the portioning practices and family rules around eating used by the parents of pre-schoolers in France, as well as into the drivers of these practices and rules. A schematic overview of the influencing factors identified in the present study is shown in Figure 1.

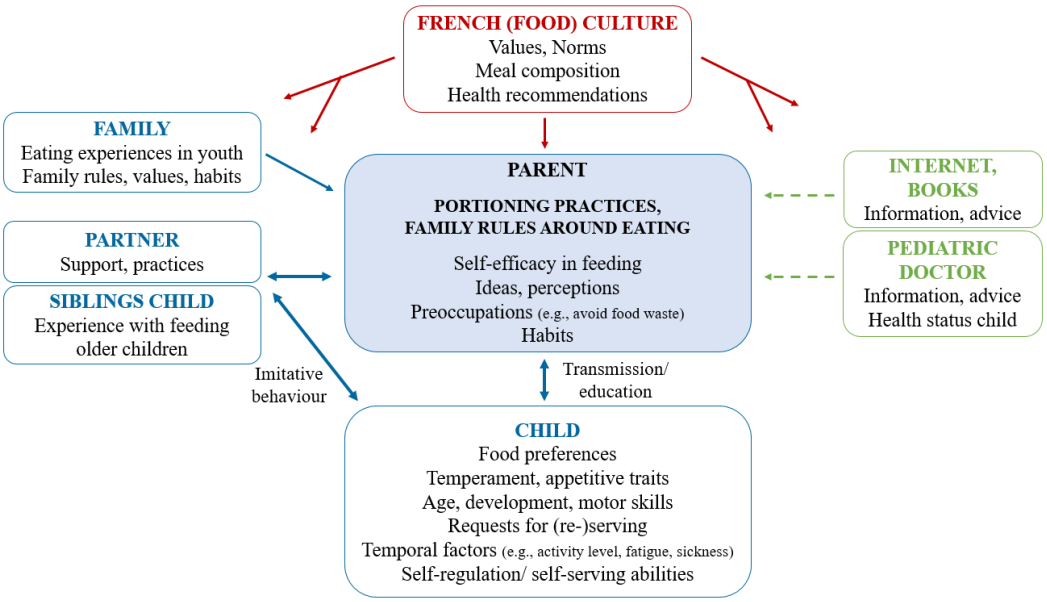

Figure 1. Schematic overview of parent-related factors, child-related factors and external factors influencing parental portioning practices and general feeding practices. Dotted lines indicate a minor influence.

In accordance with the literature review of parental food and beverage portioning practices by Kairey et al. [16], parent-related factors, child-related factors, and external factors were all identified as influencing factors. This finding is in line with Bronfenbrenner's ecological systems theory [30], which states that children develop in a complex system of relationships that are influenced by multiple levels of the environment, ranging from the child's immediate home environment (microsystem) to their larger environment, encompassing culture, norms, and values (macrosystem). Following this theory, we can indeed assume that children's capacity to self-regulate their food intake is influenced by factors on different levels, such as by people/factors in their microsystem, e.g., parents and their food portioning and feeding practices. In accordance with the theory, we observed that parents and their practices are in turn influenced by their child's behavior and characteristics (bidirectional interactions between parent and child). Parents are also influenced by other people in the child's microsystem (siblings, other family members, the pediatric doctor) and by factors in the macrosystem (culture, norms, health recommendations, etc.).

In this study, the division of responsibility between parent and pre-schooler in terms of determining portion sizes and serving was explored (Satter's theory [3]). Overall, even though there was some variation in the degree of autonomy granted to children in this study, most pre-schoolers were granted little autonomy to serve themselves or to determine their own portion sizes. French parents are in control, or they at least guide the child or monitor what (s)he is doing. This is similar to the findings

of a recent study of Loth et al. in the USA [7]. From the interviews, it is clear that French parents (try to) balance different elements: they want to be responsive to children's expressions of hunger and to take their food preferences for portioning into account (child-related factors), but at the same time they also want their child to eat a minimum portion, to taste the foods offered, and to avoid food waste (parent-related factors).

In theory, young children are believed to be able to self-regulate their energy intake [4]. Following this idea, Satter [3] suggested that children should decide how much they eat and if they want to eat. In practice, this does not seem to be entirely true: studies with infants and pre-schoolers have shown, for example, that they do not adapt their energy-intake if they were offered a snack before a meal [31,32]. In addition, a lot of inter-individual variability exists with regard to children's self-regulation capacities [33–35] and with regard to children's eating responses to portion sizes [36]. It may, therefore, not be advisable to give children complete autonomy over their intake (how much). Instead, it is important that parents provide adequate structure and guidance for their child and that they are responsive to their needs. Most parents in this study reported recognizing their child's hunger signals and "knowing" their child's appetite. They prefer to start with a small portion of food and then re-serve foods based on the child's demands. Moreover, they avoid serving portions that are too large and they do not insist that the child finishes the entire plate. Yet, only a handful of parents (n = 5) described that they explicitly teach their child to listen carefully to their stomach and their sensations of hunger when serving or asking for food or to stop when they are full. This awareness of the relationship between food and sensations of hunger should be encouraged among parents and children. This could prevent children from learning to eat for external reasons, such as because food is available or to bring comfort. This approach could also encourage parents to listen more carefully to children's sensations and to explore, together with the child, how (s)he can obtain more experience and more autonomy in determining appropriate portion sizes for himself/herself. The results of this study show that parents have little confidence in their children's self-regulation and self-serving capacities, often because parents have never explored this with their child.

In line with the results of previous studies [7,37], more autonomy was given to the child when serving breakfast or particularly when serving the mid-afternoon snack than when serving other meals. These studies, conducted in the USA, showed that often more flexibility is given with regard to the choice of foods eaten when snacking and when and where the child snacks. In response, Loth et al. [7] discussed that it is desirable for parents to provide sufficient structure, as snacks often make up a large share of the number of daily calories consumed by children [38]. In France, we also found that children were given more autonomy concerning choosing and serving snacks, but that an important difference from countries such as the USA lies in the structure around snacking. In many families in France, giving children a mid-afternoon snack ("goûter") is a common practice: 62% of children aged 1–17 years consume it daily [39], and it is often considered as an additional meal for children. Families usually have rules with regard to what, when (often between 4.30 and 5.30 p.m. [40]) and where to snack, and there is little additional snacking throughout the rest of the day. Moreover, it is interesting to know that the mid-afternoon snack is a recommended practice by The French National Nutrition and Health Program (PNNS) to diversify children's diet and ensure that they have energy throughout the day [25]. However, this does not mean that the mid-afternoon snack in France is nutritionally adequate [39]. For many, this eating occasion is a moment of pleasure and sweet foods are usually consumed [41]. Despite the adequate structure surrounding the mid-afternoon snack in France, it is therefore still advisable to encourage parents to limit children's choices of snacks that are high in

energy and encourage the consumption of a range of healthier snacks, without sacrificing the pleasure that comes with this eating moment [42].

In addition to the tradition of the mid-afternoon snack for children, it was clear during the interviews that the French food culture, passed on over generations, plays an important role in parental practices. Despite some minor deviations, all parents described that they follow the "French eating model" in their family [43]: three meals a day (breakfast, lunch, dinner) and a mid-afternoon snack for the child. Meals are usually consumed at set times and at the table in the company of other family members. In most families, lunch and dinner also consist of different components (i.e., starter, main course, dairy product, dessert), and parents strive to offer a variety of foods to their family, in accordance with the French health recommendations that stimulate the intake of a varied and balanced diet [44]. This preoccupation also has a clear impact on parental portioning practices: many parents want their child to at least taste all the foods offered, and they decide whether the child is allowed to have an extra helping depending on the types of foods (s)he wants. If the child still wants some "healthy" foods, (s)he is most likely allowed, but if (s)he wants more dessert it will be refused. It must be noted, however, that these portioning strategies based on the types of foods consumed have also been described by parents in other countries (e.g., [45,46]; additionally, see the review by Kairey et al. [16]). Nevertheless, it is possible that when striving to achieve a diverse diet, the use of different meal components in France may cause parents to automatically limit the size of children's food portions. This is necessary in order to allow the child to eat a variety of foods at mealtime. In anticipation of the following components, it could be assumed that children may also subconsciously learn that they should not overeat right away but rather eat in moderation, otherwise they will not be able to eat all components of the meal, and in particular, will not be able to enjoy the dessert (which is probably their favorite dish).

The conscious focus of parents on food diversity stands in contrast with the rather unconscious, intuitive actions used for portioning foods for children. Parents know very well which foods they want their child to eat, but determine the portion given based on *"*their intuition", "previous experience", *"*on the feeling", *"*on sight", or on their child's food preferences. This has also been described by parents in other qualitative studies (see review by Kairey et al. [16]). However, in some of these previous studies, parents have expressed doubts and difficulties with regard to determining appropriate portion sizes for their child, while the parents in the present study expressed that they feel confident in these intuitive practices and do not know of or look for recommendations. In France, recommendations about portioning practices are very limited. The French high council of public health [47] has formulated some recommendations regarding portion sizes for children aged 0–3 years and 3–17 years. They stressed the necessity of adapting portion sizes to the child's needs and that there is no need to worry if the child follows a homogeneous growth trajectory (pp. 29–30). It is indeed very important that portions are adapted to children's individual characteristics. Furthermore, it is interesting to note that the council did not give specific quantitative indications about appropriate portion sizes, but only comparative indications—for example, for children aged between 3 and 6 years, they state that the recommended portion size corresponds to about half the portion size of an adult (pp. 29–30). This comparative indication may be misleading and is obviously only advisable if parents eat an appropriate portion size. Johnson et al. [48] found that the amounts parents served themselves are indeed significantly positively associated with the amounts they served their pre-schoolers. Some caution is thus needed when communicating recommendations that use parental portions as a reference. Since parents' portioning practices are rather unconscious and based on habits, it could be an interesting

strategy to use nudges or to make changes in families' environments in order to influence children's intake in an unconscious way [49]. Both Robinson and Matheson [49] and Hetherington and Blundell-Birtill [50] identified the use of downsizing strategies—for example, using smaller tableware or purchasing individual small packages of food—as particularly interesting for supporting parents in serving appropriate portion sizes to children (and adolescents). Some parents in the present study also described using these strategies and finding them helpful for determining appropriate portion sizes for their child (to avoid giving portions that are too large). It is, however, uncertain as to whether parents who do not use these strategies currently will be receptive to recommendations about them. Parents in this study expressed some interest in receiving recommendations or advice concerning determining portion sizes for their child only when completing the final survey after the interview, but it is possible that parents showed this interest merely to please the researchers (social desirability). Population-based research is needed in order to assess this parental interest more properly. In any case, since parents appear to be quite confident in their portioning practices and do not actively search for information, it could be challenging to find a medium to convey recommendations or advice.

In addition, it is important to point out that not only parents but also the government and food industry can play an important role in stimulating the intake of appropriate portion sizes. It is necessary, for example, to make sure that portion sizes of products do not increase for reasons of industrial benefit and that the portion sizes given to children are generally not too large. To illustrate, cultural differences exist in this matter, e.g., in France, portion sizes are generally smaller in restaurants, supermarkets, and cookbooks compared to in the USA [51].

Limitations and Strengths

A limitation of this study may be the lower number of parents of 5-year-old children ($n = 8$) included compared to parents of 3-year-olds ($n = 17$) and 4-year-olds ($n = 12$). Even though we did not observe any noticeable differences according to the child's age during the analyses, this may simply be due to the observed imbalance in age groups. For some parents, the child's age, his developmental stage, or motoric skills were factors that influenced their decision to grant or not grant some autonomy to their child. When interpreting the results, it may therefore be important to keep in mind that they mostly reflect the practices and perceptions of parents with younger pre-schoolers. It would therefore be interesting to conduct studies with parents of older children using more balanced samples in order to study if parental portioning practices and the division of responsibility change with the child's age and developmental skills, as well as which (and how) factors contribute to these changes. In addition, most children in this sample were at a healthy weight. Parental portioning practices could differ depending on the weight status of the child, and this should also be examined in future studies. Finally, relating to these points, despite efforts to recruit a large and diverse sample of parents for this study, which is definitely also a strength of this study, it is possible that the parents who volunteered to participate had an above-average interest in their child's or family's eating behavior. The described practices and influencing factors should therefore not automatically be generalized to all parents in France. The number of fathers participating was also quite limited, meaning that the views of mothers may be overrepresented in this study. The results of this study are also based on what parents declared; thus, an observational approach (i.e., observing practices in the home environment and the actual portion sizes served to the child or using digital food photography for observation) could be a valuable contribution to the field.

Nevertheless, the interviews with a large and diverse sample of participants provided interesting insight into parents' portioning practices for pre-schoolers within the context of the French (food) culture, a matter that is relatively still unexplored. The combination of interviews and short surveys enabled us to obtain deep insight and explanations, as well as allowing us to quantify certain perceptions, practices, and interests. The results of this comprehensive study are therefore valuable, as they provide, at the same time, insight into (1) parental portioning practices for different meals; (2) the division of responsibility between parent and child in terms of determining portion sizes and serving; (3) the factors influencing parental practices on different levels; and (4) parents' confidence about their practices, the sources of information they use, and their wish for guidance. To our knowledge, previous studies undertaken in other countries have focused only on some of these components and never them in combination.

Similarities in practices and influencing factors were observed between this study in France and studies conducted in other countries (mostly the USA). For instance, it seems generally to be difficult for parents—whatever their culture—to give autonomy to their pre-schooler and to let him/her to decide how much to eat, except in very specific meal contexts (e.g., at breakfast and when snacking). However, some cultural specificities have also been described that are likely to have a more subtle impact. For example, in many French families, lunch and dinner consist of different successive components (i.e., starter, main course, dairy product, dessert), which may cause parents to automatically limit the size of the portions of each of these components in order to stimulate a diverse eating pattern in the child and maintain their motivation to eat all the different components. In France, portion sizes are generally also smaller in restaurants, supermarkets, and cookbooks than those in the USA [51]. These cultural norms can also influence what parents think appropriate portion sizes for their child are, although this topic was not specifically examined in the current study. A quantitative study comparing actual given portion sizes could help us to clarify this issue. In addition, it was interesting to observe that French parents were generally confident about their food portioning practices, while some parents in previous studies have expressed limited knowledge regarding determining appropriate portion sizes for children and themselves.

In short, the results of this study in France expand the results of previous studies in other countries and provide valuable insight for the possible guidance of parents and health campaigns in France and beyond.

5. Conclusions and Implications

This study revealed how French parents determine portion sizes for their pre-schoolers and how this responsibility is divided between both parents. Influencing factors related to the parent, child, and social environment were identified, as well as specificities related to the French (food) culture. Most parents are in control when serving and portioning food, but, at the same time, they are also responsive to the child's requests and characteristics. For parents, portioning food is an intuitive action that is guided by habits, their experience, and "knowing their child". They are confident about their portioning skills and most of them declare that they do not search for information to guide them in this action. Nevertheless, even though parents seem to adopt responsive portioning practices, it may be important to encourage them to be more aware of their children's capacity to self-regulate their food intake and how to stimulate this capacity. Parents can, for example, help their children to listen to their inner sensations of hunger and fullness and encourage them to adjust their intake to match this. Parents can grant their children some autonomy/responsibility in this action, adapted to the child's age and

development. Downsizing strategies could also be recommended to parents. Since parents will not look for this guidance, it may, however, be challenging to find a way to pass on these recommendations. Industries and governments should also be encouraged to take responsibility and limit the portion sizes of products made for children.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in this study.

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Appendix A. Interview Guide to Semi-Structured Interview

Researcher introduction + study/ consent form/ questions
Hello, my name is …I work at Dijon's Centre des Sciences du Goût et de l'Alimentation. First of all, I wish to thank you for accepting to participate in this study. We are conducting interviews to gain greater knowledge on food practices in households with children aged between 3 and 5 years old. I propose that we talk about your child's food habits. I wish to inform you that that anything you say will remain an anonymous contribution. If you agree, I will record this discussion to make sure that none of your answers will be misconstrued. Do you agree to this, are you ready to begin?
(For the interviewer: remember to not pronounce the participant's and child's name once the recording has begun.)

Table A1. Table containing the themes, questions and probes addressed during the semi-structured interview.

THEME	QUESTIONS	PROBES
Meal organization and composition	*You have agreed to participate in this study because you have a young boy/girl who is …years old* (state which child is being talked about) *In this interview, we are going to focus on your …year old child's eating habits.* *To begin this interview, could you describe what your child ate and drank yesterday between getting up and going to bed?* *Do you think that the day is representative of what he/she normally eats?* (If the response is no, describe the day before last) (don't ask the question too quickly in the interview)	Indicate that this also includes any food outside of normal mealtimes (snacks…)
	Ask again about: snacks, drinks, anything eaten between meals. Explain clearly what is considered a snack. Indicate that a sweet or cake eaten on its own counts.	*If the child is hungry between meals, do you give a little something to eat to get him/her to wait?*
	Do you maintain the same routine at the weekend? ('*the week*' if the interview is on Monday)? *What's different?*	If the child has lunch with his/her nanny during the week, ask about food habits during lunch with the parents at the weekend.
Meal service and portion sizes (for each meal)	- *Thank you for this very precise description. We are now going to go into more detail about how each of these moments when food is eaten. To do so, we are going to look at each meal and each snack, and we are going to see how they happen…you will see it's very simple.* - Is the food and are the drinks what are normally eaten during the meal?	
	In what sort of conditions were yesterday's meals taken?	- *Where did the meal take place?* - *Who was with the child?* - *Were the people present also eating at the same time?* - *Was the food on the table to be served, or was it served away from the table, in the kitchen?* - *Where there any TV, Telephone, computer screens present too?* - *What type of dish did the child eat from? Was it different to that of the adult, other child?*
	How do things take place when serving your child's meal, when at home?	If someone served your child: - *Who served him/her? Why?* - *How was the portion size determined (thoughts/ideas?)*

	Did your child serve him/herself or was he/she served by someone else? *How are the quantities fixed/chosen that are given to your child during the different meals of the day, during snacks?*	- *Did your child participate in determining the portion-size?* - Variation according to different situations? - Help for seasoning/sauces? If the child helped him/herself: - *Did he/she help him/herself on his/her own or did he/she receive a little help or instructions?* - *At what age did the child start serving him/herself?*
	Did he/she finish everything up? Everything eaten on his/her plate at each meal? Ask for each meal	- *Otherwise: what happened?* - *If yes, did he/she ask for more? What did you do or say?*
	If your child has finished everything and asks for more, how do you generally respond?	*Do you give more? Do you move on to next food/course? Do you explain that the meal is over? Do you propose something else? Is it the same for each food that makes up the meal? And for each meal? Why (not)?*
	And what do you do if your child refuses to eat something you've served, or a portion of something?	
	Are you satisfied with the amount of food that your child eats?	
	Do you think your child is able to serve him/herself and fix the portion-size adapted to his/her needs?	
	How do you go about finding out what is the adapted portion-size for your child? *More generally, what influences your food practices/habits (intuition, personal experience, family or friends, doctor, internet sites, blog…)? ….*	E.g., medical advice, school, child-care centre, family or friends, internet, blogs, advertisements, books, reports… In the case of families with several children: *Has the way in which you handle food with your children changed? If yes, in which ways?* Different approaches for different children?
Family rules around eating	*Let's now move on to look at rules or principles relating to food which are important for you. Very simply, in your household, are there rules relating to types of food you serve, for different meals…etc…* (It's very important to give the participant the necessary time to express spontaneously what is important for him/her, reword the question before trying to elicit again)	(e.g., the child must try tasting everything, he/she only takes what he/she wants from the plate.) - *Can these rules vary? How and why?* - *Does he/she have an unlimited access to certain foods?* (Sweets...) *What inspires you in the setting up of these rules? What motivates you to set up these rules?*
	Would you say that your behaviour/approach towards food is different to that of your husband/wife/partner)? Do you have the same approach or habits relating to food as your husband/wife/partner)?	*Who fixes portion size?* *Differences between husband/wife/partner?* *Food choice?* *Rules relating to food?*

Appetite, satiation and weight	*We are now going to come back to your child, in particular about his/her appetite. How would you describe your child's appetite? Would you say that your child's appetite is stable, constant (has there been an evolution/change in it)?*	- *How do you know that your child is hungry? Does your child let you know when he/she is hungry?* - *How do you manage the situation when your child says he/she's hungry/not hungry?* - *How do you manage things when your child tells you that he/she is still hungry for example just after the meal?*
	Does your child let you know that he/she's had enough to eat/is no longer hungry?	- *Your child tells you that he/she's had enough to eat/is no longer hungry and he/she has finished eating what's on his/her plate, what do you do?* - *Your child lets you know that he/she has had enough, isn't hungry anymore after the meal, but wants a dessert, how do you respond?*
	We are now going to talk about your child's weight and height. *How do you manage this information? Do you make a note of the weight/height of your child? How often? Is your child's growth a cause of concern for you? How do you track your child's growth? Using which tools (Health notebook, wall chart?)*	- *For what reasons?* Through worry …?
The current lockdown context	*We have gone through an unusual period with the lockdown and the gradual lifting of it. So, we'd like to know if this period of time has modified your behaviour and habits as you have described them during this interview.* *According to you, have there been any changes/an evolution in what you have just explained to me concerning the period before the lockdown?*	
Additional participant comments	*Thank you so much for answering my questions. Maybe you would like to talk about things which are important to you and that I've not asked you about?* *Are there any aspects that I've not mentioned and that you would like to add?*	

Interview conclusion + thanks and compensation + explanation of what follows

- *If you have nothing further to add, I wish to really thank for your time and for answering my questions.*
- *We would really appreciate it if you could complete a final questionnaire, online, which will take about 10 minutes of your time. You can fill-in this questionnaire at your convenience* (give the person's code). *Once we have acknowledged receipt of this questionnaire, and to thank you for your time spent taking part in our study, we will send you a voucher of 20€ through the post.*
- *Do you have any final questions about this questionnaire or the study in general?*
- (Do not record) Check that the postal address is correct!

Appendix B. Original French Citations and Their English Translation.

Table B1. Table containing the original French citations used as illustrations in the article and their English translation.

Original French citation	Translated English citation
3.2 Parent portioning practices	
3.2.1 Who serves/ who decides on portion sizes?	
First serve versus following serves	
Effectivement au premier service c'est moi qui décide. Et puis ensuite, s'il a encore faim, je fais un deuxième service où là, je lui demande à quel point il veut être resservi. (U065)	*Indeed, I decide on the first serve. And then, if he's still hungry, I serve again and I ask him how much he wants. (U065)*
Souvent on le sert nous la première fois. Mais après si c'est pour se resservir, je les invite eux à se resservir. (TAL01)	*Often, we serve him the first time. Then after, if they want seconds, I suggest they help themselves. (TAL01)*
Different practices for different meals?	
C'est moi qui sers. Enfin, c'est moi ou c'est mon mari. C'est nous qui servons les enfants à table, oui. (Y214)	*I'm the one who serves. Well, it's me or my husband. We serve the children, yes. (Y214)*
Oui, comme le midi en fait, je prépare les assiettes et je les amène à tout le monde. (C697)	*Yes, like at lunchtime in fact, I serve up on plates and then dish them out to everyone. (C697)*
Par contre, je la laisse prendre son yaourt, par exemple le midi ils ont le droit de choisir le yaourt qu'ils veulent. Donc elle a le droit d'aller dans le frigo quand je lui donne l'autorisation. (P078)	*However, I let her have her yoghurt, for example at lunchtime they can choose which yoghurt they want. So she can go and open the fridge when I tell her she's allowed to. (P078)*
A la limite, le moment où il me guide le plus c'est le matin sur la quantité de lait ou de céréales ou sur les tartines, il va me dire ce qu'il veut en termes de quantités mais sur les autres repas non, c'est moi qui impose. (R863)	*At a push, the moment he guides me the most is in the morning about the quantity of milk or cereals or regarding toast, he tells me what he wants in terms of quantities but not for the other meals, I'm the one who decides. (R863)*
Bon le matin, ils se lèvent et puis ils peuvent se servir eux-mêmes. Bon, je contrôle ce qu'ils prennent, mais bon comme c'est tout le temps la même chose en portion identique, je ne suis pas étonnée on va dire. Ils ne font pas d'abus sur ce qu'ils prennent, sur ce qu'elle prend. (J086)	*Well, in the morning, they get up and they can help themselves. Well, I check what they take, but as it's always the same thing and the same portion size, let's say I'm not surprised. They don't take advantage in terms of what they take, what she takes. (J086)*
Comme le matin c'est elle qui va choisir ce qu'elle veut manger, ce qu'elle veut boire. Elle se sert dans le placard pour les gâteaux, elle va me demander pour boire mais en général je lui donne de l'eau. (S615)	*Like in the morning, she chooses what she wants to eat, what she wants to drink. She helps herself to cakes in the cupboard, she'll ask me for a drink but generally I give her water. (S615)*
Après, c'est vrai que le goûter à la maison, je les laisse plus souvent en autonomie. Enfin, je mets des choses sur la table et puis, je les laisse un peu se gérer quoi. (TAL01)	*After, it's true that I leave them more often than not to choose their own snacks at home. I mean, I put things on the table and then I sort of leave them to it. (TAL01)*
Conditioned autonomy child	
Il se sert tout seul, mais je surveille quand même. (U065)	*He helps himself, but I still keep an eye on him. (U065)*
Après pour tout le reste je connais un peu son appétit donc j'adapte, je demande déjà quelle quantité elle veut et des fois elle a « les yeux plus gros que le ventre » donc je réadapte moi-même en disant « tu manges déjà ça et si tu en reveux j'en remets mais déjà je crois que c'est bien comme ça ». (N675)	*After, for everything else, I know pretty well how she eats, so I adapt, I ask her how much she wants and sometimes her eyes are "bigger than her belly", so I adapt by saying "eat this first and if you want more, you can, but I think it's already fine like that". (N675)*
Why does parent or child serve?	
Mais quand même la plupart du temps c'est nous qui servons [...] oui, le côté pratique et rapide pour être très honnête. (TAL01)	*But still, most of the time we serve […] yes, it's more practical and quicker to be honest with you. (TAL01)*
Très souvent on la sert, on la sert parce que tout pareil… Toujours à cause de la motricité. Ce n'est pas évident de prendre dans un plat et de se servir […] Alors par contre en ce moment comme on mange pas mal de crudités, je la	*Very often we serve her, we serve her because everything is the same... Always because of dexterity. It's not easy to serve yourself from a dish [...] however, at the moment as we're eating quite a lot of raw vegetables, I let her*

laisse se servir. Par exemple, quand on mange des radis, c'est elle qui se sert des radis. (R371)	*serve herself. For example, when we eat radishes, she helps herself to the radishes. (R371)*
Alors je vais dire que ça dépend en fait. Je le pousse à être un peu autonome et à faire des choses par lui-même. Mais après voilà, si c'est des choses qui sont trop chaudes, ou trop liquides, ou pas faciles à servir, il ne se sert pas tout seul… mais si c'est des choses simples, je ne sais pas. S'il veut se servir dans le saladier et prendre la pince à salade et se servir, ça ne me dérange pas. (T261)	*So I'd say it depends in fact. I push him to be a bit independent and to do things for himself. But then, if things are too hot, or too runny, or not easy to serve, he doesn't help himself... but if it's simple things, I don't know. If he wants to serve himself from the salad bowl and take the salad tongs and serve himself, I don't mind. (T261)*
Je lui dis « tu te sers mais comme ça coule vite je fais avec toi » pour pouvoir contrôler aussi. (N675)	*I say to him "you help yourself but as it's really runny I'll do it with you" so I can control it too. (N675)*
Quand elle le demande, c'est elle qui se sert, il n'y a pas de soucis. (E492)	*When she asks, she serves herself, there's no problem. (E492)*
Non, c'est lui qui demande. Il veut faire tout seul. (TAL03)	*No, it's him who asks. He wants to do it on his own. (TAL03)*
Je sers le grand aussi. C'est vrai que j'ai des parents qui nous ont servi petits... Enfin, j'ai ma mère qui nous servait et c'est vrai que c'est… Oui, j'ai une tendance à servir tout le monde, moi. (Y214)	*I serve the eldest too. It's true that my parents served us when we were kids... Well, my mother served us and it's true that it's... Yes, I tend to serve everyone. (Y214)*
3.2.2 Portion sizes	
Rules around serving and re-serving	
Moi, je n'aime pas trop jeter donc je mets en général une portion que je sais qu'il est capable de manger. Mais je préfère qu'il m'en redemande plutôt qu'il en laisse. Donc, je ne charge pas trop les assiettes. (T261)	*I don't like throwing food away too much, so I generally give him a portion that I know he'll be able to eat. But I'd rather he asks me for more rather than leave it. So I don't serve too much. (T261)*
Je préfère en mettre moins qu'il en mange une fois et après au pire, je lui en redonne s'il en veut, plutôt que de lui mettre une grosse quantité. Pour l'avoir remarqué, si on lui met la grosse quantité dès le départ, il y a des fois où il va regarder l'assiette et puis il va en manger deux bouchées et… ... Oui, il va s'arrêter. Que si on lui met des plus petites quantités, il en mangera plus facilement. Il en prendra plus facilement. (Y214)	*I prefer to serve less and that he eats everything and then at the worst I give him more if he wants it, rather than serving a lot. I've noticed that if you serve a big amount straight away there are times when he'll look at his plate and then he'll have two bites and... ... Yes, he will stop. However, if we give him smaller quantities, he will eat more easily. He'll take them more easily. (Y214)*
Mais quand elle se sert […] disons qu'elle ne met pas les quantités, ces quantités suffisantes qui font que derrière elle va se resservir. Et ça, c'est un truc que je ne veux pas lui apprendre en plus: à se resservir. C'est voilà. Elle se sert une fois et voilà. (K122)	*But when she helps herself [...] let's say she doesn't serve herself enough, sufficient quantities so that she'll want more. And that's something I don't want to teach her: to serve herself again. That's it. She helps herself once and that's it. (K122)*
Oui, c'est moi qui détermine, et quand c'est quelque chose qu'elle a bien aimé, là elle me redemande une 2ème fois […] En général je lui mets un peu moins. (S615)	*Yes, it's me who decides, and when it's something she's really liked, she asks me for seconds [...] In general I give her a little less. (S615)*
Alors, je lui demande s'il est vraiment certain [de vouloir plus] parce que je ne veux pas qu'il gâche la nourriture. Et s'il est sûr, je lui en remets une petite portion. Je préfère lui en remettre un tout petit peu et de lui en remettre plusieurs fois, que de lui mettre une trop grosse quantité et là après finalement il n'en veut plus du tout. (T411)	*So I ask him if he is really sure [to want more] because I don't want him to waste food. And if he's sure, I give him a small portion more. I'd rather give him a little bit and then serve him again a few times, than give him too much and then he doesn't want it at all. (T411)*
Oui non, pas le dessert. Si c'est un truc hyper sucré, je ne lui en redonnerai pas. Une Danette ou un truc comme ça… parce que c'est un dessert et point-barre. Mais s'il reveut de la salade de pâtes ou des légumes, il n'y a pas de problème. (S986)	*Yes, no, not dessert. If it's something really sweet, I won't give him more. A Danette or something like that... because it's a dessert, full stop. But if he wants more pasta salad or vegetables, there's no hassle. (S986)*
S'il me demande une deuxième glace, non, c'est mort. S'il me redemande un bout de fromage, je lui redonne un bout de fromage. S'il veut un fruit, il va avoir un fruit. Ça dépend des aliments en fait. Si j'estime que ce n'est pas mauvais pour sa santé, je lui en redonne. Ils ne sont pas	*If he asks me for a second ice cream, no, that's out. If he asks me for another slice of cheese, I give him a slice of cheese. If he wants a piece of fruit, he'll get one. It depends on the food. If I think it's not bad for his health,*

en surpoids, alors voilà... S'ils ont faim, ils ont faim. (Y023)	*I give him more. They are not overweight, so there you go... If they're hungry, they're hungry. (Y023)*
Des fois quand ils ont envie de se resservir je leur dis « oui mais il y autre chose, tu peux manger un yaourt, fruit ». (N675)	*Sometimes when they want more, I tell them "yes, but there's something else, you can eat a yoghurt, fruit". (N675)*
Nous on essaye déjà d'une manière générale qu'il mange bien son plat principal parce que justement c'est plus la priorité par rapport au fait d'équilibrer son alimentation. Et après on va dire que le fromage et dessert, c'est « du plus ». C'est, si vraiment il a encore faim, on essaye de doser, voilà pour qu'il… voilà, que le plat principal lui suffise et après, voilà le dessert c'est un petit plus plaisir. (B681)	*We already try to make sure that they eat their main course well, because that's the priority in terms of balancing their diet. And then we'll say that cheese and dessert are "extras". It's, if really he's still hungry, we try to balance it out so that he... so there you go, the main course is enough for him and after, the dessert is a little more for pleasure. (B681)*
Tricks to determine portion sizes	
*Chez nous, c'est un peu les trois ours. *rire* c'est voilà, il y a le grand bol, le moyen bol et le petit bol. *rire* parce que c'est vrai que du coup ils ont 10, 6 et 4 ans donc les portions sont adaptées en fonction leur taille. On va dire. C'est vrai que du coup le petit dernier, je lui donne des portions plus petites. Quitte à le resservir, enfin je préfère... (TAL01)*	*At home, it's a bit like the three bears. *Laughter* There's the big bowl, the medium bowl and the small bowl. *Laughter* because it's true that they are 10, 6 and 4 years old so the portions are adapted according to their height. That's how I'd put it. It's true that the youngest one, I give him smaller portions. Even if this means I'll serve him again, well I prefer... (TAL01)*
Je lui adapte sa portion. Déjà, par rapport à son frère et à sa sœur, je lui donne une portion plus petite. (L691)	*I adapt his portion. Already, compared to his brother and sister, I give him a smaller portion. (L691)*
C'est à peu près… quoi… Je ne sais pas… je veux dire, la moitié de mon assiette. (Y023)	*It's about... what... I don't know... I mean, half of my plate. (Y023)*
Oui, j'achète beaucoup [d'aliment] en individuel pour les enfants. Notamment les compotes, les jus de fruits, c'est des choses que j'achète en individuel. Même les gâteaux, j'essaye de prendre des choses en individuel. Si c'est des cookies qui sont emballés par deux, des choses comme ça. C'est plus facile à emmener et plus facile à rationner. (T261)	*Yes, I buy a lot [of food] in individual portions for the children. Especially compotes, fruit juices, these are things that I buy in individual portions. Even cakes, I try to buy things in individual portions. If it's cookies that are packed in twos, things like that. It's easier to carry and easier to ration. (T261)*
Alors c'est, on va parler en cuillères à soupe, ça va peut-être être plus facile. J'y mettrais deux cuillères à soupe. Je préfère en mettre moins qu'il en mange une fois et après au pire, je lui en redonne s'il en veut plutôt que de lui mettre une grosse quantité. (Y214)	*So it's, let's talk in tablespoons, it might be easier. I would put two tablespoons in. I prefer to put less than he eats in one go and then at the worst I'll give him more if he wants it rather than serving a big amount. (Y214)*
What guides parents when determining portion sizes?	
Il aime énormément les féculents, mais il a du mal quand c'est du taboulé. Donc s'il y a que taboulé et crudités, je vais forcément mettre des plus petites quantités parce que je sais qu'il ne va pas trop aimer donc il va moins manger. Voilà, mais après sinon globalement ça reste tout le temps pareil. (S616)	*He likes carbs a lot, but he has trouble with tabbouleh. So if there's only tabbouleh and fresh, raw vegetables, I'm bound to use smaller quantities because I know he won't like it so he'll eat less. So that's it, but otherwise it's the same all the time. (S616)*
En grandissant, on augmente tout petit peu plus les quantités parce qu'on le voit, par exemple on va essayer de ... On va lui mettre une quantité comme on mettait avant et puis on va constater qu'au final, il va nous en reprendre plusieurs fois et là on va dire « bon ben là peut-être la quantité est peut-être trop juste ». (Y214)	*As he gets older, we increase the quantities a bit more because we can see it, for example we'll try to ... We'll give him a quantity as we used to and then we'll see that in the end he'll have several helpings and then we'll say "well, maybe the quantity is too small". (Y214)*
Je sais que les quantités de ce qu'elle mange sont adaptées à son métabolisme et qu'elle ne prend pas plus que ce qu'il lui faut et pas non plus insuffisamment parce que voilà, elle est en bonne santé. (N675)	*I know that the quantities of what she eats are adapted to her metabolism and that she doesn't take more than what she needs and not insufficient either, because she's healthy. (N675)*
*C'est selon l'expérience... ouais c'est ma troisième hein. Donc je pense avoir bien fait avec les autres. *rire* donc on continue comme ça. (L691)*	*It's through experience... yeah, it's my third one eh. So, I think I did well with the others. *laughter* so no change. (L691)*
3.3 Family rules around eating	
3.3.1 Meal timing	

Ben si… tout dépend de l'heure. Je lui explique que c'est bientôt [l'heure du repas] ou voilà je suis à son écoute quand même par rapport au repas. Si elle a faim un peu plutôt, on peut décaler l'heure de son repas. (TAL06)	*Well, yes... it all depends on the time. I explain to her that it's soon [mealtime] or I'm still attentive obviously about when she eats. If she's a bit hungry earlier, we can move her mealtime. (TAL06)*
Ça dépend l'heure. Si c'est à 10 minutes du repas, non. Si c'est une heure d'avant, oui je lui donne un petit quelque chose (TAL07)	*It depends on the time. If it's 10 minutes before the meal, no. If it's an hour before, yes I give her a little something (TAL07)*
3.3.2 Pressure to eat - negotiate – bribe	
Oui, quand il en reste un peu et que je voudrais qu'il mange encore, je lui dis « ben tu manges encore deux cuillères. ». Et après, tu laisses le reste … (TAL05)	*Yes, when there's a little bit left and I want him to eat more, I tell him "Well you eat two more spoons". And then you leave the rest ... (TAL05)*
En général, on essaye un peu entre guillemets de l'avoir au chantage, même si ça ne marche pas forcément. On lui dit qu'il n'y a que ça à manger quoi. On lui dit il n'y a que ça à manger et s'il ne mange pas bah voilà, il n'y aura pas de fromage ou de dessert. (B681)	*In general, we try between brackets to blackmail him a bit, even if it doesn't necessarily work. We tell him there's only this to eat you see. We tell him there's only this to eat and if he doesn't eat, well there you go, there won't be any cheese or dessert. (B681)*
*Mais il n'y a pas ce côté du genre « tu finis ton plat et tu as ton dessert ». Mais non il n'y a pas. Aucun *rire* oui, non non il n'y a pas ça. (PRTAL03)*	*But there's no such thing as "you finish your meal and you get your dessert". But no, there isn't. No *laugh* yes, no no there is none of that. (PRTAL03)*
Donc je ne l'oblige pas justement à finir l'assiette et à manger. [..] En fait, hormis où j'insiste les fois pour qu'il goûte quelque chose parce que je trouve ça important de goûter. Après je ne lui demande pas à manger, je lui demande de goûter […] Quand on a plus faim, on a plus faim […] Donc je ne force pas finir. (T261)	*So I don't actually force him to finish the plate and eat. [...] In fact, except when I insist that he tastes something because I think it's important to taste. Afterwards I don't ask him to eat, I ask him to taste [...] When you're not hungry anymore, you're not hungry anymore [...] So I don't force him to finish. (T261)*
3.3.3 Origins of feeding practices and inter-generational transmission	
*Et puis c'était, oui on finissait nos assiettes. Ma mère elle est comme moi, elle n'aime pas trop qu'il y ait des restes donc on fait des quantités à peu près juste quoi pour le repas pour tout le monde donc... Donc oui je pense que c'est mon schéma à moi *rire* de ma famille, de mes parents (C697)*	*And then it was, yes we used to finish off our plates. My mother is like me, she doesn't really like it if there are leftovers, so we prepare just about the right quantity for the meal for everyone, so... So yes, I think that's my way of doing it too *laughter* getting it from my family, my parents (C697)*
Ben, le grignotage… Ça, c'est sûr, c'est hors de question. Voilà, nous quand elle nous dit qu'elle a faim, on lui dit par exemple « ben tu avais qu'à mieux manger tout à l'heure. » (J086)	*Well, snacking... That, to be sure, is out of the question. When she tells us she's hungry, we tell her, for example, "Well, you should have eaten earlier. " (J086)*
Je pars du principe qu'il faut qu'elle se rende compte que si elle demande quelque chose à manger, c'est qu'elle en veut ou qu'elle a faim (N675)	*I start from the principle that she has to work it out for herself - if she asks for something to eat, it's that she wants it or she is hungry (N675)*
Alors pour la quantité, on leur demande à la fin du repas de bien écouter leur ventre, si elles en reveulent ou si c'est juste de la gourmandise, donc ça à force de répétitions je pense qu'elles ont compris la différence. (PRTAN01)	*So for the quantity, we ask them at the end of the meal to listen to their bellies, if they want more or if it's just greediness, so by hearing it time and again I think they have understood the difference. (PRTAN01)*
Bon bah voilà elle adore ça, je ne vais pas lui dire non, non. […] Je veux vraiment que ça reste un plaisir de manger. Moi j'adore ça, j'adore ça manger, j'adore ça cuisiner et je veux vraiment que ce soit pour elle un plaisir. (K122)	*Well, she loves it, I'm not going to say no to her, no. […] I really want it to remain a pleasure to eat. Me, I love it, I love to eat, I love to cook and I really want it to be a pleasure for her. (K122)*

CHAPTER V.

Eating behaviours and feeding practices within the context of the COVID-19 pandemic in France

This chapter will be presented in the form of two articles:
one published in *Appetite* and one in *Food Quality and Preference*.

Article 4

Child eating behaviors, parental feeding practices and food shopping motivations during the COVID-19 lockdown in France: (how) did they change?

Philippe, K., Chabanet, C., Issanchou, S., & Monnery-Patris, S.

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Introduction:

The COVID-19 pandemic forced the French government to impose a strict lockdown on its inhabitants, affecting families' habits in many domains, including the food domain.

Objectives:

The first objective of this study was to evaluate possible changes in eating behaviours in French children aged 3-12 years, parental eating and cooking behaviours, parental feeding practices, and parental motivations when shopping for food during the lockdown, compared to the period before the lockdown.

The second objective was to explore possible links between, on the one side, changes in the child's level of boredom at home, changes in parental stress at home, and child and parental socio-demographic variables, and, on the other side the changes in children's and parental eating behaviours, practices and motivations for food shopping during the lockdown.

Focus:

Changes in *children*'s eating behaviours (pickiness, appetite, food enjoyment, food responsiveness, emotional overeating, snacking behaviour), *parental* feeding practices, parental eating and cooking behaviours, parental motivations, and influencing factors.

System(s) Bronfenbrenner:

Microsystem (parents); Exosystem (parents' work situation); Chronosystem (COVID-19 pandemic)

Child eating behaviors, parental feeding practices and food shopping motivations during the COVID-19 lockdown in France: (how) did they change?

Abstract: The COVID-19 pandemic caused France to impose a strict lockdown, affecting families' habits in many domains. This study evaluated possible changes in child eating behaviors, parental feeding practices, and parental motivations when buying food during the lockdown, compared to the period before the lockdown. Parents of 498 children aged 3-12 years (238 boys; *M*=7.32; *SD*=2.27) completed an online survey with items from validated questionnaires (e.g., CEDQ, CEBQ, HomeSTEAD). They reported on their (child's) current situation during the lockdown, and retrospectively on the period before the lockdown. Many parents reported changes in child eating behaviors, feeding practices, and food shopping motivations. When changes occurred, child appetite, food enjoyment, food responsiveness and emotional overeating significantly increased during the lockdown. Increased child boredom significantly predicted increased food responsiveness, emotional overeating and snack frequency in between meals. When parents changed their practices, they generally became more permissive: less rules, more soothing with food, more child autonomy. They bought pleasurable and sustainable foods more frequently, prepared more home-cooked meals and cooked more with the child. Level of education and increased stress level predicted changes in parental practices and motivations. This study provides insights in factors that can induce positive and negative changes in families' eating, feeding and cooking behaviors. This can stimulate future studies and interventions.

Keywords: child eating behavior, snacking, food parenting practices, BMI, boredom, stress

1. Introduction

At the end of 2019, the highly contagious coronavirus SARS-CoV-2 causing a severe acute respiratory syndrome (COVID-19) has sparked a pandemic. Many countries worldwide were affected by the spread of this virus, forcing governments to protect their inhabitants by imposing strict rules. In France, a strict first lockdown took place from March 17 until May 10, 2020. During this period, schools were closed, working from home was enforced except for some specific professional domains (e.g., working in hospital, in food shops). Leaving your home was allowed only under certain circumstances and only after filling in a special certificate. Valid reasons to leave your home, indicated on this certificate, were for example essential work, grocery shopping, medical reasons, urgent family matters or assistance to vulnerable people, and open-air physical activities (limited to one hour a day at a maximal distance of one kilometer from your home).

The lockdown forced people to adapt their everyday behaviors to the new situation, including their food-related behaviors. This particular situation stimulated many researchers to study the impact of the lockdown on eating behaviors. Most studies have been conducted with adolescents or adults. For example, Di Renzo et al. (2020) studied eating habits and lifestyles changes during the lockdown among the Italian population (aged between 12-86 years). Marty, de Lauzon, Labesse & Nicklaus (2021) studied how changes in French adults' food choice motives were related to changes in nutritional quality during the lockdown compared to the period before the lockdown. Pietrobelli and colleagues (2020) conducted a study in Italy on eating behavior with parents of children aged 6-18 years, but the sample was very small (N=41) and the children all had obesity.

The current study is original and complementary to these researches as it focused specifically on changes in children's eating behaviors and families' feeding practices during the lockdown, compared to the period before the lockdown.

Since schools were closed and most people had to work from home or were technically unemployed, many children and adults had to consume all their meals at home. Parents were consequently responsible for their child's food intake throughout the whole day, and this could be challenging in terms of time (additional meal planning, food shopping, food preparation), especially for those parents who were still working. The pandemic also faced some parents with changed accessibility and availability of foods and food insecurity, in particular those parents who were financially vulnerable (Loopstra, 2020).

The psychological states (fear, depressive symptoms, stress, etc.) linked to the COVID-19 pandemic (Jiao et al., 2020; Wang et al., 2020) possibly also affected children's and parents' eating behaviors and consequently also their motivations when buying foods. In fact, previous studies have shown that the experience of stress and negative emotions leads people to overeat and makes them reach for so-called "comfort foods", rich in sugar and calories (Evers, Dingemans, Junghans, & Boevé, 2018; Michels et al., 2012; Rodriguez-Martin & Meule, 2015). Increased levels of boredom have previously also been associated with increased energy intake (Moynihan et al,, 2015).

Similarly, parents possibly adapted their parental feeding practices, *i.e.*, the behavioral strategies to control what, how much, when, and where the child eats (Ventura & Birch, 2008), to this unseen situation. On the one hand, because of child-driven reasons: to meet the changed eating and emotional needs of their child at home. On the other hand, because of situation-driven or parent-driven reasons: changes in families' routines could for example affect the timing of meals or parents could have provided foods to entertain their children while working from home. As parental feeding practices have an important influence on child eating behavior (Birch, 1999), it is of importance to explore how these practices may have changed during the lockdown to obtain a more complete picture of the impact of the COVID-19 pandemic on the food domain. Moreover, young children are very dependent on their parents for food intake (e.g., Poti & Popkin, 2011): what parents buy and their motivations when buying foods for their child influence children's eating behavior. (Rigal, Chabanet, Issanchou, Monnery-Patris, 2012). It is thus important to differentiate their food shopping motivations from adults in general.

Therefore, this study's first goal was to evaluate possible changes in eating behaviors in children aged 3-12 years, in parental eating and cooking behaviors, in parental feeding practices, and also in parental motivations when shopping for food during the lockdown, compared to the period before the lockdown. The age range of 3-12 years was chosen because these children are still highly dependent on their caregivers for their food intake. Given the results of previous studies highlighting the impact of stress and of boredom on eating behaviors (Evers & al, 2018; Michels et al., 2012; Rodriguez-Martin & Meule, 2015; Moynihan et al, 2015), the second goal of this study was to explore possible links between, on the one side, changes in the child's level of boredom at home, changes in parental stress at home, and child and parental socio-demographic variables, and, on the other side the changes in children's and parental eating behaviors, practices and motivations for food shopping during the lockdown.

2. Method

2.1 Recruitment and ethics

An online questionnaire was used to obtain data for this study. Parents were recruited via an agency disposing of a panel of participants all over France. Prerequisites to participate were (1) having a child aged 3-12 years, and (2) no recent changes in the parent's or child's eating behaviors due to other reasons than a change of habits linked to the lockdown (e.g., following a new diet to lose weight, changed eating behaviors because of a medical treatment, changed eating behaviors because of religious reasons). The questionnaire was anonymous and on the first page of the questionnaire, parents were required to tick a box indicating that they understood and accepted the study information and data protection policy. The questionnaire was open for participation from the 30th of April until the 10th of May, 2020 (the end of the strict lockdown in France). Participants received a voucher of six euros for questionnaire completion. An ethical approval (n°20-686) was granted for this study by the Institutional Review Board (IRB00003888, IORG0003254, FWA00005831) of the French Institute of Medical Research and Health, and a study registration was done by the data protection service involved (CNRS).

2.2 Measures

2.2.1 Demographics

Parents were asked to report the sex of the child and his/her date of birth to ensure a correct calculation of the child's age and his/her normed body mass index' (BMI) z-score. Once these calculations were completed, the child's birth date was deleted to minimize information that could possibly help to identify the participants. Parents were also asked to report their own sex, age, relationship status, number of children in the household, level of education, type of housing, employment status before and during the lockdown, and their perception of their financial status. In addition, to describe the general eating habits of our sample during the lockdown, parents were asked to report the number of meals (breakfast, lunch, mid-afternoon snack, dinner) their child generally took at home on a weekly basis (ranging from 1-7) during the lockdown, and if they took more, less, or the same amount of meals with their child compared to the period before the lockdown.

2.2.2 Child eating behaviors

Appetite, Food enjoyment, Food pickiness

The Children's Eating Difficulties Questionnaire (CEDQ; Rigal et al., 2012) was used to measure the child's levels of appetite (three items; e.g., *My child eats small quantities (even if the food is liked)* (Reversed item)), food enjoyment (three items; e.g., *My child looks forward to mealtimes*), and food pickiness (three items; e.g., *My child only eats a small variety of foods)*. Parents were asked to rate their agreement with each item on a five-point Likert-like scale (*Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree*), according to their child's eating behavior during the lockdown, and retrospectively for the period before the lockdown. A score was calculated for each period. Scores were calculated in such way so higher scores indicated a higher appetite, a higher food enjoyment, and a higher level of food pickiness in the child.

Food responsiveness and Emotional overeating

The Children's Eating Behavior Questionnaire (CEBQ; Wardle, Guthrie, Sandreson, Rapoport, 2001) was used to measure the child's levels of food responsiveness (five items; e.g., *My child is*

always asking for food), and emotional overeating (four items; e.g., *My child eats more when anxious*). Parents rated their agreement with each item on a five-point Likert-like scale (*Never, Rarely, Sometimes, Often, Always*), for both the period before and during the lockdown. For emotional overeating, we also added a sixth answer option: *not applicable*, as we were not sure if all children would have already presented all emotions (worried, annoyed, anxious, boredom) during the lockdown. Higher scores indicated higher food responsiveness and more emotional overeating.

Snacking frequency and Types of snacks

In France, the mid-afternoon snack ("goûter") is a common practice and is perceived as an additional meal beside breakfast, lunch and dinner, especially in children (Francou & Hébel, 2017). We therefore distinguished between the frequency of the mid-afternoon snack (which usually also includes a drink) and the frequency of other snacks/drinks in between meals. We clearly explained the difference between both types of snacking occasions to parents in the instructions of the questions. For the mid-afternoon snack, parents were asked to rate the child's frequency of this snacking occasion on a four-point scale (*Less than once a week, 1-3 times per week, 4-6 times per week, Every day*), for both the period before and during the lockdown. For other snacks/drinks, parents rated the frequency on a seven-point scale (*Less than once a week, 1-3 times per week, 4-6 times per week, once per day, Twice a day, Three times a day, 4 or more times a day*), also for both the period before and during the lockdown. We gave examples of possible snacks/drinks (e.g., *candy, piece of bread, fruit, compote, yoghurt, salty or sweet biscuits*) to illustrate that any food and drink, except water, should be counted as a snack/drink.

We asked parents as well about the types of foods their child usually consumed during snack times: "When your child has a mid-afternoon snack or a snack/drink in between meals, how often does (s)he consume the following types of foods and drinks?". The frequency of each type of food/drink (Table 4) was rated on a five-point-Likert scale (*Never, Rarely, Sometimes, Often, Always*), for both the period before and during the lockdown. The selection of the types of foods and drinks was based on the food groups presented in a French food consumption report (ANSES, 2017).

2.2.3 Child boredom

Parents were asked to report how often their child was bored at home on a five-point Likert scale (*Never, Rarely, Sometimes, Often, Always*), for both the period before and during the lockdown. Higher scores indicated higher levels of boredom at home.

2.2.4 Parental feeding practices

Parental feeding practices were derived from the Home Self-Administered Tool for Environmental Assessment of Activity and Diet Family Food Practices Survey (HomeSTEAD; Vaughn, Dearth-Wesley, Tabak, Bryant, & Ward, 2017). This 86-item instrument captures five coercive control practices (CCP), seven autonomy support practices (ASP), and twelve structure practices (SP). We selected seven practices we thought to be susceptible for change during the lockdown: Soothing with food (CCP; four items; e.g., *I give my child something to eat or drink when she or he is bored or worried, even if I know she or he is not hungry*), Guided choices - when (ASP; three items; e.g., *I let my child eat between meals whenever she or he wants*), Guided choices - what (ASP; three items; e.g., *I allow my child to choose what she or he has for snacks*), Guided choice - amount (ASP; three items; e.g., *During meals, I allow my child to decide when she or he has had enough to eat.*), Rules and limits around unhealthy foods (SP; four items; e.g., *I place limits on the sweet or salty snacks (candy, ice*

cream, cake, potato chips, tortilla chips) that my child eats), Meal setting (SP; three items; e.g., *Do you limit snacking to designated places in your home?; I insist my child eats meals at the table.*), and Atmosphere of meals (SP; three items; e.g., *Dinner time is usually a pleasant time for the family*). Parents rated their use of these practices on a five-point Likert scale (*Never, Rarely, Sometimes, Often, Always*), for both the period before and during the lockdown. Higher scores indicated the use of more soothing with foods, more child autonomy, more rules and limits, a stricter meal setting, and a more positive meal atmosphere. The items were translated from English to French by several researchers of the team, and some questions were slightly modified; to adapt them to the French situation (e.g., mid-afternoon snack "goûter" vs. other snacks/drinks) or to be more uniform within the entire questionnaire (Appendix A).

One additional feeding practice "Feeding on a schedule" was selected for this study. This three-item dimension (e.g., *During the week, do you make him/her eat at set times?)* was retrieved from the Infant Feeding Questionnaire (IFQ; Baughcum et al., 2001) and has already been validated for the use in French samples (Monnery-Patris, Rigal, Peteuil, Chabanet, & Issanchou, 2019). Parents rated their answers on a five-point Likert-like scale (*Never, Rarely, Sometimes, Often, Always*), for both the period before the lockdown and during the lockdown. Higher scores indicated stricter times for eating.

2.2.5 Parental motivations for buying foods

Changes in parental motivations for buying foods were assessed using 19 items. Most of these items were retrieved from the Questionnaire relating to Parental Motivations when buying food for children (Rigal et al., 2012). This 17-item instrument captures six dimensions of parental motivations: convenience (e.g., *easy to cook*), weight-control (e.g., *not too high in calories*), natural-content (e.g., *fresh*), health-concern (e.g., *high in vitamins*), preference (e.g., *adapted to children's taste*), price (e.g., *good price-quality*). Originally, parents are asked to rate their agreement with each item: e.g.,"For my child, I am careful to buy food which are… easy to cook" on a five-point scale ranging from "very wrong for me" (1) to "very true for me" (5). For this study, we wanted to evaluate the changes in parental motivations (during vs. before the lockdown) in a direct way, so we reformulated all items to e.g., "Compared to the period before the lockdown, you buy and prepare foods for your child(ren) that are… easy to cook". Parents indicated a possible difference on a five-point scale (*Much less often than before, A bit less often than before, As often as before, A bit more often than before, Much more often than before*). The answers were rescored to -2, -1, 0, 1, 2 respectively so negative scores would indicate a decrease, zero no change, and positive scores an increase. Four original items were deleted because they were less relevant for this study, and the dimensions sustainability (three items, *i.e., locally produced; seasonal products; biological*), pleasure (one item: *pleasurable*), conservation (one item: *easy to store for a longer period*) and comfort (one item: *comfort foods*) were added.

2.2.6 Parental eating and cooking behaviors and stress level at home

Parents were asked to rate their own frequency of intake of a mid-afternoon snack and of other snacks/drinks in between meals using the same scales as for the children, also for both the period before and during the lockdown.

Parents were also asked to report how often they felt stressed or tensed at home on a five-point Likert scale (*Never, Rarely, Sometimes, Often, Always*), for both the period before and during the lockdown. Higher scores indicated higher levels of stress at home.

Parents were also asked to report changes in their emotional eating, in the preparation of homemade dishes, in the preparation of comfort foods, and in the time they spent cooking with their child(ren). These changes were directly rated on a five-point scale (*Much less than before, A bit less than before, As often as before, A bit more than before, Much more than before*). The answers were rescored to -2, -1, 0, 1, 2 respectively so negative scores would indicate a decrease, zero no change, and positive scores an increase.

The questionnaire also contained three open questions to ask parents about their food-related experiences during the COVID-19 lockdown. The results of these questions are not presented in this paper.

2.2.7 Anthropometric data for parent and child

As measuring and weighing participants was impossible for the researchers during the COVID-19 lockdown, parents were asked to self-report their current weight and height, and the weight and height of their child. Parents were encouraged to report recent child measurements carried out by health professionals from the child's medical health book. If no recent measures were available in this book, or if the measurements of height and weight were not carried out within a time span of two months, we asked them to measure and/or weigh their child at home. Parents' and children's BMI were calculated by dividing their weight (kg) by their height (m) squared. For children, normed BMI z-scores were calculated using WHO's (2006) international growth standards for children.

2.3 Statistical analyses

R version 3.6.1 (R Core Team, 2019) was used to clean and analyse the data.

2.3.1 Data cleaning

Questionnaires were excluded when the child was younger than 3 years or older than 12.9 years (n=4), when the child had an illness (different from food allergy) susceptible of influencing his/her eating (e.g., autism, thyroid disease; n=8), or when the child was born very premature (< 28 weeks of gestation; n=0). When information on age, sex, illness or prematurity was missing, these questionnaires were also excluded (n=20).

2.3.2 Preliminary analyses

Cronbach's alphas were calculated to test the psychometric properties of the measures used for evaluating child eating behaviors and parental feeding practices before and during the lockdown. When these alphas were too low (< 0.60), confirmatory factor analyses (CFA) with a SEM approach (Bollen, 1989; Kaur et al., 2006) were performed to gain more insights in the factor structures and to potentially optimize them. Acceptable Cronbach alphas were observed for all child eating behaviors (ranging between 0.79 and 0.87). For parental feeding practices, some Cronbach's alphas were acceptable (ranging between 0.63 and 0.81; for soothing with food, rules and limits around healthy food, atmosphere of meals), some were borderline acceptable (ranging between 0.52 and 0.57; for guided choices - when, and feeding on a schedule) and some were found lower (ranging between 0.31 and 0.41; for guided choices – what and amount, and meal setting). In contrast, the CFAs indicated acceptable factor loadings for all practices, except for guided choices - amount. One item was deleted for this dimension because the factor loading was very low. Details are available in Appendix A.

2.3.3 Primary analyses

Scores were calculated for each dimension by averaging the scores of the corresponding items, for the period of the lockdown, and for the period before the lockdown. For the dimensions emotional overeating and soothing with food, the answer option "not applicable" was coded as missing value. For emotional overeating, 22 parents responded with "not applicable" to all corresponding items, and for soothing with food, six parents responded with "not applicable" to all items. These parents thus did not report changes in this behavior/practice during the lockdown compared to before the lockdown. Proportions of individuals showing a change ($score_{during\ lockdown}$ - $score_{before\ lockdown} \neq 0$) were calculated for each child behavior and each parental feeding practice. For those children/ parents for whom changes were reported, paired-samples *t*-tests were conducted for each behavior/practice in order to compare mean scores of both periods ($M_{during\ lockdown}$ - $M_{before\ lockdown}$). Simple regressions were performed to study the effects of changes in level of child boredom at home, child age, child sex, and child z-BMI (as a continuous variable) on changes in child eating behaviors. Simple regressions were also used to study the effects of parental demographics (parent's sex, BMI, relationship status, level of education, work status during lockdown, perception of financial status) and changes in parental stress levels at home, on changes in parental feeding practices, changes in parental motivations for buying foods, and on changes in parental cooking behaviors. Whenever the results of these simple regressions indicated multiple significant predictors for a given dependent variable, we subsequently performed a multiple regression analysis to verify if the relations remained significant after controlling for the effects of the other predictors. In all regression analyses, the dependent variables only included the children/parents for whom changes in their behaviors, practices or motivations were reported. This approach was chosen since this study was specifically designed to focus on possible predictors of the observed changes, but also for statistical reasons (*i.e.,* to meet the assumption of normality, and to maintain a homogenous variance). The significance level was set at $p < 0.05$ for all analyses. Our analytic plan was pre-specified in our study file and submitted to the ethical committee before the data were collected.

3. Results

3.1 Participants

A sample of 498 parents of children aged 3.0-12.3 years (47.8% boys; *M* age = 7.3; *SD* = 2.2) was retained for analyses after data cleaning. The demographics for the parents are presented in Table 1. According to parental reports of child weight and height, 8% of children aged 3.0-5.0 years had underweight (z-BMI < -2), 68% had a normal weight (-2 ≤ z-BMI < 1), 18% were at risk for overweight (1 ≤ z-BMI < 2), 5% had overweight (2 ≤ z-BMI < 3), and 1% had obesity (z-BMI > 3) (categories derived from WHO, 2006). Among the children aged 5.1-12.3 years, 6% had underweight (z-BMI < -2), 69% had a normal weight (-2 ≤ z-BMI < 1), 15% had overweight (1 ≤ z-BMI < 2), and 9% had obesity (z-BMI > 2) (categories derived from de Onis, Onyango, Borghi, Siyam, Nishida, & Siekmann, 2007). During the lockdown, the children in this study took on average 6.8 breakfasts a week at home, 6.8 lunches, and 7.0 dinners. Fourteen percent of parents reported taking more breakfasts with their child during the lockdown than before, 85% reported no difference, and 1% of parents reported a decrease. For lunch, 59% of parents reported an increase in lunches taken with their child, 37% no difference, and 3% a decrease. Forty-six percent of parents reported an increase in the number of mid-

afternoon snacks taken with their child, 50% no difference, and 4% a decrease. For dinner, 14% of parents reported an increase in dinners taken with their child, 86% no difference, and 1% a decrease.

Table 1.
Demographics for parents.

Demographic	**Parents (n = 498)**
Sex (female/male) [%]	71.7 / 28.3
Age [%]	
25-34 years	30.5
35-49 years	67.9
50-64 years	1.6
BMI [%]	
Underweight (< 18.5 kg/m^2)	3.4
Normal weight (18.5-25 kg/m^2)	51.6
Overweight (25-30 kg/m^2)	29.7
Obesity (≥ 30 kg/m^2)	15.3
Relationship status (couple/ single parent) [%]	89.2 / 10.8
Number of children in household, mean (SD)	2.1 (0.9)
Level of education [%]	
Low (secondary studies degree or lower)	33.5
Middle (higher technology degree or first cycle of higher education)	26.7
High (university degree)	39.8
Type of housing [%]	
Apartment without a balcony or a terrace	6.8
Apartment with a balcony or terrace	20.7
House without a garden	1.0
House with a garden	71.5
Work status before the lockdown [%]	
Working (part-time or full-time)	85.1
Unemployed, job seeker	4.8
Other (e.g., student, parental leave, parent at home)	11.0
Work status during the lockdown [%]	
Working outside the house (part-time or full-time)	20.7
Working from home (part-time or full-time)	35.1
At home, not working	35.1
Other (e.g., student)	9.0
Perception of financial situation [%]	
You can't make ends meet without going into debt	3.2
You get by but only just	12.9
Should be careful	34.9
It's OK	36.3
At ease	11.6
I do not want to answer	1.0

3.2 Children

3.2.1 Changes in child eating behaviors (during versus before lockdown)

Sixty percent of parents reported a change on at least one dimension of their child's eating behaviors during the lockdown compared to the period before the lockdown. When looking only at the children with changed behaviors, paired-samples *t*-tests resulted in a significant increase for all behaviors but

food pickiness (Table 2). The highest increases in mean score were observed for emotional eating (+0.61) and for food responsiveness (+0.44).

Table 2
Child eating behaviors: percentage of total sample of parents (N = 498) reporting a change for their child (%), mean scores before and during the lockdown (*M before* and *M during*) for these children with changed behaviors, standard deviations (*SD*), difference in mean scores (*M difference = M during – M before*), and paired-samples *t*-tests (*t value* and *p value*).

Child eating behavior	%	*M (SD) before*	*M (SD) during*	*M difference*	*t*	*p*
Emotional overeating[a]	31	2.43 (0.74)	3.05 (0.91)	0.61	**12.43**	**<0.001**
Food responsiveness[a]	45	2.46 (0.70)	2.90 (0.93)	0.44	**11.49**	**<0.001**
Food enjoyment[b]	28	2.69 (0.58)	2.96 (0.86)	0.27	**3.87**	**<0.001**
Appetite[b]	33	2.18 (0.76)	2.30 (0.93)	0.12	**1.98**	**0.049**
Food pickiness[b]	20	2.97 (0.89)	2.85 (1.01)	-0.12	-1.41	0.162

[a]Answer modalities ranged from never (1) to always (5).
[b]Answer modalities ranged from do not agree at all (1) to do completely agree (5).
Significant results ($p < 0.05$) in bold.

In this study, two types of snacking were studied: the mid-afternoon snack (perceived as a meal for children in France) and snacks/drinks in between meals. The frequency of the mid-afternoon snack increased in 15% of children (during versus before the lockdown), decreased in 9%, and did not change in 76% of children. The majority of children already had a daily mid-afternoon snack before the lockdown, and maintained this habit during the lockdown (Table 3). Parents reported an increase in snack frequency in between meals in 36% of children, a decrease in 4% of children, and no change in 60% of children.

Table 3
Frequency of mid-afternoon snacks and of snacks/drinks in between meals for all children and all parents (N = 498), before and during the lockdown.

	Children		**Parents**	
	before (%)	**during (%)**	**before (%)**	**during (%)**
Mid-afternoon snacks				
< 1 time a week	1	1	39	21
1-3 times per week	8	4	25	26
4-6 times per week	13	10	12	18
Every day	78	84	25	34
Snacks/drinks in between meals				
< 1 time a week	51	39	53	45
1-3 times per week	20	19	24	22
4-6 times per week	6	9	6	9
Once a day	16	16	11	14
Twice a day	4	12	4	6
3 times a day	1	3	1	2
4 or more times a day	2	3	1	3

Concerning the types of foods consumed by the children during (mid-afternoon) snack occasions, 66% of parents reported at least one change in consumption during the lockdown versus before. When studying only the children with a change in their consumption, paired-samples *t*-tests resulted in a statistically significant increase in mean scores ($M_{\text{during lockdown}}$ - $M_{\text{before lockdown)}}$ for candy/chocolate, fruit juices, sodas, chips/salty biscuits, ice creams, pastries/cake/sweet cookies, cream dessert, milks, yoghurt/cheese/quark, fresh and dried fruits, and nuts. A significant decrease in the consumption of compote/fruits in syrup was observed (Table 4).

Table 4
Snacking frequency: percentage of total sample of parents (N = 498) reporting a change for their child (%), mean scores before and during the lockdown (*M before* and *M during*) for these children with changed behaviors, standard deviations (*SD*), difference in mean scores (*M difference = M during – M before*), and paired-samples *t*-tests (*t value* and *p value*).

Types of food/drinks consumed during (mid-afternoon) snacks	**%**	***M (SD) before***	***M (SD) during***	***M difference***	***t***	***p***
Candy, chocolate	26	2.57 (0.86)	3.47 (0.98)	0.89	**9.26**	**<0.001**
Fruit juice	22	2.36 (1.01)	3.09 (1.10)	0.73	**7.53**	**<0.001**
Soda	11	2.13 (0.83)	3.02 (0.99)	0.89	**7.24**	**<0.001**
Chips, salty biscuits	13	2.33 (1.06)	3.17 (1.06)	0.83	**6.47**	**<0.001**
Ice cream	27	2.20 (0.71)	2.66 (1.14)	0.58	**5.68**	**<0.001**
Pastries, cake, sweet cookies	30	2.97 (0.95)	3.48 (1.09)	0.52	**4.76**	**<0.001**
Cream dessert	15	2.20 (0.94)	2.80 (1.13)	0.61	**4.35**	**<0.001**
Milks	19	2.53 (1.00)	3.06 (1.26)	0.54	**4.02**	**<0.001**
Yoghurt, cheese, quark	21	2.39 (1.00)	2.90 (1.16)	0.50	**3.95**	**<0.001**
Fresh and dried fruits	23	2.63 (1.00)	3.00 (1.15)	0.37	**3.29**	**0.001**
Nuts	10	2.23 (0.88)	2.69 (1.15)	0.46	**2.68**	**0.010**
Bread	28	2.70 (0.91)	2.92 (1.16)	0.22	1.96	0.052
Sandwich, pizza, savory pies	4	2.58 (0.69)	3.05 (1.08)	0.47	1.69	0.108
Cheese	11	2.43 (0.95)	2.66 (1.18)	0.23	1.29	0.204
Cereals, cereal bars	22	2.42 (0.86)	2.52 (1.11)	0.10	0.82	0.414
Compote, fruits in syrup	25	3.26 (1.11)	2.97 (1.20)	-0.29	**-2.24**	**0.027**

Answer modalities ranged from never (1) to always (5).
Significant results ($p < 0.05$) in bold.

3.2.2 Links with child boredom, age, sex, and z-BMI

Forty-five percent of parents reported no change in their child's level of boredom at home during the lockdown compared to the period before the lockdown, 53% reported an increase in level of boredom, and 2% a decrease. A paired-samples *t*-test performed on the scores of the children for whom changes were reported (n = 276) indicated a significant increase in mean score of level of boredom (+1.20, $t(275) = 26.82$, $p < 0.001$; $M_{before} = 2.28$, $SD_{before} = 0.67$; $M_{during} = 3.48$, $SD_{during} = 0.70$).

Simple regressions indicated that a greater increase in children's level of boredom at home (during vs. before lockdown) was significantly linked with a greater increase in emotional overeating, in food responsiveness and in snack frequency in between meals (Table 5). Simple regressions also indicated that child age, child sex and child z-BMI were not significant predictors for changes in child boredom levels, neither for changes in child (mid-afternoon) snack frequency, nor for changes in child eating behaviors, except for a significantly lower increase in food responsiveness in children with higher BMI z-scores ($\beta = -0.07$, $t = -2.96$, $p < 0.001$). The results of these regression analyses, significant and non-significant, can be found in Appendix B.1.

Table 5
Simple linear regression models with the changes in child eating behaviors (when change occurred) as dependent variables, and the change in child level of boredom as independent variable.

Change in	**Df**	**Estimate**	**Std. Error**	***t***	***p***
Emotional overeating	150	0.20	0.05	**3.59**	**<0.001**
Food responsiveness	224	0.14	0.04	**3.26**	**<0.001**
Food enjoyment	135	0.08	0.08	1.03	0.30
Appetite	164	-0.02	0.07	-0.34	0.74
Food pickiness	96	0.01	0.09	0.14	0.89
Mid-afternoon snack frequency	116	-0.19	0.15	-1.27	0.21
Snack frequency in between meals	198	0.28	0.10	**2.78**	**0.01**

Significant results ($p < 0.05$) in bold.

3.3 Parents

3.3.1 Changes in parental feeding practices

Sixty percent of parents reported at least one change in their feeding practices during lockdown compared to the period before the lockdown. When including only the parents who reported a change, paired-samples *t*-tests resulted in a significant increase in mean scores for soothing with food, guided choices - when, what and amount, and meal atmosphere. A significant decrease was observed for rules and limits around unhealthy foods, meal setting, and feeding on a schedule (Table 6). The highest increases in mean score were observed for soothing with food (+0.43) and guided choices - when (+0.36), the greatest decrease was observed for feeding on a schedule (-0.40).

Table 6
Parental feeding practices: percentage of total sample of parents (N = 498) reporting a change (%), mean scores before and during the lockdown (*M before* and *M during*) for these parents with changed practice, standard deviations (*SD*), difference in mean scores (*M difference = M during – M before*), and paired-samples *t*-tests (*t value* and *p value*).

Parental feeding practice	**%**	***M (SD) before***	***M (SD) during***	***M difference***	***t***	***p***
Soothing with food	18	1.62 (0.61)	2.06 (0.75)	0.43	**11.44**	**<0.001**
Guided choices - when[a]	26	1.60 (0.57)	1.96 (0.64)	0.36	**8.79**	**<0.001**
Guided choices - amount[a]	14	2.59 (0.88)	2.89 (0.82)	0.30	**4.00**	**<0.001**
Guided choices - what[a]	22	2.33 (0.68)	2.50 (0.65)	0.18	**3.41**	**<0.001**
Meal atmosphere	23	4.01 (0.73)	4.28 (0.76)	0.27	**4.05**	**<0.001**
Rules and limits around unhealthy foods	27	3.78 (0.73)	3.68 (0.69)	-0.10	**-2.40**	**0.018**
Meal setting[b]	13	4.03 (0.63)	3.84 (0.54)	-0.20	**-3.72**	**<0.001**
Feeding on a schedule	31	4.29 (0.56)	3.90 (0.61)	-0.40	**-8.40**	**<0.001**

Answer modalities ranged from never (1) to always (5).
Significant results ($p < 0.05$) in bold.
[a]Higher scores for guided choice indicate higher levels of autonomy granted to the child.
[b]Meal setting refers to the place where the child eats, higher scores indicate stricter rules.

3.3.2 Changes in parental motivations for buying foods

Eighty-five percent of parents reported at least one change in their motivations to buy and prepare certain foods for their child(ren) during the lockdown compared to the period before the lockdown. For each motivation dimension, proportions of parents who reported no change, a decrease, or an increase are presented in Fig. 1. Highest increases in motivation were observed for buying pleasurable and sustainable foods. The greatest decrease in motivation was observed for buying convenient foods.

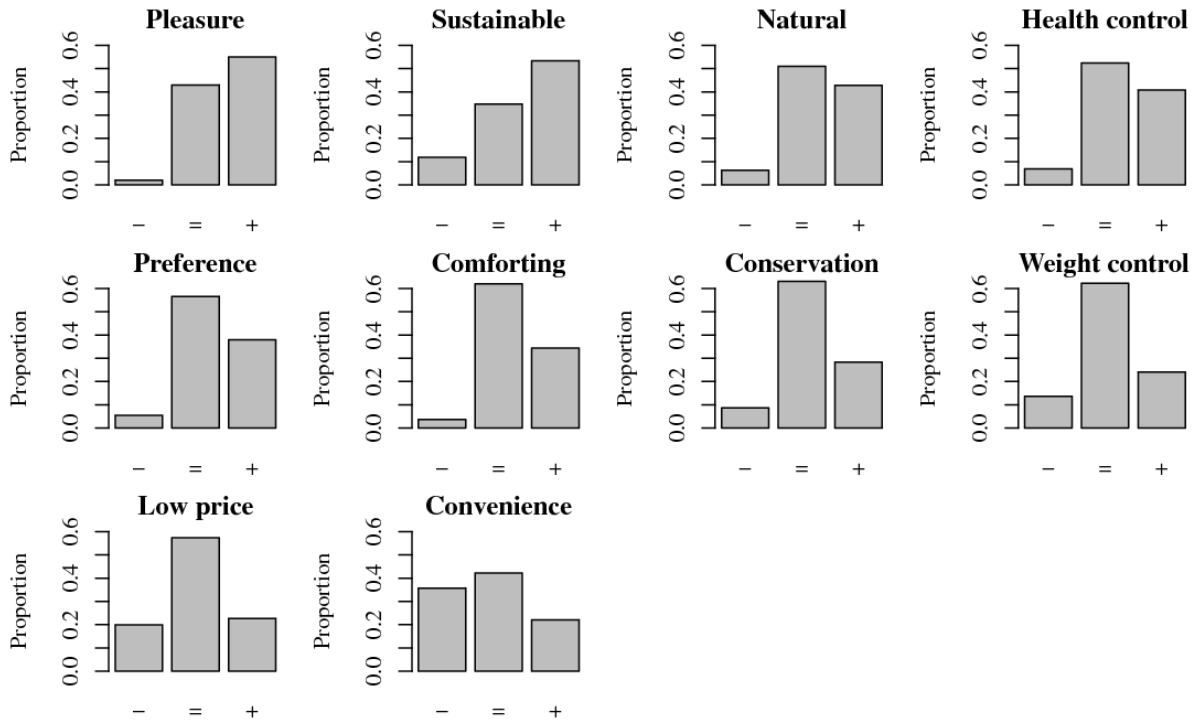

Fig. 1 Proportions of parents who reported a decrease (-), no difference (=), and an increase (+) in their motivation to buy/ prepare certain foods for their child(ren).

3.3.3 Changes in parental eating and cooking behaviors

The frequency of the mid-afternoon snack increased in 35% of parents (during versus before the lockdown), decreased in 4%, and did not change in 61% of parents. Thirty-one percent of parents reported an increase in their snack frequency in between meals, 8% reported a decrease, and 62% no change. The frequencies of both snack occasions in parents before and during the lockdown are presented in Table 3. When asked if the lockdown and the accompanying emotions (e.g., boredom, stress, anxiety) induced parents to have more, the same or less desire to eat during the lockdown than before, 46% of parents answered that they felt more like eating than before, 41% of parents reported no change, and 14% of parents reported feeling less like eating than before.

When asked about the preparation of homemade dishes, 66% of parents reported preparing more homemade dishes than before, 30% reported no change, and 4% of parents reported preparing less homemade dishes. When asked about the preparation of comforting foods or recipes, 57% of parents reported preparing more comforting foods or recipes, 40% reported no change, and 3% reported preparing less. When asked about the time they spent cooking with their child(ren), 71% of parents reported spending more time cooking with their child(ren), 26% reported no change, and 2 % reported spending less time cooking together.

3.3.4 Links with changes in parental level of stress and parental demographics

Effects of changes in parental stress level on parental feeding practices

Forty-four percent of parents reported no change in their level of stress at home during the lockdown compared to the period before the lockdown. An increase in level of stress was reported by 42% of parents and a decrease by 14%. A paired-samples *t*-test performed on the scores of the parents with a

change in their stress level (n = 280), indicated a significant increase in mean score of stress level with +0.59 ($t(279) = 7.70$, $p < 0.001$; $M_{before} = 2.74$, $SD_{before} = 0.86$; $M_{during} = 3.33$, $SD_{during} = 0.93$).

Simple regressions indicated that greater increases in stress level were linked with greater increases in guided choice - amount (more autonomy for the child to decide the amount of intake) (Table 7): on average, guided choice – amount increased during the lockdown (Table 6), and this increase was even greater if stress level increased. Also, on average, the meal time atmosphere quality improved during the lockdown (Table 6), but not for those parents who became more stressed at home (Table 7). More specifically, compared to the period before the lockdown, there was no improvement in meal atmosphere quality if parents' stress level increased by one unit, and there was a decrease in atmosphere quality if the stress level increased by more than one unit.

Table 7
Simple linear regression models with the changes in parental feeding practices (when change occurred) as dependent variables and the change in parental level of stress as independent variable.

Change in	Df	Estimate	Std. Error	*t*	*p*
Soothing with food	89	-0.04	0.03	-1.38	0.17
Guided choices – when	128	0.01	0.03	0.43	0.67
Guided choices – what	107	0.02	0.04	0.49	0.62
Guided choices – amount	68	0.15	0.06	**2.38**	**0.02**
Meal atmosphere	115	-0.34	0.04	**-7.67**	**<0.001**
Rules and limits around unhealthy foods	133	0.03	0.04	0.82	0.41
Meal setting	65	-0.08	0.06	-1.35	0.18
Feeding on a schedule	154	-0.06	0.04	-1.42	0.16

Significant results ($p < 0.05$) in bold.

Effects of parental demographics on changes in parental feeding practices

Some parental demographics were also identified as significant predictors of changes in parental feeding practices. Simple regressions indicated that the decrease in rules and limits around unhealthy foods (Table 6) was even greater among parents with a higher level of education ($\beta = -0.08$, $t = -2.45$, $p = 0.02$; see Appendix B.2). Feeding on schedule decreased on average (Table 6), but a smaller decrease was observed in more educated parents ($\beta = 0.11$, $t = 2.56$, $p = 0.01$; see Appendix B.2). In other words, parents became more permissive regarding the times to eat, but to a lower extent among higher educated parents. Parental sex significantly predicted changes in guided choices – when ($\beta = 0.22$, $t = 2.32$, $p = 0.02$): mothers showed an increase in this practice and thus granted increased autonomy to the child in deciding when to eat, while fathers did not show such a change. Finally, a higher parental BMI predicted a significantly lower increase in meal atmosphere quality ($\beta = -0.03$, $t = -2.47$, $p = 0.01$). The results of all regression analyses, significant and non-significant, can be found in Appendix B.2.

Effects of parental demographics on changes in parental cooking behavior

Regarding parental cooking behaviors, simple regressions indicated that a higher level of education and a more comfortable perceived financial status predicted greater increases in time spent cooking with the child (Table 8). However, for level of education, this result became non-significant after adjustment for financial status in a multiple regression model ($\beta = +0.05$, $t = 1.69$, $p = 0.09$).

Table 8
Simple linear regression models with changes in cooking behaviors (when change occurred) as dependent variables and parental demographics as independent variables.

	Df	Estimate	Std. Error	*t*	*p*
More homemade dishes					
Level of education	347	0.07	0.04	1.87	0.06
No work[a] *[ref working outside]*	346	0.16	0.12	1.41	0.16
Working from home *[ref working outside]*	346	0.18	0.12	1.50	0.13
Financial status[b]	344	0.03	0.04	0.75	0.46
Single parent *[ref couple]*	347	-0.20	0.13	-1.51	0.13
Parent BMI	347	0.01	0.01	1.27	0.20
Parent sex *[ref men]*	347	0.03	0.09	0.32	0.75
More time spent cooking with child					
Level of education	365	0.06	0.03	**2.11**	**0.04**§
No work[a] *[ref working outside]*	364	0.07	0.10	0.71	0.48
Working from home *[ref working outside]*	364	0.03	0.10	0.27	0.79
Financial status[b]	362	0.09	0.04	**2.34**	**0.02***
Single parent *[ref couple]*	365	-0.14	0.11	-1.28	0.20
Parent BMI	365	0.00	0.01	-0.67	0.50
Parent sex *[ref men]*	365	-0.00	0.08	-0.04	0.96

[a] No work refers to those parents who were at home without work; e.g., those who were technically unemployed due to the lockdown, parents on parental leave, students, etc.
[b] Perceived financial status ranges from less to more comfortable.
§ No longer significant after adjustment for financial status (multiple regression).
* Remains significant after adjustment for level of education (multiple regression).

Effects of parental demographics on changes in parental motivations for buying foods

Some parental demographics were also identified as significant predictors of changes in parental motivations for buying foods for their child(ren). Employment status during the lockdown significantly predicted changes in the motivation to buy convenient foods: parents who were working from home (β = -0.54, t = -3.18, $p < 0.001$) and parents who were at home without work (β = -0.41, t = -2.41, p = 0.02) showed a significant decrease in this motivation, while parents working outside the home showed no significant change in this motivation. In simple regressions, parental level of education (β = -0.11, t = -2.18, p = 0.03) and parent BMI (β = 0.03, t = 2.05, p = 0.04) also significantly predicted changes in the motivation for buying convenient foods. However, in a multiple regression including these three predictors (work status, level of education, parent BMI), only the effect of work status remained significant when adjusted for the effects of these other predictors.

Furthermore, in simple regressions, parents with a higher level of education showed a greater increase in the motivation to buy healthy foods (β = 0.13, t = 3.25, $p < 0.001$), foods linked to weight control (β = 0.12, t = 2.37, p = 0.02), comforting foods (β = 0.12, t = 2.28, p = 0.02), and sustainable foods (β = 0.17, t = 5.04, $p < 0.001$) than parents with a lower level of education. In a simple regression model, perceived financial status also significantly predicted changes in the motivation to buy foods related to weight control (β = 0.13, t = 2.08, p = 0.04), but in a multiple regression model, both the effects of level of education and financial status became non-significant after adjustment for each other's effect. Also, in simple regressions, parents with a more comfortable perceived financial status showed a greater increase in the motivation to buy sustainable foods (β = 0.14, t = 3.19, $p < 0.001$) and single parents showed a lower increase in this motivation (β = -0.37, t = -2.57, p = 0.01) compared

to parents with a less comfortable financial status and parents with a partner. In a multiple regression, level of education and family situation ("single parent") remained significant predictors for sustainability after adjusting for each other's effects, but not financial status. Finally, parents with a higher BMI showed a lower increase in the motivation to buy foods that can easily be preserved ("conservation") (β = -0.04, t = -2.22, p = 0.03). The results of all regression analyses, significant and non-significant, can be found in Appendix B.3.

4. Discussion

This study wanted to evaluate possible changes in eating and feeding habits in families with young children during the COVID-19 lockdown in France, versus the period before the lockdown. The results showed that not all, but a majority of parents reported some changes in their child's eating behaviors, in their feeding practices, their food shopping motivations, and in their own eating and cooking behaviors. This clearly indicates that the lockdown had an important impact on families' eating and feeding habits at home.

Children showed significant increases in "food approach" behaviors during the lockdown (behaviors involving a movement toward or a desire for foods: *i.e.* food enjoyment, emotional overeating, food responsiveness (Vandeweghe, Vervoort, Verbeken, Moens, & Braet, 2016; Webber, Cooke, Hill, & Wardle, 2010)). Children's snack frequency in between meals also increased significantly. Moreover, increases in emotional overeating, food responsiveness and snack frequency were predicted by an increase in child boredom at home: children may have tried to "fill up" their time with eating or found comfort and enjoyment in food during this unusual, monotonous period. In children, the literature related to bored-eating is scarce and the construct is often lumped together in questionnaires with emotional- and stress-eating (e.g., in CDEBQ, CEBQ). In this study, we also studied emotional overeating in a more general way with the CEBQ (four items studying overeating in response to both boredom, anxiety, annoyment, and worry). However, recent studies have indicated that bored-eating is viewed as a distinct construct by mothers, and may be a more common practice in children than emotional- or stress-eating. Therefore, the authors suggested that it may be of interest to present and to study bored-eating separately from other emotions (Hayman, Lee, Miller, & Lumeng, 2014; Koball, Meers, Storfer-Isser, Domoff, & Musher-Eizenman, 2012). In adults, boredom has previously been found to increase the desire to eat unhealthily (e.g., Moynihan et al., 2015). Similar to the results in adults, our results showed that increased boredom in children was strongly related to increased food responsiveness, increased emotional overeating and increased snack frequency. Our study thus showed that also in (young) children boredom can play a role in their desire for foods.

Moreover, even though the COVID-19 lockdown was an unusual situation, the increased manifestation of these food approach behaviors and their link with child boredom could be cause for concern. It suggests that these children did not merely rely on their internal cues of hunger and satiety when asking for foods/drinks (crucial for an optimal self-regulation of food intake); and ignoring internal cues could possibly make children overeat and induce weight gain if maintained for a long period (Kral, Allison, Birch, Stallings, Moore, & Faith, 2012; Monnery-Patris et al., 2019). With age, research has shown that children rely less on their internal cues for their food intake (e.g., Fox, Devaney, Reidy, Razafindrakoto, & Ziegler, 2006). It is therefore important to encourage children (and their caregivers) from a young age to listen to their inner sensations for food intake, and to maintain this even in more challenging situations. Parents and schools could play an important role in guiding

children in using adaptive self-regulation strategies and in modeling these strategies. In both children and adults, several types of interventions such as mindfulness-based interventions and appetite awareness training have been proposed to increase awareness of hunger and satiety cues, with various levels of success (e.g., in adults: Alberts, Thewissen, & Raes, 2012; Craighead & Allen, 1995; Kristeller & Wolever, 2010; Van de Veer et al., 2012; in children: Bloom, Sharpe, Mullan, Zucker, 2013; Boutelle, Peterson, Rydell, Zucker, Cafri, Harnack, 2011; Johnson; 2000; Lumeng et al., 2017). Some interventions were for example successful in the short term, but not in the long term (Bloom et al., 2013). Reigh and colleagues (2020) recently also suggested a technology-enhanced intervention for preschoolers, using an interactive character-based technology platform and educational materials for parents, to improve preschoolers' energy intake regulation and their knowledge related to hunger, fullness and digestion. In their pilot study, preschoolers' (N=33) knowledge increased significantly and boys' short-term energy compensation improved following a 4-week intervention.

The results of our study further showed that when feeding practices were adapted, there was a significant trend to more permissive, child-centered and pleasure-oriented practices: parents reported less rules and limits, more soothing with food and gave more autonomy to the child in deciding when, what, how much and where to eat. Regarding the types of foods offered during snacking, we also observed increased intake of so-called "comfort foods". The theory of division of autonomy states that parents should be mainly responsible for what, when and where the child eats, but the child for the amount of food eaten (Satter, 1990; Vaughn et al., 2015). Here, we could thus argue that parents may have become a bit too permissive regarding the types of foods offered during the lockdown, there was also a significant decrease in structure of the meals (timing of meals, place). By contrast, the increases in guided choices (i.e., more child autonomy) may indicate that parents had the opportunity to listen better to children's needs and demands, and to respond to them in a more responsive way (even though we are aware that these child demands were not only based on children's internal cues, as discussed above). Interestingly, our results also showed that parental level of stress played a role in changes in parental feeding practices during the lockdown: greater increases in stress predicted greater increases in giving autonomy to the child regarding the amount to eat, and no improvement in meal atmosphere quality (in contrast to parents with no increases in stress).

Furthermore, parents showed many changes in their motivations when buying foods for their children. Highest increases in motivations were observed for buying pleasurable foods, sustainable foods, natural foods and healthy foods. These findings are in accordance with the findings of a French survey that was carried out by Ipsos during the lockdown in April 2020 for L'Observatoire E.Leclerc des nouvelles consommations: they found that French consumers aged 16-75 years turned more to products of French origin (45%), fresh products (37%) or products from short circuits (37%). Sixty-three percent of consumers claimed that they consumed more local products in order to support the local economy during the lockdown. For the parents in our study, pleasure also became an important motivation, and this is in line with the observed increases in snack frequency in both parents and children, increased emotional eating in both, and the increase in the preparation of comforting foods/recipes during the lockdown. From a cultural point of view, family meals in France were already known to be strongly pleasure-oriented (Lhuissier et al., 2013), and the lockdown seemed to have reinforced this. Convenience became less important for many parents, which can be supported by their reported increase in the preparation of home-cooked meals and their increase in time cooking with their children. Di Renzo and colleagues (2020) also observed this increase in homemade recipes during the lockdown in Italy.

In the present study, parental motivations for buying foods for their child(ren), changes in parental feeding practices and parental cooking behaviors were significantly predicted by parental characteristics. We observed that especially a higher level of education was linked to some more favorable changes in behaviors: for example, maintaining to eat at set times, buying more sustainable and healthy foods, more cooking with the child, preparing more homemade dishes (marginal effect: $p = 0.06$). These results may imply that it is of interest to take into account parental level of education when planning interventions to improve parental feeding behaviors. Parents with different levels of education may experience different barriers and facilitators for changing their behaviors. It seems that, during the lockdown, increased time at home could have played a role in facilitating cooking with the child, preparing homemade dishes and buying more local, sustainable foods, but more particularly for parents with higher levels of education. Previous studies have already shown that parental education level is linked to differences in parental feeding practices and in parental motivations when buying foods for their child. For instance, parents with lower levels of education tend to be less concerned by health and more concerned by children's preferences when buying foods (Rigal, Champel, Hébel, Lahlou, 2019), they serve larger portion sizes (Hébel, 2017; Rigal et al., 2019) and are less likely to restrict their child's intake of unhealthy foods (Wijtzes, Jansen, Jansen, Jaddoe, Hofman, Raat, 2013).

The COVID-19 pandemic has changed our habits in many ways during the lockdown, but even after months, we have not gone back to the situation "before the pandemic". As we are still reshaping some of our habits, we suggest that future research and policy makers also focus on the implications for the food domain in all its facets, this by also taking into account possible facilitators and barriers linked to people's socio-demographic characteristics.

We acknowledge that there were several limitations to this study. First, parental practices and behaviors were self-reported in this study and may be subject to social desirability bias even though the questionnaires were anonymous. The children's eating behaviors and level of boredom were also parent-reported and thus reflected the parent's perception. Second, the data obtained about the period before the lockdown was reported retrospectively, possibly leading to a recall bias that can threaten the internal validity of our study (Delgado-Rodriguez & Llorca, 2014; Hassan et al., 2005). Yet, recall accuracy diminishes with increasing time gap, and as the time gap in this study was very small (max. eight weeks), we think the recall bias was limited here. Here, we also want to note that we did not define "the period before the lockdown" for the parents. It is therefore possible that parents interpreted this period in different ways (more or less broad) and thus responded differently based on their own interpretation, with possible corresponding effects on our results. We hope, however, that the differential interpretations would be limited because of the high contrast between the two periods parents needed to report on: the "normal" life and related general habits right before the lockdown versus those during the lockdown.

Meanwhile, this study also has several strengths. To our knowledge, it is the only study that looked in a more systemic way at changes in families' food habits during the COVID-19 lockdown, including eating and cooking behaviors, parental feeding practices and parental motivations when buying foods for the family. Other studies tend to focus uniquely on adults or on children. Our sample may not be entirely representative of the national population in France: there was for example a relatively small sample of parents with a low level of education (33.5% in our sample compared to approximately 55% in the French population (Insee, 2016)), and the majority of our participants were female (71.7%). However, we managed to recruit parents with diverse profiles, also in terms of work status, perceived financial situation, relationship status, and BMI categories (of both children and adults) that were very

close to representativeness in the French population (Argouarc'h & Picard, 2018; Verdot, Torres, Salanave, Deschamps, 2017). This enabled us to obtain a broad idea of the changes in eating and feeding habits in young children and their parents in France, and of the parental characteristics that were linked to these changes.

5. Conclusion and perspectives

This study provided unique insights into how a drastic change in habits is accompanied by changes in eating and feeding habits both on parent and child level. The unusual situation drove some parents to turn a blind eye to the usual feeding rules, and to privilege enjoyment and comfort at home. Changes in child boredom and parental stress were found to influence eating and feeding behaviors, and some parental characteristics were identified as possible barriers and facilitators for eating, feeding and cooking behaviors. These insights could be useful for future studies and interventions, and could be of interest to policy makers. Qualitative studies that reflect the experiences of parents and children during the lockdown could also be interesting to complement our results. They could provide us, for example, with more insights into reasons why eating behaviors, feeding practices and food shopping motivations have changed or not, and if the lockdown and the accompanying changes have had an impact on families' food habits on a longer term and why.

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Authors Contributions

KP, SI and SM-P conceptualized the study. KP and CC conducted all analyses. KP wrote a first version of the manuscript, thereafter all authors contributed to editing the manuscript and they all approved the final article.

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Appendix A. Cronbach's alphas for dimensions parental feeding practices (before and during lockdown) and final item loadings in confirmatory factor analyses (CFA) (before and during lockdown).

Dimension parental feeding practice with items	**Loading "before lockdown"**	**Loading "during lockdown"**
Soothing with food (α_{bef} = 0.81 (acceptable); α_{dur} = 0.77 (acceptable))		
Sooth1. Quand mon enfant s'ennuie ou s'inquiète, je lui propose de manger ou boire quelque chose même si je sais qu'il/elle n'a pas faim. *(I give my child something to eat or drink when she or he is bored or worried, even if I know she or he is not hungry.)*	**No CFAs needed because acceptable Cronbach's alphas**	
Sooth2. Quand mon enfant est énervé/excité je lui propose de manger quelque chose. *(When my child is annoyed or excited, I offer his something to eat;* replacing the original item: *Offering my child something to eat is one of the best ways to stop his or her temper tantrums.)*		
Sooth3. Je propose des aliments pour distraire mon enfant (par exemple, s'il/elle m'empêche de faire mon (télé)travail). *(How often do you use food as a way to distract your child (eg,if he or she is preventing you from doing your chores)?)*		
Sooth4. Pour que mon enfant se conduise bien, je lui promets quelque chose à manger. *(To get my child to behave himself or herself I promise him or her something to eat.)*		
Rules and limits around unhealthy foods[a] (α_{bef} = 0.64 (acceptable); α_{dur} = 0.63 (acceptable))		
Rules1. Je limite les collations sucrées ou salées (bonbons, glaces, gâteaux, biscuits, chips) de mon enfant. *(I place limits on the sweet or salty snacks (candy, ice cream, cake, potato chips, tortilla chips) that my child eats.)*	**No CFAs needed because acceptable Cronbach's alphas**	
Rules2. Je restreins (ou essaie de restreindre) l'accès de mon enfant aux sodas. *(How often do you restrict (or try to restrict) your child's access to sweetened beverages?)*		
Rules3. Si mon enfant demande des sodas, je lui en donne (R). *(If my child asks for sweetened beverages (~~including juice drinks or~~ soda), I will give it to him or her. (R))*		
Rules4. Je permets à mon enfant de se servir des collations salées ou sucrées ou des bonbons quand il/elle est à la maison. (R) *(How often do you allow your child to help himself or herself to snacks, including salty or sweet snacks, or candy when he or she is at home? (R))*		
Guided choices - *when* food is eaten (α_{bef} = 0.55 (borderline); α_{dur} = 0.57 (borderline))		
When1. J'autorise mon enfant à manger entre les repas quand il/elle le veut. *(I let my child eat between meals whenever she or he wants.)*	**0.48**	**0.46**
When2. Je laisse mon enfant décider quand il souhaite prendre son repas. *(I let my child decide when he or she would like to have his or her meal.)*	**0.99**	**0.99**
When3. Je décide les moments où mon enfant prend ses repas. (R) *(I decide the times when my child eats his or her meals. (R))*	**0.62**	**0.64**
Guided choices - *what* food is eaten (α_{bef} = 0.39 (low); α_{dur} = 0.41 (low))		
What1. J'autorise mon enfant à choisir ce qu'il/elle veut pour les collations entre les repas. *(I allow my child to choose what she or he has for snacks.)*	**0.33**	**0.38**
What2. Je décide de ce que mon enfant mange entre les repas. (R) *(I decide what my child eats between meals. (R))*	**0.79**	**0.74**
What3. En tant que parent, je décide des catégories d'aliments que mon enfant mange. (R) *(As a parent, I decide the kinds of food that my child eats. (R))*	**0.47**	**0.47**

Dimension parental feeding practice with items	Loading "before lockdown"	Loading "during lockdown"
Guided choices - *amount* of food eaten[b] (α_{bef} = 0.33 (low); α_{dur} = 0.31 (low)) (0.28 and 0.24 if amount3 not deleted)		
Amount1. Pendant les repas, je laisse mon enfant décider quand il/elle a assez mangé. *(During meals, I allow my child to decide when she or he has had enough to eat.)*	**0.29**	**0.32**
Amount2. Quand il/elle prend des collations entre les repas, je laisse mon enfant décider quand il/elle a assez mangé. *(At snack time, I allow my child to decide when she or he has had enough to eat.)*	**0.81**	**0.69**
Amount3. Lorsque mon enfant dit "je n'ai pas faim", je réponds "tu dois manger quand même" (R) *(When your child says "I'm not hungry," how often do you reply "You need to eat anyway"? (R))*	**removed**	**removed**
Meal setting (α_{bef} = 0.39 (low); α_{dur} = 0.36 (low))		
Sett1. A quelle fréquence votre enfant mange-t-il/elle dans sa chambre ? (R) *(How often does your child eat in a bedroom? (R))*	**0.81**	**0.78**
Sett2. Je limite le grignotage/le goûter à des endroits ou des lieux bien définis dans notre maison. *(Do you limit snacking to designated places in your home?)*	**0.73**	**0.72**
Sett3. J'insiste pour que mon enfant prenne ses repas à table. *(I insist my child eats meals at the table.)*	**0.48**	**0.44**
Atmosphere of meals (α_{bef} = 0.69 (acceptable); α_{dur} = 0.71 (acceptable))		
Atmos1. Le repas du soir est un moment convivial en famille. *(Dinner time is usually a pleasant time for the family.)*	**No CFAs needed because acceptable Cronbach's alphas**	
Atmos2. Le repas du soir est un moment tendu ou stressant pour notre famille. (R) *(How frequently is the evening meal an unpleasant or stressful time for your family? (R))*		
Atmos3. Le repas du soir est un moment de conflit pour notre famille. (R) *(Dinner time is a time of conflict for the family (R)* ;replacing the original items: *How often would you say arguments about eating occur during dinner time?; - How often do other arguments, not about eating, occur during dinner time?)*		
Feeding on a schedule (α_{bef} = 0.52 (borderline); α_{dur} = 0.56 (borderline))		
FS1. En semaine, je fais en sorte que mon enfant mange à des heures régulières. *(During the week, do you make him/her eat at set times?)*	**0.70[c]**	**0.82[c]**
FS2. Le week-end, je fais en sorte que mon enfant mange à des heures régulières. *(During the weekend, do you make him/her eat at set times?)*	**0.70[c]**	**0.82[c]**
FS3. Quand mon enfant a faim avant le repas, je le fais patienter *(When my child is hungry before a meal time, I make him/her wait.)*	**0.70[c]**	**0.82[c]**

Answer options ranged from "never" to "always" for all items in the French questionnaire.
Items in italics are the original English items, unless described otherwise. ; (R) = reversed item
Cronbach's alphas were acceptable if >0.60, borderline if between 0.50-0.60, and low if <0.50
All the items have a p-value ≤ 0.001 except the item $Amount2_{bef}$, the p-value of which is 0.021.

[a] For the dimension Rules and limits around unhealthy foods, the original item "How often do you restrict (or try to restrict) your child's access to fruit juice?" was deleted from the start because fruit juices are viewed as ambiguous in terms of healthiness in France.

[b] For the dimension Guided choices: amount of food eating, the original item "I know better than my child if she or he is hungry or full" (R) was deleted from the start.; The CFAs also indicated that it was better to delete item Amount3.

[c] For the dimension Feeding on a schedule, equal loadings were imposed in order to avoid a non-admissible solution (loadings higher than 1 or lower than -1, and negative variances).

Appendix B. Regression analyses

Appendix B.1. Simple linear regression models with the change in child level of boredom or the changes in child eating behaviors (when change occurred) as dependent variables and child age, sex and child BMI z-score as independent variables.

Change in behavior	Df	Estimate	Std. Error	*t*	*p*
Child boredom					
Age	274	0.02	0.02	0.75	0.45
Sex *[ref boys]*	274	-0.08	0.09	-0.84	0.40
z-BMI	269	-0.05	0.03	-1.90	0.06
Emotional overeating					
Age	150	-0.04	0.02	-1.73	0.09
Sex *[ref boys]*	150	-0.05	0.10	-0.55	0.58
z-BMI	147	-0.04	0.03	-1.42	0.16
Food responsiveness					
Age	224	-0.01	0.02	-0.50	0.62
Sex *[ref boys]*	224	-0.01	0.08	-0.13	0.90
z-BMI	220	-0.07	0.02	**-2.96**	**<0.001**
Food enjoyment					
Age	135	-0.04	0.03	-1.53	0.13
Sex *[ref boys]*	135	0.07	0.14	0.49	0.62
z-BMI	132	-0.04	0.04	-0.92	0.36
Appetite					
Age	164	-0.03	0.03	-0.97	0.33
Sex *[ref boys]*	164	0.13	0.12	1.07	0.29
z-BMI	160	0.00	0.03	-0.09	0.93
Food pickiness					
Age	96	-0.04	0.04	-1.12	0.26
Sex *[ref boys]*	96	0.18	0.17	1.01	0.31
z-BMI	94	-0.03	0.04	-0.64	0.52
Mid-afternoon snack frequency					
Age	116	0.01	0.06	0.18	0.85
Sex *[ref boys]*	116	-0.07	0.27	-0.25	0.80
z-BMI	114	0.04	0.09	0.42	0.67
Snack frequency in between meals					
Age	198	0.03	0.04	0.72	0.47
Sex *[ref boys]*	198	0.19	0.18	1.03	0.31
z-BMI	194	-0.09	0.06	-1.55	0.12

Appendix B.2. Simple linear regression models with the changes in parental feeding practices (when change occurred) as dependent variables and parental demographics as independent variables.

Change in practice	Df	Estimate	Std. Error	*t*	*p*
Soothing with food					
Level of education	89	-0.05	0.03	-1.69	0.10
No work[a] *[ref working outside]*	88	0.08	0.09	0.87	0.39
Working from home *[ref working outside]*	88	-0.07	0.10	-0.67	0.51
Parent sex *[ref men]*	89	-0.02	0.08	-0.22	0.82
Single parent *[ref couple]*	89	-0.15	0.15	-0.99	0.32
Parent BMI	89	0.01	0.01	1.40	0.17
Guided choices – when					
Level of education	128	-0.04	0.03	-1.08	0.28
No work[a] *[ref working outside]*	127	-0.16	0.12	-1.34	0.18
Working from home *[ref working outside]*	127	-0.14	0.13	-1.15	0.25
Parent sex *[ref men]*	128	0.22	0.09	**2.32**	**0.02**
Single parent *[ref couple]*	128	-0.19	0.13	-1.46	0.15
Parent BMI	128	0.14	0.01	0.75	0.45
Guided choices – what					
Level of education	107	-0.08	0.04	-1.88	0.06
No work[a] *[ref working outside]*	106	-0.15	0.15	-0.98	0.33
Working from home *[ref working outside]*	106	-0.18	0.15	-1.20	0.23
Parent sex *[ref men]*	107	-0.08	0.11	-0.69	0.49
Single parent *[ref couple]*	107	-0.23	0.16	-1.44	0.15
Parent BMI	107	0.01	0.01	1.00	0.32
Guided choices – amount					
Level of education	68	0.03	0.06	0.44	0.66
No work[a] *[ref working outside]*	67	0.01	0.20	0.06	0.95
Working from home *[ref working outside]*	67	-0.08	0.22	-0.38	0.70
Parent sex *[ref men]*	68	-0.17	0.16	-1.05	0.30
Single parent *[ref couple]*	68	-0.33	0.25	-1.34	0.18
Parent BMI	68	0.00	0.01	0.33	0.74
Meal atmosphere					
Level of education	115	0.10	0.05	1.79	0.08
No work[a] *[ref working outside]*	114	0.17	0.19	0.90	0.37
Working from home *[ref working outside]*	114	0.29	0.20	1.41	0.16
Parent sex *[ref men]*	115	0.15	0.15	1.00	0.32
Single parent *[ref couple]*	115	0.04	0.21	0.2	0.85
Parent BMI	115	-0.03	0.01	**-2.47**	**0.01**
Rules and limits around unhealthy foods					
Level of education	133	-0.08	0.03	**-2.45**	**0.02**
No work[a] *[ref working outside]*	132	0.00	0.11	-0.01	0.99
Working from home *[ref working outside]*	132	-0.07	0.12	-0.53	0.60
Parent sex *[ref men]*	133	0.07	0.09	0.81	0.42
Single parent *[ref couple]*	133	-0.02	0.14	-0.14	0.89
Parent BMI	133	0.00	0.01	0.22	0.83
Meal setting					
Level of education	65	0.02	0.04	0.42	0.67
No work[a] *[ref working outside]*	64	-0.02	0.16	-0.11	0.92
Working from home *[ref working outside]*	64	0.12	0.16	0.74	0.46
Parent sex *[ref men]*	65	-0.06	0.11	-0.56	0.58
Single parent *[ref couple]*	65	0.04	0.15	0.25	0.80
Parent BMI	65	-0.00	0.01	-0.71	0.48
Feeding on a schedule					
Level of education	154	0.11	0.04	**2.65**	**0.01**
No work[a] *[ref working outside]*	153	-0.04	0.13	-0.35	0.73
Working from home *[ref working outside]*	153	0.10	0.14	0.70	0.48

Parent sex *[ref men]*	154	-0.06	0.11	-0.53	0.60
Single parent *[ref couple]*	154	-0.18	0.15	-1.19	0.24
Parent BMI	154	-0.01	0.01	-1.51	0.13

[a] No work refers to those parents who were at home without work; e.g., those who are technically unemployed due to the lockdown, parents on parental leave, students, etc.

Article 5

Contrasts and ambivalences in French parents' experiences regarding changes in eating and cooking behaviours during the COVID-19 lockdown.

Philippe, K., Issanchou, S., & Monnery-Patris, S.

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Introduction:

The COVID-19 pandemic forced the French government to impose a strict lockdown on its inhabitants, affecting families' habits in many domains, including the food domain.

Objectives:

The main objective of this study was to explore which food-related changes parents perceived as positive during the lockdown (1), which changes they perceived as negative (2), and which changes they would like to maintain after the lockdown (3).

The secondary objective was to compare the personal experiences of parents regarding food-related changes during the lockdown based on their sex (mothers vs. fathers), their work status during the lockdown (working outside the house vs. working from home vs. at home, not working), and their perceived financial situation (comfortable vs. difficult).

Focus:

Mothers' and *fathers*' experiences regarding food-related changes in their *family* (and factors that contributed to these changes).

System(s) Bronfenbrenner:

Microsystem (parents); Exosystem (parents' work situation); Chronosystem (COVID-19 pandemic)

Contrasts and ambivalences in French parents' experiences regarding changes in eating and cooking behaviours during the COVID-19 lockdown.

Abstract: Using open-ended questions, this study explored parents' experiences regarding changes in their family's food-related behaviours during the first COVID-19 lockdown in France (March-May 2020). Parents (N=498, 72% mothers) of children aged 3-12 years described which food-related changes they (1) perceived as positive during the lockdown, (2) perceived as negative, and (3) would like to maintain after the lockdown. A thematic analysis revealed that parents appreciated the choice of more local, fresh foods, the time to prepare food (home-made dishes, new recipes) and cooking and eating together with the family. In contrast, some parents highlighted a burden imposed by the increased food preparation at home. They also described a higher intake of unhealthy, palatable food (or the temptation to do so), and weight concerns. Parents would like to maintain their choice of local, fresh foods, and to continue spending more time together around food but doubt the feasibility after the lockdown. The results revealed many inter- and intra-individual contrasts in parents' answers. An ambivalent attitude toward food pleasure was demonstrated: the sensory/commensal pleasure of eating versus the concerns about an increased intake of pleasurable food. Additionally, gender differences were observed: mothers perceived the preparation of additional meals, for example, more often as a burden than fathers. This study revealed intimate perceptions of the impact of the lockdown on eating habits in families. They give insight into possible facilitators and barriers (e.g., time) for the adoption of recommended eating and cooking behaviours in families, beyond the pandemic.

Keywords: COVID-19, qualitative research, families, eating behaviors, gender differences, emotions

1. Introduction

In 2020, the highly contagious coronavirus SARS-CoV-2, also known as COVID-19, has induced a pandemic. Many countries took measures to avoid the spread of this virus among their inhabitants and to avoid a collapse of hospitals. In France, a first lockdown was imposed from March until May 2020, with a profound impact on people's habits. Schools, non-food stores and leisure centres were closed, working from home was enforced except for those with essential jobs (e.g., in hospitals, food shops), and leaving your home was only allowed for a limited number of predetermined reasons (e.g., grocery shopping, medical visits, etc.).

Since both adults and children were enforced to take most of their meals at home during the lockdown, this study wanted to explore how this impacted families' eating, feeding, cooking and food shopping behaviours. The study setup was twofold: there was a quantitative part aiming to map the changes in families' food-related habits (see Philippe, Chabanet, Issanchou, Monnery-Patris, 2021), and a qualitative part aiming to explore how parents experienced these changes. The current article focusses on this second, qualitative part of the study.

Eating behaviours consist mainly of habits, *i.e.,* automatic associations between specific context cues and responses, which are hard to change (Wood & Runger, 2016). Changes in the environment, such as induced by the COVID-19 pandemic, could cause changes in people's habits as they have to engage in a new non-automatic process of decision making (Verplanken & Wood, 2006). Qualitative data could provide insight into the drivers and barriers for certain changes and into the perceived impact of these changes on families, even beyond the scope of COVID-19. They could help us to gain insight into the factors that could be useful to consider when promoting healthy eating and feeding

behaviours in families. A recent systematic review (Wolstenholme, Kelly, Hennessy, Heary, 2020) highlighted the added-value of a qualitative approach for targeting families' experiences, perceptions and emotions regarding children's eating behaviours.

Moreover, it is well described in the literature how emotional factors and the family mealtime atmosphere can impact parents' and children's eating behaviours. For example, experiencing stress or negative emotions can make people overeat and reach for "comfort foods", rich in sugar and calories (Evers, Dingemans, Junghans, & Boevé, 2018; Michels et al., 2012; Rodríguez-Martín & Meule, 2015). Hughes and Shewchuk (2012) have observed a negative relationship between positive parent emotions and problems in feeding children fruit and vegetables. Berge et al. (2014) have shown that positive food-related family dynamics at family meals were associated with a reduced risk of childhood overweight. It is therefore interesting to study how parents experienced the COVID-19 lockdown in France and how this was related to changes in their families' eating behaviours.

Therefore, the present qualitative study aimed to explore which food-related changes parents perceived as positive during the lockdown (1), which changes they perceived as negative (2), and which changes they would like to maintain after the lockdown (3), by using open-ended questions. To our knowledge, no data have been published yet on parents' personal experiences and emotions related to changes in their families' eating and feeding habits during the lockdown. They could make a valuable contribution to the COVID-19 literature on changes in the food domain that is currently dominated by quantitative studies.

In addition, at the start of the pandemic, some studies (e.g. Alon, Doepke, Olmstead-Rumsey, Tertilt, 2020 (USA); Andrew et al., 2020 (England); Carlson, Petts, & Pepin, 2020 (USA)) and media coverage (e.g., Ascher, 2020 (England)) discussing the impact of the COVID-19 measures, drew the attention to gender inequalities and divisions within families. They pointed out that women took up more childcare and household work than men during the pandemic, and showed a profound impact on women's work-life balance. The COVID-19 pandemic also had a major impact on the work life of many adults and possibly also their financial situation (ILO, 2021). Therefore, the secondary goal of the present study was to compare the experiences of parents regarding food-related changes during the lockdown based on their sex (mothers vs. fathers), their work status during the lockdown (working outside the house vs. working from home vs. at home, not working), and their perceived financial situation (comfortable vs. difficult).

2. Method

2.1 Study design

As mentioned previously, this study is part of a mixed-method research project, including a quantitative and qualitative part. An online survey with closed-ended questions (quantitative part) and open-ended questions (qualitative part) was used to obtain data. The quantitative part of the survey aimed to describe possible changes in French families' eating behaviours and feeding practices during the COVID-19 lockdown compared to the period before the lockdown. The results of this part are described in a different publication (Philippe et al., 2021).

The qualitative part of the survey aimed to explore parents' experiences regarding changes in their family's eating and feeding behaviours and is the object of the current publication. Three open-ended questions were used to obtain data for this qualitative part. For the first question, parents were asked to describe changes related to their own or their child's/ family's eating that they perceived as positive

during the period of the lockdown, compared to the period before the lockdown. For the second question, they were asked to describe changes they perceived as negative. For the third question, they were asked to describe which changes they would like to maintain after the lockdown.

2.2 Recruitment and ethics

Parents were recruited online via an agency disposing of a large panel of French respondents. They were eligible to participate if they had at least one child aged 3-12 years living with them during the lockdown. This age range was chosen because these children are still highly dependent on their caregivers for food intake. The online survey was anonymous and parents were asked to tick a box indicating that they understood and accepted the study information and data protection policy. Participation was possible from the 30th of April until the 10th of May 2020 (the end of the first strict lockdown in France) and a compensation, a voucher of six euros, was offered after survey completion. An ethical approval (n°20-686) was obtained for this study from the Institutional Review Board (IRB00003888, IORG0003254, FWA00005831) of the French Institute of Medical Research and Health, and a study registration was done by the data protection service involved (CNRS).

2.3 Data analysis

The responses of the parents were analysed inductively with the use of the qualitative data analysis software NVivo in the original language of the survey (French). A thematic analysis was conducted following the steps proposed by Braun and Clarke (2006): (1) familiarization with the data, (2) initial coding generation with a data-led approach, (3) searching for themes based on initial coding, (4) theme definition and labelling. Steps 1-3 were performed manually and independently by two authors on the first 250 answers (50%) of each of the three questions. After comparison and obtaining consensus on the generated themes and initial coding, the first author coded all answers in NVivo, and the coding was checked by the other authors. A separate analysis was performed for each question. All three authors were involved in step 4.

As the sample size was quite large, some steps proposed by Feng and Behar-Horenstein (2019) were followed in parallel to those of Braun and Clarke (2006) in order optimize the analyses by using different NVivo utilities. A word frequency analysis was performed for each of the three open-ended questions, using a frequency query with words with stemmed variants (e.g., “cuisine”, “cuisiner”, “cuisinons”, “cuisiné”), in order to identify patterns more easily (Jackson & Trochim, 2002) and to limit bias regarding overweighing (Onwuegbuzie, & Leech, 2007). However, as this approach also has the reputation to decontextualize words, this analysis was only performed as a check for the search of themes. After text coding all responses, matrix coding was performed for each question to allow comparison between different groups of parents. Three comparisons were performed; one based on parents’ sex (mothers (n=357) vs. fathers (n=141)), one based on parents’ work status (working outside the house (n=103) vs. working from home (n=175) vs. at home, not working (n=175)), and one based on parents’ perceived financial situation (comfortable (n=239) vs. difficult (n=254)). For this last comparison, the group of parents with a more comfortable situation included those parents who indicated “It’s OK” or “At ease” when asked about their financial situation. The group with a difficult situation included those parents who indicated “Should be careful”, “You get by but only just” or “You can’t make ends meet without going into debt”. Parents who indicated “I do not want to answer” (n=5) were not included in the comparison. For the comparison based on work status, we also did not include parents who indicated that they had another work status (n=45), since this group was so diverse. The matrixes show the number of coded responses and verbatims for each theme and subtheme for each

group separately. Chi-squared tests were performed to identify significant differences. The verbatims presented in this article were translated from French to English by an English linguist who lives in France and knows the French food culture. The original French verbatims with their translation are presented in Appendix 1.

3. Results

A total of 498 parents (72% mothers) with at least one child aged 3-12 years answered the open-ended questions. All departments in France were represented except Corsica and the oversea territories, with most parents living in Île-de France (18.7%), Auvergne-Rhône-Alpes (13.7%), Grand Est (10.6%) and Hauts-de-France (10.4%). Details about all other parental characteristics are presented in Table 1.

For each of the three open-ended questions, several themes and subthemes emerged from the thematic analysis. Overall, themes and subthemes were similar for the three different open-ended questions, meaning that parents described both positive and negative experiences regarding these themes. Table 2 presents the different themes and subthemes for each of the questions and the number and percentage of parents who described content that was coded into these (sub)themes.

Table 1.
Parents' characteristics.

Characteristic	Parents (N = 498)
Sex (female/male) [%]	71.7 / 28.3
Age [%]	
25-34 years	30.5
35-49 years	67.9
50-64 years	1.6
BMI [%]	
Underweight (< 18.5 kg/m^2)	3.4
Normal weight (18.5-25 kg/m^2)	51.6
Overweight (25-30 kg/m^2)	29.7
Obesity (≥ 30 kg/m^2)	15.3
Relationship status (couple/ single parent) [%]	89.2 / 10.8
Number of children in household, mean (SD)	2.1 (0.9)
Level of education [%]	
Low (secondary studies degree or lower)	33.5
Middle (higher technology degree or first cycle of higher education)	26.7
High (university degree)	39.8
Type of housing [%]	
Apartment without a balcony or a terrace	6.8
Apartment with a balcony or terrace	20.7
House without a garden	1.0
House with a garden	71.5
Work status before the lockdown [%]	
Working (part-time or full-time)	85.1
Unemployed, job seeker	4.8
Other (e.g., student, parental leave, parent at home)	11.0
Work status during the lockdown [%]	
Working outside the house (part-time or full-time)	20.7
Working from home (part-time or full-time)	35.1
At home, not working	35.1
Other (e.g., student)	9.0
Perception of financial situation [%]	
You can't make ends meet without going into debt	3.2
You get by but only just	12.9
Should be careful	34.9
It's OK	36.3
At ease	11.6
I do not want to answer	1.0

Note. Table retrieved from Philippe et al., 2021.

Table 2. Number and percentage of parents (total N = 498) describing content belonging to themes and subthemes for each of the three open-ended questions.

Theme and subtheme	Positive experiences		Negative experiences		Aspects to maintain	
	N	%	N	%	N	%
Nothing/ No change	**53**	**10.6**	**129**	**25.9**	**98**	**19.7**
Time	**110**	**22.1**	11	2.2	**45**	**9.0**
Food choice						
Sustainable foods	**58**	**11.6**	4	0.8	**75**	**15.1**
Healthy/ fresh foods	**106**	**21.3**	17	3.4	**97**	**19.5**
Unhealthy/ palatable foods	**23**	**4.6**	**111**	**22.3**	11	2.2
Quality foods and meals	18	3.6	1	0.2	11	2.2
Meat and fish	5	1.0	3	0.6	5	1.0
Alcohol	0	0.0	7	1.4	0	0.0
Bread	14	2.8	4	0.8	5	1.0
Nutrition, diversity, balance	**33**	**6.6**	19	3.8	**24**	**4.8**
Foods easy to store for longer	0	0.0	2	0.4	2	0.4
Food preparation						
Sociability (cook together)	**116**	**23.3**	1	0.2	**73**	**14.7**
Home-made dishes	**103**	**20.7**	18	3.6	**87**	**17.5**
Elaborated dishes	16	3.2	3	0.6	5	1.0
Recipes	**55**	**11.0**	**31**	**6.2**	**30**	**6.0**
Quickly prepared dishes	0	0.0	5	1.0	0	0.0
Unspecified [a]	**46**	**9.2**	0	0.0	**46**	**9.2**
Commensality (eat together, sharing)	**52**	**10.4**	3	0.6	**38**	**7.6**
Emotions/ meal atmosphere	**28**	**5.6**	**30**	**6.0**	0	0.0
Education, transmission	**22**	**4.4**	0	0.0	4	0.8
Control intake child	4	0.8	0	0.0	0	0.0
Food acceptation/ rejection child	13	2.6	1	0.2	5	1.0
Frequency/ quantity						
Frequency meals	6	1.2	**64**	**12.9**	6	1.2
Quantity consumed	8	1.6	**41**	**8.2**	5	1.0
Desire, temptation to eat/ appetite	1	0.2	**48**	**9.6**	13	2.6
Food pleasure	**32**	**6.4**	7	1.4	11	2.2
Health	17	3.4	4	0.8	16	3.2
Weight, calories, lack of sport	5	1.0	**36**	**7.2**	0	0.0
Meal planning	10	2.0	0	0.0	10	2.0
Meal timing	1	0.2	16	3.2	7	1.4
Meal location	0	0.0	1	0.2	3	0.6
Food shopping	13	2.6	**37**	**7.4**	10	2.0
Finances, prices	3	0.6	**35**	**7.0**	4	0.8
Food waste	4	0.8	0	0.0	5	1.0
Decorations	1	0.2	0	0.0	1	0.2
Cleaning/ Tidying	2	0.4	2	0.4	0	0.0
Easter	0	0.0	5	1.0	0	0.0

[a]Aspects of food preparation which were unspecified (e.g., "I cook more").

Note: all the (sub)themes evoked by more than 20 parents (4% of our sample) are in bold.

3.1 Positive food-related experiences during the lockdown

Fifty-three parents reported either no change in their family's eating behaviours or no positive changes. The other parents (almost 90%) described a multitude of changes they perceived as positive during the lockdown. The most frequently mentioned themes were related to time, food choice, food

preparation, sociability and commensality, food pleasure, emotions/ meal atmosphere, and education/ transmission.

Food choice and food preparation

Parents expressed their appreciation for their choices of more fresh, seasonal, and local foods. This was often related to an increased choice of fruits and vegetables. Some parents also mentioned that the lockdown gave them the opportunity to pay more attention to the nutritional value of foods and meals, and stimulated them to provide a diversity of foods and balanced meals.

> *"Much more fresh seasonal fruit and vegetables."*

> *"I have more time on my hands to prepare more balanced dishes."*

Different aspects related to food preparation were perceived as positive during the lockdown. Parents described increases in home-made dishes and meals (e.g., desserts, mid-afternoon snacks "goûters", main meals) and in the preparation of elaborated dishes that are time-consuming. Some parents also expressed the joy of trying new recipes, stimulating variety in their meals or trying out new flavours. The sources of these new recipes were not always revealed, but if revealed, television programs were a popular source of inspiration.

> *"I cook a few more new recipes to vary everyone's enjoyment."*

> *"We prepare more elaborate recipes thanks to a TV program on M6* (a tv-channel in France)*."*

Sociability and commensality

Cooking and eating together with the family was appreciated to a high extent. Not only were there more occasions to do so, but if it took place, there was also more time to eat at a calm pace. This also had consequences for the meal atmosphere at home and on children's eating behaviours. Some parents described that children had more interest in and accepted certain foods more easily when they had helped to prepare them.

> *"We eat all our meals together and have more time to prepare and enjoy them."*

> *"The meal is eaten in a calm atmosphere, less tense. The children eat more easily healthier foods than they used to."*

Cooking with the child was not only a pleasurable activity: for some parents, it was also the occasion to educate their children about food, to pass on certain cooking skills and values around food, and to make them taste new flavours.

> *"Through preparing food as a family, I teach my child how to cook, how to bake. I explain to him that vegetables are good for his health that he will be big and strong by eating them."*

> *"I take time to try out new recipes. My two children participate more willingly to help me, they are proud of doing so, eat more easily when they have participated. If the recipe doesn't work out, they are also more motivated to try again. We all take time together; it allows me to try and pass on a bit of know-how and share family anecdotes during the conversation."*

Food pleasure

The joy of preparing and eating pleasurable food was very present in parents' answers. Parents tried their best to prepare food the family loves, enjoyed the process of planning and preparing these meals, and to taste them together.

> *"Food has become more pleasurable, so it's positive."*
>
> *"I take more time to cook and please my family, I buy more locally and choose things that we fancy."*
>
> *"I prepare a lot more home-made food and I try to vary the recipes and to please my family. I cook a lot more pastries with my son, who loves doing that. And my husband is really happy."*

Time

The notion of time was present in a majority of parents' answers. Time was cited as a factor that gave families the opportunity to plan meals and moments together, to prepare meals that are normally time-consuming, and to spend time together around food.

> *"Time has stopped a little and we live at a slower pace, we want to treat ourselves and pay more attention to our food than before. We prepare a lot more home-made food. We find more time to cook, even if we continue to work at the office, because we go out less."*
>
> *"Having fewer time constraints (no school, no telecommuting) we have time to cook as a family and choose exactly what we want to eat, so automatically it is healthier and more varied."*

3.2 Negative food-related experiences during the lockdown

Even though a high number of parents (n=129) reported either no change during the lockdown or no negative change, the majority of parents (74%) described a diversity of aspects they perceived as unpleasant or negative.

Choice of palatable foods

In contrast to the choice of more fresh, local products (e.g., fruits and vegetables), which parents perceived as positive, parents also described an increased choice of palatable, energy-dense foods and foods high in sugar. Some of these foods and dishes were bought (e.g., candy, chocolate, ice cream), others were prepared at home (e.g., home-made cakes).

> *"Home-made food is maybe much more fatty or calorific."*
>
> *"More frequent treat yourself buys (ice cream, cakes...)."*
>
> *"Tendency to make a lot of cakes and therefore snack more generously."*

Quantity of (unhealthy) foods

In addition to an increased choice for palatable foods, many parents described an increased consumption or even an « overconsumption » of these foods during the lockdown. Both an increase in frequency of eating was described as increased portion sizes.

> *"We certainly snack more between meals."*
>
> *"All the same, we do eat more than before."*

Some parents did not describe an actual increase of intake, but described a struggle with the temptation to eat and with sensations of hunger. From their answers, it is unclear whether they have also given in to the described temptations or not.

"We are more tempted to snack."

Sometimes, parents mentioned reasons (or excuses) for their changed eating behaviours. Emotions, such as stress, anxiety, and tiredness were frequently mentioned: there was a need for food to cope with the emotional challenges that arose during the lockdown. Some parents also explained that simply taking more time to eat stimulated eating bigger quantities, or that more time at home and boredom induced more snacking or stimulated the preparation of more energy-dense, sugary food.

"Personally, stress made me snack more (feeling hungry) and so I put on weight."

"More junk food to compensate for stress."

"More calorific meals, more need to prepare things that make you feel good."

"We eat more fatty, comforting food to make the lockdown seem less harsh for the children."

"My daughter is bored so she wants to snack between meals from time to time."

"More time at the table at lunchtime, bigger meals so a little weight gain...."

"Being at home all day so we tend to snack more and eat sweets, biscuits..."

"Well, who says more time says more baking, so more sweet things."

Even though most parents described an increased intake or appetite, some parents also described a lack of appetite and weight loss which they attributed to the stress and emotions accompanying the lockdown.

"Me on the other hand, I don't eat much and normally I am really epicurean. I lost 7 kilos in 2 months, I am in good health but stress always causes me to lose my appetite, in fact I am afraid for my loved ones, I am also angry that I am going through this and that my 4 year old son is going through it too, I am a bit depressed and as a result I don't eat enough, I am a rather nervous person so my stomach has knotted up and I eat little or very little."

Weight concerns

The increased intake of foods and a lack of activity during the lockdown were associated with weight gains in certain families, or with concerns about possible weight gains. Some parents reported this weight gain or related concerns explicitly:

"Feel hungrier, significant weight gain because of stress."

"I bake a lot more, which makes everyone happy, but everyone is putting on weight."

Others referred to it in a more indirect way; for example, by describing a lack of physical activity during the lockdown and by comparing calorie intake during versus before the lockdown. Some parents also described a combination of these factors.

"We tend to eat as much as we did before the lockdown, which is a problem because we have less physical activity."

"Meals have more calories than before and we don't exercise."

As cited previously, there were also some parents who lost appetite during the lockdown and reported weight loss.

Practical inconveniences

Beside negative emotions linked to increased intake and possible weight gains, parents also described a number of practical inconveniences. Taking more meals at home meant preparing more meals and this was perceived as a burden by some parents. Especially the time invested in meal preparation and the lack of inspiration to vary meals everyday was challenging and provoked negative emotions and stress.

> *"We have to cook every day and at every meal without exception. You need to find ideas to vary your meals and adapt the amount of shopping you do because you have to buy more than usual. Shopping is also more expensive. More meals to prepare, which means we have to make the same dishes over and over again because we run out of ideas."*

According to parents, the lockdown was also accompanied by a changed offer in food stores and higher costs. They also had to put more effort in planning their food shopping as it was recommended to limit trips outside the house. Different reasons were provided for an increase in food costs: some families described increased costs due to increased food purchases during the lockdown, others described that a changed offer in food stores forced them to buy more expensive food brands. Some families also decided or were forced to do their food purchases in different food stores with different prices (e.g., stores closer to home).

> *"It is more difficult to find certain products."*

> *"More shopping to do and with an increased food budget. More difficult to do the shopping because I know I'm not going to go back straight away... so you mustn't forget anything."*

> *"No possibility to go to my usual producers so as to reduce travel."*

3.3 Aspects to maintain after the lockdown

Ninety-eight parents reported no changes or no wish to maintain changes that occurred during the lockdown. In parallel to the positive experiences, the remaining parents (80%) reported the wish to maintain their choice of more fresh, seasonal, and local foods, to maintain the preparation of home-made, elaborated meals and to take more time to cook and eat together with the family.

> *"I want to continue using seasonal fruit and vegetables. The pleasure of eating them and getting my family to eat more thanks to all the on-line recipes you can find."*

> *"Continue to support local producers and allow time to go to the market with my children so that they can discover even more things and be even more eager about food."*

Parents expressed a wish to maintain certain changes after the lockdown, but some also questioned the feasibility. They were not sure if they would be able to do so when they return to their habits from before the lockdown, often due to an anticipated lack of time. This was not always indicated literally by parents, but could often be deduced from the use of the conditional tense of the verbs. Some parents already suggested some solutions to overcome these challenges; they, for example, want to try to invest

more effort in meal planning and to prepare bigger quantities of home-made dishes and freeze them for later.

> *"We would like to maintain the quality of our meals however to prepare this takes up time..."*
>
> *"Prepare all the meals as a family but with work commitments it's a bit complicated."*
>
> *"Eat more vegetables, shop less regularly but in larger quantities and organized for the week."*

3.4 The ambivalent relation with food pleasure

The answers also revealed an ambivalent relation with food pleasure among some parents. When answering the question about positive food-related experiences during the lockdown, many parents mentioned different aspects of food pleasure. Some parents referred to pleasure related to the types of food: e.g., the joy of eating "pleasurable food" or preparing foods that bring joy to the family, while other parents referred to the social aspects of food pleasure: the joy of preparing foods together, eating together, sharing moments around food.

In contrast, when answering the question about negative experiences and referring to food pleasure, the focus was predominantly on the types of food consumed: "pleasurable foods" and often preceded by an indication of quantity: e.g., "more", "much more", "too many" pleasurable food.

In some parents, the ambivalent relation with food pleasure was visible within a single verbatim, and was usually expressed as an answer to the question concerning negative experiences (-). Here, parents directly contrasted positive and negative sides of increased food pleasure during the lockdown.

> (-): *"I'm baking a lot more, which makes everyone happy, but everyone is putting on weight."*
>
> (-): *"We indulge ourselves more, so we have a dessert after every lunch in addition to the fruit! Often, it's an ice-cream that we eat outdoors in the sun, so of course it's more sugar, but at the same time it's good for morale!"*
>
> (-): *"At the weekend we treat ourselves and have an aperitif at lunchtime, so soda and crisps twice a week."*

For other parents, the ambivalent relation was only uncovered when looking at the answers to the different questions on an intra-individual level. These parents reported positive and negative sides of food pleasure as a response to different questions ((+): positive experiences, (-): negative experiences, (M): changes to maintain).

> (+): *"More convivial meals, pleasure of cooking with the children and all of this will create great memories."* (-): *"Weight gain, too much comfort food."*
>
> (+): *"More time, more pleasure, more diversity, new recipes (especially from Cyril Lignac's tv programme* (a French tv-cook)*)."* (-): *"We are getting fatter."*
>
> (+): *"I take more time to cook and please my family, I buy more locally and things that tempt us."* (-): *"We eat more however than before."*

(+): *"I have cooked more home-made mid-afternoon snacks, before I only bought them."*
(-): *"We have eaten a lot fattier, a lot more pleasure foods, us adults have taken to mid-afternoon snacking too."* (M): *"Making more home-made mid-afternoon snacks."*

In this last verbatim, the mother appreciated preparing home-made mid-afternoon snacks ("goûter") and she would like to continue doing so, but she also thought it was a negative habit to take a mid-afternoon snack as an adult. This shows that she was well aware of French health recommendations that discourage snacking in adults, but not the mid-afternoon snack in children. She knew that her snacking behaviour during the lockdown (which she seems to appreciate) was not perfectly in line with the recommendations.

There are also answers in which parents classify the consumption of certain types of food as "negative", in line with social norms and health recommendations, but at the same time present excuses or reasons to exonerate their behaviour. They state for example that the increased intake was "reasonable" or that overall, they have "a varied diet". Easter was also a popular argument, as this is a period in France when it is socially acceptable to eat chocolate and sweets. Some parents even seemed to present eating chocolate during Easter as a cultural necessity.

"No negative change in our eating habits, or maybe the desire to eat a little bit more than before the lockdown but still reasonably."

"Due to eating home-made cakes, I don't know the sugar and fat content, but my daughter has a varied diet..."

"A few more sweets but it was Easter-time."

"We probably eat a bit richer, especially in terms of pastries. And maybe some more sweet snacks. But hey, you have to eat the Easter chocolates."

3.5 Differences between groups of parents

3.5.1 Fathers versus mothers

The results of the matrix coding, allowing comparison between fathers' and mothers' responses, revealed differences for each of the three questions (Table 3).

Regarding positive experiences, proportionally more mothers reported appreciating aspects related to food preparation during the lockdown: they enjoyed having more time to prepare home-made meals and to try out new recipes.

Regarding negative experiences, proportionally more fathers reported either no changes during the lockdown or no changes that were perceived as negative. Compared to fathers, mothers mentioned more often that they perceived aspects related to food preparation negatively during the lockdown: for them, it was more often a burden to prepare an increased number of home-made meals and to come up with new recipes and vary the meals, especially for those mothers who were still working during the lockdown.

"Working in a hospital, a bit too worn out to cook."

"I spend a lot of time in the kitchen!!"

Furthermore, it were also dominantly mothers who struggled with an increased desire to eat, the temptation to eat, and with sensations of hunger during the lockdown or who reported this temptation for their child or the family in general.

"Having the urge to eat all the time."

"He tends to snack a bit more because he's at home."

Regarding changes to maintain after the lockdown, proportionally more fathers than mothers reported that they would like to maintain the increased choice of sustainable foods (local, seasonal) and of qualitative foods and meals. Compared to fathers, more mothers reported that they would like to maintain the positive social aspects (eating together, cooking together) and having more time for cooking and for trying new recipes.

3.5.2 Parents with a different work status

Regarding positive experiences, proportionally fewer parents who were at home without work reported appreciating an increased choice of sustainable foods compared to parents who worked outside the house and parents who worked from home (6%, 13% and 16%, respectively, $p < 0.05$; see Appendix 2 - Table A). Fewer of these parents who were at home without work also described appreciating the consumption of unhealthy/ palatable foods compared to parents who worked from home (2% and 7%, respectively, $p < 0.1$). Proportionally more parents who worked at home reported appreciating baking own bread than parents who worked outside the house and parents who were at home without work (6%, 1% and 1%, respectively, $p < 0.05$).

Regarding negative experiences, proportionally more parents working outside the house reported either no changes during the lockdown or no changes that were perceived as negative compared to those parents at home with or without work (35%, 26% and 22%, respectively, $p < 0.1$).

Regarding changes to maintain after the lockdown, proportionally more parents who were at home without work reported that they would like to continue eating together with the family compared to parents who were working outside the house and working from home (12%, 6% and 5%, respectively, $p < 0.05$).

3.5.3 Parents with a comfortable versus difficult perceived financial situation

Regarding positive experiences, proportionally fewer parents with a difficult perceived financial situation discussed increased healthiness during the lockdown compared to parents with a comfortable financial situation (2% and 5%, respectively, $p < 0.1$; see Appendix 2 - Table B).

Regarding negative experiences, proportionally more parents with a comfortable financial situation reported either no changes during the lockdown or no changes that were perceived as negative compared to parents with a difficult situation (30% and 22%, respectively, $p < 0.05$). Furthermore, proportionally more parents with a difficult situation described negative experiences with regard to nutrition/diversity/balance (1% and 6%, respectively, $p < 0.05$), the quantity of foods consumed (11% and 6%, respectively, $p < 0.1$), the preparation of meals (5% and 2%, respectively, $p < 0.1$), and finances/prices (9% and 5%, respectively, $p < 0.1$).

Regarding changes to maintain after the lockdown, proportionally more parents with a comfortable financial situation reported that they would like to maintain the positive meal atmosphere (4% and 1%, respectively, $p < 0.05$).

Table 3. Percentages of mothers (M) and percentages of fathers (F) describing content belonging to themes and subthemes for each of the three open-ended questions. Percentages of mothers are calculated in proportion to total number of mothers (N=357), and percentages of fathers are calculated in proportion to total number of fathers (N=141).

Theme and subtheme	Positive experiences			Negative experiences			Aspects to maintain		
	M (%)		F (%)	M (%)		F (%)	M (%)		F (%)
Nothing/ No change	10.80		10.50	**21.65**	***	**37.06**	19.94		19.58
Time	22.22		22.38	2.85		0.70	9.40		8.39
Food choice									
Sustainable foods	11.39		12.59	0.57		1.40	**13.39**	*	**19.58**
Healthy/ fresh foods	21.37		21.68	3.42		3.50	18.23		23.08
Unhealthy/ palatable foods	4.84		4.20	23.36		20.28	2.28		2.10
Quality foods and meals	2.84		5.59	0		0.70	**1.42**	*	**4.20**
Meat and fish	0.57		2.10	0.28		1.40	0.57		2.10
Alcohol	0		0	0.57		2.10	0		0
Bread	3.10		2.10	0.85		0.70	0.85		1.40
Nutrition, diversity, balance	6.26		7.69	3.70		4.20	4.56		5.60
Foods easy to store for longer	0		0	0.28		0.70	0.28		0.70
Food preparation									
Sociability (cook together)	24.50		21.00	0.28		0	**16.52**	*	**10.49**
Homemade dishes	**23.08**	*	**15.38**	**4.48**	**	**0.70**	17.95		16.78
Elaborated dishes	3.11		3.50	0.85		0	0.85		1.40
Recipes	**13.68**	**	**5.59**	**7.69**	**	**2.80**	7.12		3.50
Quickly prepared dishes	0		0	1.42		0	0		0
Unspecified [a]	9.11		9.79	**4.56**	*	**1.40**	**11.40**	*	**4.20**
Commensality (eat together, sharing)	11.11		9.09	0.28		0	**9.40**	**	**3.50**
Emotions/ meal atmosphere	5.70		5.59	6.55		4.20	2.56		2.80
Education, transmission	5.13		2.80	0		0	0.85		0.70
Control intake child	0.85		0.70	0		0	0		0
Food acceptation/ rejection child	3.10		1.40	0		0.70	1.14		0.70
Frequency/ quantity									
Frequency meals	0.85		2.10	13.11		12.59	1.14		1.40
Quantity consumed	1.13		2.80	8.83		7.70	0.85		1.40
Desire, temptation to eat/ appetite	0		0	**12.82**	***	**2.10**	0		0
Food pleasure	5.98		7.69	1.14		2.10	2.28		2.10
Health	3.42		3.50	0.85		0.70	3.13		3.50
Weight, calories, lack of sport	1.13		0.70	6.84		8.39	0		0
Meal planning	1.99		2.10	0		0	0		0
Meal timing	0.28		0	3.99		1.40	1.14		2.10
Meal location	0		0	0		0.70	0.85		0
Food shopping	2.28		3.50	7.98		6.30	1.99		2.10
Finances, prices	0.28		1.40	7.41		6.30	0.28		2.10
Food waste	1.13		0	0		0	0.85		1.40
Decorations	0.28		0	0		0	0.28		0
Cleaning/ Tidying	0.28		0.70	0.28		0.70	0		0
Easter	0		0	1.14		0.70	0		0

[a]Aspects of food preparation which were unspecified (e.g., "I cook more").

Note. Percentages that present gender differences are in bold; significance levels of Chi-squared tests: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$

4. Discussion

The results of this qualitative study provided intimate insight into parents' positive and negative experiences regarding changes in their family's eating and feeding habits during the first COVID-19 lockdown in France. Parents also expressed which changes they would like to maintain after the lockdown.

Generally, the thematic analyses revealed changes in eating and feeding habits that are in agreement to those reported in recent quantitative studies and surveys in France and in Europe: for example, an increase in the preparation of home-made food and comfort food, more time spent cooking with children, and an increased choice of sustainable foods (local, seasonal) (e.g., Di Renzo et al., 2020; EIT Food, 2020; L'Observatoire E. Leclerc des nouvelles consommations, 2020; Marty, de Lauzon, Labesse & Nicklaus, 2021; Santé Publique France, 2020). In agreement with other reports (e.g., EIT Food, 2020; Loopstra, 2020; Santé Publique France, 2020; Zerbini et al., 2020), some parents in the current study also reported difficulties to purchase certain foods in food stores and higher prices.

In addition, the qualitative analyses did not only reveal which food-related changes occurred in families during the lockdown, but also which changes parents perceived as positive or negative and what they would like to maintain. Overall, the results showed that the positive experiences were multifactorial: parent expressed their appreciation for different food choices, increased time for food preparation and social food-related activities (cooking and eating together, sharing). For the negative experiences, the focus was predominantly on the choice for unhealthy, palatable food and on quantitative aspects: food portions, frequency of eating or food shopping outings, prices, weight, etc. What parents liked to maintain was, logically, in line with their positive experiences; the most common themes were food choice, food preparation and spending time together.

When taking a transversal look at parents' answers to the different questions, they reveal many contrasts (on inter-individual level) and ambivalences (on intra-individual level).

First, there were contrasting inter-individual opinions and experiences regarding the theme "food preparation". For a majority of parents, it was a real joy to have more time during lockdown for preparing home-made meals and for experimenting with new recipes, while other parents perceived the additional time in the kitchen as a burden and reported a lack of cooking inspiration. Here, it is good to keep in mind that in France, children have a four- or five-component lunch at school: a starter (e.g., raw vegetables), a protein dish (e.g., meat, fish, eggs), garnish (vegetables, pulses, potatoes, grain products), a dairy product, and a dessert. Variety, a balanced diet, and adaptation to children's nutritional needs are key concepts for these lunches (GEM-RCN, 2015). For some adults, it is similar at their work place. As this culinary script is strongly embedded in French culture, it is possible that parents experienced pressure to provide a similar script at home during the lockdown, when both children and adults were at home. For some parents, it may have been challenging to match the variety of recipes and nutritional balance at home, which was also expressed by some parents in the current sample.

In addition, the comparison of mothers' and fathers' answers showed that it was almost exclusively mothers reporting a perceived burden of the additional meals to prepare during the lockdown. Before the lockdown, women were, on average, already more involved in household and care activities such as food management, than men (Eurostat, 2019). There was some hope that the lockdown would bring more gender equality in household duties, and some studies did report an increase in men's participation in housework and childcare during the lockdown (e.g., Farré, Fawaz, González, & Graves, 2020 (Spain); Mangiavacchi, Piccoli, & Pieroni, 2020 (Italy); Yerkes et al., 2020 (Netherlands)). However, in several countries, women shouldered most of the extra unpaid work at home during the lockdown and reduced their working hours (e.g., Collins, Landivar, Ruppanner, & Scarborough, 2020 (USA); Craig & Churchill, 2020 (Australia); Farré et al., 2020 (Spain)). The COVID-19 pandemic thus appeared to have increased gender inequalities in (paid and) unpaid work, and this was even the case in a country like Iceland which scores well on gender equality indexes

(Hjálmsdóttir & Bjarnadóttir, 2020). Mothers in the present study seem to confirm this imbalance in cooking duties. Alternatively, it is also possible that mothers felt a higher pressure to provide a variety of meals and meals of high nutritional standards than fathers, as women generally focus on providing healthy food to the family while men focus more on food pleasure when providing food (Dupuy, 2017).

Second, contrasts and ambivalences were observed regarding food pleasure. Many parents highlighted positive aspects of food pleasure during the lockdown, with a focus on the sensory dimension (pleasure from food sensory properties) and the interpersonal dimension of food pleasure (pleasure from interactions with others while cooking or eating and sharing food) (Marty, Chambaron, Nicklaus, Monnery-Patris, 2018). In contrast, many parents also described a higher consumption of "pleasurable food" as negative during the lockdown. There were parents who only reported one side of food pleasure (the positive or the negative side), while other parents reported both sides: either when answering to the different questions, or embedded in one single answer. This seems to indicate that some parents struggled to find a balance between pleasure and "too much" pleasure during the lockdown, and this was related almost exclusively to the choice of palatable food and the amount and frequency of consumption. Even though food pleasure has a central role in the French eating culture (Ducrot et al., 2018), parents seem to know (and have internalized) the guidelines of the French National Nutrition Programme (PNNS, 2019) about healthy eating (e.g., avoid snacking, limit foods high in sugar and fat, limit alcohol, etc.) and realize their (family's) eating behaviour did not fully comply with these guidelines during the lockdown. Some answers seemed to indicate that parents themselves did not perceive their experienced food pleasure as negative *in se*, but that norms and recommendation prescribe that too much food pleasure is or can be a negative thing. This could be cause for concern, because it could make parents feel guilty about their food pleasure, while food pleasure is not necessarily a bad thing. A recent systematic literature review (Bédard et al., 2020) concluded, for example, that eating pleasure may be a levier for the promotion of healthy eating, and found especially favourable associations between eating pleasure and dietary outcomes. The review identified some strategies related to food pleasure as particularly promising: those that focus on sensory experiences, cooking and/or sharing activities, mindful eating, and memories associated with eating. In the same vein, a recent experimental study has shown that a pleasure-oriented intervention can increase the link between food liking and perceived healthiness in mother-child dyads, meaning that healthy foods were more appreciated after the intervention (Poquet et al., 2020).

It is also remarkable that those parents who described an increased temptation and desire to eat during the lockdown were almost exclusively mothers. Even though these mothers described an increased temptation for both themselves, their child, or their family in general, it seems to indicate that they struggled more with how to act upon food temptations or sensations of hunger. Mothers acknowledged the temptation but did not necessarily want to give in to it, they tried to control themselves, if possible. This might be due to gender differences in perceptions of desirable body shapes and related norms. A comparative study including 13 countries and 4 continents (Robineau & de Saint Pol, 2013) showed that the mean difference in BMI between men and women was largest in France, and that slimness is highly valued for French women (53%) but not for men (37%). The majority of French respondents prefer a slim female (52%) and a larger-sized male (62%), showing that the ideals related to body shape are very different for men and women.

Third, several parents described that their emotions during the lockdown had an impact on their family's eating behaviour. In most cases, negative emotions (e.g., stress, boredom) were linked to a higher food intake and parents explained that foods could serve as a way to keep them busy or to

comfort them in these difficult times. In contrast, some parents also described that their emotions lowered their appetite and induced weight loss. These findings could be interesting for health prevention during the ongoing pandemic. They seem to call for the need of strategies and initiatives that could help people to cope with their emotions during the lockdown, in order to avoid emotional under- and overeating which has been linked to unfavourable weight and health outcomes in the long term (e.g., Frayn & Knäuper, 2018). Governments could, for example, invest in accessible and affordable mental health care, and introduce preventive mental health campaigns.

Fourth, many parents wished to maintain positive changes in their family's behaviours, such as buying more local, seasonal, fresh foods, preparing more home-made meals, cooking with the family and taking more time to eat together. These intentions can only be encouraged. Children's involvement in cooking activities has, for example, been found to increase their food acceptance and intake of vegetables (Allirot, da Quinta, Chokupermal, & Urdaneta, 2016; Cunningham-Sabo & Lohse, 2013; Jarpe-Ratner, Folkens, Sharma, Daro, Edens, 2016), which was also expressed by some parents in this study. Children are also more likely to eat and try foods when they see their parents eat and enjoy the same foods (Addessi, Galloway, Visalberghi, & Birch, 2005). Moreover, more frequent family meals have been associated with a decreased risk of obesity (Berge et al., 2015), and improved well-being (Musick & Meier, 2012), even though this may also be due to different underlying factors. Furthermore, frequent consumption of home prepared meals has been associated with better dietary quality and with lower adiposity (e.g., Mills, Brown, Wrieden, White, Adams, 2017).

Parents' intentions stand, however, in contrast with an expressed doubt about the feasibility of the maintenance of these new eating and cooking habits. Time and a difficult work-life balance were mentioned as the most important barriers. Previous research has shown that employment and longer working days are associated with less time spent at cooking at home, especially among women (e.g., Adams & White, 2015; Etilé & Plessz, 2018; Sliwa, Must, Peréa, Economos, 2015). Before the lockdown, working from home was not a common practice in France (Aguilera, Lethiais, Rallet, Proulhac, 2016), it is therefore possible that the ongoing pandemic and its predicted related long-lasting effects on work culture (Carillo, Cachat-Rosset, Marsan, Saba, & Klarsfeld, 2020) could be a window of opportunity for parents to use the time gain from a reduction in occupational commuting for cooking home-made meals and cooking with the family on days they are working from home. However, more research is needed to explore this, as surprisingly few significant differences between parents' reported experiences based on their work status were found in this study.

Furthermore, the current study has not done a follow-up on the participants and was thus unable to verify whether parents were able to fulfil their expressed intentions. As the pandemic is still ongoing, it could be interesting to do a follow-up after the pandemic, to examine possible long-lasting effects on families' eating and cooking habits.

Lastly, we also want to note that, just as for parents' work status, surprisingly few significant differences in parental experiences were found based on their perceived financial situation. Interestingly, however, the analysis did show that fewer parents with a comfortable financial status reported negative changes during the lockdown, compared to those parents with a difficult financial situation. This could reinforce the idea that these last people could be more vulnerable for negative experiences during a pandemic.

Strengths and limitations

Some limitations must be noted for this study. First, as this study is part of a mixed-method study, it is possible that parents were influenced by the content of closed-ended questions preceding the three open-ended questions. These questions were for example about changes in the preparation of home-made food during the lockdown, the time spent cooking with the child, changes in parental motivations when buying food for the child *et cetera* (for a detailed overview: see Philippe et al., 2021). However, even though some content of closed-ended questions was also present in parents' answers to the open-ended questions, these last questions also allowed for the emergence of new topics (e.g., the transmission of food-related values and skills, the burden of cooking more meals, problems linked to grocery shopping). In addition, the open-ended questions gave parents the opportunity to express their personal experiences with food-related changes and to evaluate positive and negative aspects and future goals. Second, even though this study had a diverse French sample, it was not entirely representative. There was, for example, only a limited percentage of parents with a lower level of education (33.5% in this sample compared to approximately 55% in the French population (Insee, 2016)). Experiences and perceptions of parents with a higher level of education might thus be overrepresented in the current study. This is important to keep in mind, as level of education is linked to attitudes towards healthy eating and to compliance with dietary guidelines (Lê et al., 2013).

This study also presents several strengths. A first strength is the large sample size (N=498) which enabled the researchers to obtain insight into parents' positive and negative food-related experiences during the first COVID-19 lockdown in France. The use of NVivo made it possible to code the high number of answers to the open-ended questions without losing the overview and to keep track of more or less dominant themes and subthemes. This study showed that the use of open-ended questions could be an interesting method for obtaining qualitative data from a high number of participants and for generating valuable results that can complement those obtained with closed-ended questions. In this study, the results provided valuable insight into the drivers and barriers for changes in families' behaviours, even beyond the scope of COVID-19. For example, parents' and children's emotions during the lockdown and spending more time at home seemed to have strongly supported changes in families' eating and cooking behaviours. These results are useful to consider when promoting healthy eating behaviours in families. Then, despite the fact that this study had an unbalanced sample of mothers (N=357, 72%) and fathers (N=141, 28%) which is not preferable when comparing groups, the quite high number of fathers could be considered as a second strength, especially knowing that the inclusion of fathers in feeding research can be challenging (e.g., Jansen, Harris, Daniels, Thorpe, Rossi, 2018). Moreover, despite this unbalanced sample significant differences were found using matrix coding and Chi-squared tests; they generated insight into gender differences regarding perceptions, experiences and emotions. These results, and to a lesser extent those based on perceived financial situation and work status, showed that experiences can differ during a situation such as a pandemic. Policy makers should be aware of this and strive to support all groups in the population in the best possible way.

5. Conclusion and perspectives

This study revealed intimate perceptions of parents about changes in their families' eating, cooking and food-shopping habits during the first COVID-19 lockdown in France. The results uncovered positive and negative experiences, and many contrasts and ambivalences. Time was identified by parents as a cornerstone for changes in eating and cooking behaviours, and as a future barrier to

maintain the positive changes. The COVID-19 situation and related measures were unseen in France and probably amplified certain experiences, contrasts and ambivalences which were already present, but to a lesser extent. The results of this study might be of interest for further research studying possible facilitators and barriers for the adoption of recommended eating, cooking and food shopping behaviours in families, beyond the pandemic, and for intervention studies. Some interesting gender differences were also uncovered in the current study, stressing the importance of studying perceptions and behaviours of both men and women separately in future studies and to consider possible differences in interventions. Here, it is however recommended to recruit balanced samples of men and women, in order to study possible gender differences more precisely.

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Authors Contributions

KP, SM-P and SI conceptualized the study. KP and SMP conducted all analyses, SI was involved in the final steps of the analyses. KP is first author and wrote a first version of the manuscript, thereafter all authors contributed to editing the manuscript and they all approved the final article.

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Appendix 1. Original French verbatims and their English translation.

Original French verbatim	***Translated English verbatim***
3.1 Positive food-related experiences during the lockdown	
"Beaucoup plus de fruits et légumes frais de saison."	*"Much more fresh seasonal fruit and vegetables."*
"J'ai davantage de temps pour préparer des plats plus équilibrés."	*"I have more time on my hands to prepare more balanced dishes."*
"Je cuisine un peu plus de nouvelles recettes pour varier les plaisirs de chacun."	*"I cook a few more new recipes to vary everyone's enjoyment."*
"Nous faisons des recettes plus élaborées grâce à l'émission d'M6 (a tv-channel in France)."	*"We prepare more elaborate recipes thanks to a TV program on M6 (a tv-channel in France)."*
"Nous prenons tous nos repas ensemble et nous avons plus de temps pour en profiter et préparer."	*"We eat all our meals together and have more time to prepare and enjoy them."*
"Le repas pris se fait dans le calme, moins tendu. Les enfants mangent plus facilement des aliments bons pour la santé qu'ils mangeaient moins avant."	*"The meal is eaten in a calm atmosphere, less tense. The children eat more easily healthier foods than they used to. "*
"Une alimentation qu'on prépare en famille, j'apprends à mon enfant comment cuisiner comment faire de la pâtisserie je lui explique que les légumes sont bons pour sa santé qu'il sera grand et fort en les mangeant."	*"Through preparing food as a family, I teach my child how to cook, how to bake. I explain to him that vegetables are good for his health that he will be big and strong by eating them."*
"Je prends le temps de tester de nouvelles recettes. Mes 2 enfants participent plus volontiers pour m'aider, ils en sont fiers, mangent plus facilement lorsqu'ils ont participé. S'il y a un échec, ils sont également plus motivés à tenter un nouvel essai. Nous prenons le temps tous ensemble, cela me permet d'essayer de transmettre un peu de savoir-faire et de partager des anecdotes familiales au cours de conversations."	*"I take time to try out new recipes. My two children participate more willingly to help me, they are proud of doing so, eat more easily when they have participated. If the recipe doesn't work out, they are also more motivated to try again. We all take time together; it allows me to try and pass on a bit of know-how and share family anecdotes during the conversation."*
"Plus une alimentation plaisir donc c'est positif."	*"Food has become more pleasurable, so it's positive."*
"Je prends plus de temps pour cuisiner et faire plaisir à ma famille, j'achète plus local et des choses qui nous font envie."	*"I take more time to cook and please my family, I buy more locally and choose things that we fancy."*
"Je prépare beaucoup plus de plats maisons et j'essaie de varier dans les recettes, de faire plaisir à ma famille. Je cuisine beaucoup plus de pâtisseries avec mon fils qui adore ça. Et mon mari est bien content."	*"I prepare a lot more home-made food and I try to vary the recipes and to please my family. I cook a lot more pastries with my son, who loves doing that. And my husband is really happy."*
"Le temps s'est un peu arrêté et nous vivons au ralenti, on a beaucoup plus envie de se faire plaisir et mieux soigner notre alimentation qu'avant. Nous préparons beaucoup plus de plats "maison". Nous trouvons plus de temps, car moins de sorties, pour cuisiner même si nous continuons à travailler à l'extérieur."	*"Time has stopped a little and we live at a slower pace, we want to treat ourselves and pay more attention to our food than before. We prepare a lot more home-made food. We find more time to cook, even if we continue to work at the office, because we go out less."*
"Ayant moins de contraintes d'horaires (pas d'école, pas de télétravail) nous avons le temps de cuisiner en famille et de choisir précisément ce que l'on veut manger donc automatiquement c'est plus sain, plus varié."	*"Having fewer time constraints (no school, no telecommuting) we have time to cook as a family and choose exactly what we want to eat, so automatically it is healthier and more varied."*

3.2 Negative food-related experiences during the lockdown	
"Les aliments cuisinés sont peut-être beaucoup plus gras ou caloriques."	*"Home-made food is maybe much more fatty or calorific."*
"Achats plaisir plus fréquents (glaces, gâteaux...)."	*"More frequent treat yourself buys (ice cream, cakes...)."*
"Tendance à faire beaucoup de gâteaux et donc goûter plus généreux."	*"Tendency to make a lot of cakes and therefore snack more generously."*
"On grignote certainement plus entre les repas."	*"We certainly snack more between meals."*
"On mange quand même en plus grande quantité qu'avant."	*"All the same, we do eat more than before."*
"On est plus tenté de grignoter."	*"We are more tempted to snack."*
"Personnellement le stress m'a fait davantage grignoter (sensation de faim) et donc j'ai pris du poids."	*"Personally, stress made me snack more (feeling hungry) and so I put on weight."*
"Plus de cochonneries pour compenser le stress."	*"More junk food to compensate for stress."*
"Repas plus calorique, plus besoin de préparer des choses qui donnent le moral."	*"More calorific meals, more need to prepare things that make you feel good."*
"On mange plus gras, plus réconfortant pour que le confinement paraisse moins dur pour les enfants."	*"We eat more fatty, comforting food to make the lockdown seem less harsh for the children."*
"Ma fille s'ennuie donc elle veut de temps en temps grignoter entre les repas."	*"My daughter is bored so she wants to snack between meals from time to time."*
"Plus de temps à table le midi, repas plus copieux donc une petite prise de poids..."	*"More time at the table at lunchtime, bigger meals so a little weight gain...."*
"Etant à la maison toute la journée donc on a plus tendance à grignoter et à manger des sucreries, biscuits…"	*"Being at home all day so we tend to snack more and eat sweets, biscuits..."*
"Et bien qui dit davantage de temps, dit plus de pâtisserie, donc plus de choses sucrées."	*"Well, who says more time says more baking, so more sweet things."*
"Moi par contre, je ne mange pas beaucoup et normalement je suis une bonne épicurienne. J'ai perdu 7 kilos en 2 mois, je suis en bonne santé mais le stress me provoque toujours des pertes d'appétit, en fait j'ai peur pour mes proches, je suis aussi en colère de vivre ça et que mon fils de 4 ans le vive aussi, je suis un peu déprimée et du coup je ne mange plus assez, je suis une personne plutôt nerveuse donc mon estomac s'est noué et je mange peu voire très peu."	*"Me on the other hand, I don't eat much and normally I am really epicurean. I lost 7 kilos in 2 months, I am in good health but stress always causes me to lose my appetite, in fact I am afraid for my loved ones, I am also angry that I am going through this and that my 4 year old son is going through it too, I am a bit depressed and as a result I don't eat enough, I am a rather nervous person so my stomach has knotted up and I eat little or very little."*
"Plus faim, prise de poids importante car stressée."	*"Feel hungrier, significant weight gain because of stress."*
"Je fais beaucoup plus de pâtisserie ce qui fait plaisir mais cela fait prendre du poids a tout le monde."	*"I bake a lot more, which makes everyone happy, but everyone is putting on weight."*
"Nous avons tendance à manger autant qu'avant le confinement, ce qui pose problème car nous avons moins d'activité physique."	*"We tend to eat as much as we did before the lockdown, which is a problem because we have less physical activity."*
"Les repas sont plus caloriques qu'avant et nous ne faisons pas d'exercices."	*"Meals have more calories than before and we don't exercise."*

“Il faut cuisiner tous les jours et à tous les repas sans exception. Il faut trouver des idées pour varier les repas et il faut adapter la quantité de courses à faire car on doit en acheter plus que d'habitude. Les courses sont aussi plus chères. Plus de repas à préparer ce qui nous oblige à faire toujours les mêmes plats par manque d'idées.”	*"We have to cook every day and at every meal without exception. You need to find ideas to vary your meals and adapt the amount of shopping you do because you have to buy more than usual. Shopping is also more expensive. More meals to prepare, which means we have to make the same dishes over and over again because we run out of ideas."*
“Il est plus difficile de trouver certains produits.”	*"It is more difficult to find certain products."*
“Plus de courses à faire et un budget alimentaire plus élevé. Plus difficile de faire les courses car je sais que je ne vais pas y retourner de suite... donc il ne faut rien oublier.”	*"More shopping to do and with an increased food budget. More difficult to do the shopping because I know I'm not going to go back straight away... so you mustn't forget anything."*
“Pas de possibilité d'aller chez mes producteurs habituels pour réduire les déplacements.”	*"No possibility to go to my usual producers so as to reduce travel."*
3.3 Aspects to maintain after the lockdown	
“Je souhaite maintenir l'attention sur les fruits et légumes de saison. Le plaisir d'en consommer et d'en faire consommer plus grâce à de nombreuses recettes sur des sites en ligne.”	*"I want to continue to cook using seasonal fruit and vegetables. The pleasure of eating them and getting my family to eat more thanks to all the on-line recipes you can find."*
“Continuer à faire travailler les producteurs locaux et accorder du temps pour faire le marché avec mes enfants qu'elles puissent découvrir encore plus de choses et avoir plus envie.”	*"Continue to support local producers and allow time to go to the market with my children so that they can discover even more things and be even more eager about food."*
“Nous aimerions maintenir la qualité de nos repas mais cela nécessite du temps de préparation...”	*"We would like to maintain the quality of our meals however to prepare this takes up time..."*
“Faire tous les repas en famille mais avec les activités professionnelles c'est un peu compliqué.”	*"Prepare all the meals as a family but with work commitments it’s a bit complicated."*
“Manger plus de légumes, faire des courses moins régulièrement mais en plus grande quantité et organisé pour la semaine.”	*"Eat more vegetables, shop less regularly but in larger quantities and organized for the week."*
3.4 The ambivalent relation with food pleasure	
(-): “Je fais beaucoup plus de pâtisserie ce qui fait plaisir mais cela fait prendre du poids a tout le monde.”	*(-): "I’m baking a lot more, which makes everyone happy, but everyone is putting on weight."*
(-): “Nous nous faisons plus plaisir, donc un dessert après chaque déjeuner en plus du fruit! Souvent c'est une glace qu'on mange au soleil donc forcément ça fait plus de sucre mais en même temps ça remonte de moral!”	*(-): "We indulge ourselves more, so we have a dessert after every lunch in addition to the fruit! Often, it's an ice-cream that we eat outdoors in the sun, so of course it's more sugar, but at the same time it's good for morale!"*
(-): “Le week-end on se fait plaisir et on fait l'apéro le midi donc soda et chips deux fois par semaine.”	*(-): "At the weekend we treat ourselves and have an aperitif at lunchtime, so soda and crisps twice a week."*
(+): “Repas plus conviviaux, plaisir de cuisiner avec les enfants et cela restera de bons souvenirs.” (-): “Prise de poids, trop de nourriture réconfort.”	*(+): "More convivial meals, pleasure of cooking with the children and all of this will create great memories." (-): "Weight gain, too much comfort food."*

(+): "Plus de temps, plus de plaisir, plus de diversité, essais nouvelles recettes (notamment de l'émission de Cyril Lignac (a French tv-cook))." (-): "On grossit."	*(+): "More time, more pleasure, more diversity, new recipes (especially from Cyril Lignac's tv programme (a French tv-cook))." (-): "We are getting fatter."*
(+): "Je prends plus de temps pour cuisiner et faire plaisir à ma famille, j'achète plus local et des choses qui nous font envie." (-): "On mange quand même en plus grande quantité qu'avant."	*(+): "I take more time to cook and please my family, I buy more locally and things that tempt us." (-): "We eat more however than before."*
(+): "J'ai cuisiné plus de goûters maison, avant je ne faisais que les acheter." (-): "Nous avons mangé beaucoup plus gras, beaucoup plus d'aliments plaisir, les adultes ont pris des goûters." (M): "Faire plus de goûters maison."	*(+): "I have cooked more home-made snacks, before I only bought them." (-): "We have eaten a lot fattier, a lot more pleasure foods, us adults have taken to snacking too." (M): "Making more home-made snacks."*
"Pas de changement négatif au niveau de l'alimentation, ou peut-être l'envie de manger un petit peu plus qu'avant le confinement mais en restant raisonnable."	*"No negative change in our eating habits, or maybe the desire to eat a little bit more than before the lockdown but still reasonably."*
"A force de manger des gâteaux que l'on fait, je ne sais pas le taux de sucre et de gras, mais bon ma fille mange très varié..."	*"Due to eating home-made cakes, I don't know the sugar and fat content, but my daughter has a varied diet..."*
"Un peu plus de bonbons mais c'était la période de Pâques."	*"A few more sweets but it was Easter-time."*
"Nous mangeons sûrement un peu plus riche, surtout au niveau pâtisserie. Et peut-être quelques collations sucrées en plus. Mais bon il faut bien manger les chocolats de Pâques."	*"We probably eat a bit richer, especially in terms of pastries. And maybe some more sweet snacks. But hey, you have to eat the Easter chocolates."*
3.5 Differences fathers versus mothers	
"Travaillant à l'hôpital, un peu trop usée pour cuisiner."	*"Working in a hospital, a bit too worn out to cook."*
"Je passe beaucoup de temps dans la cuisine !!"	*"I spend a lot of time in the kitchen!!"*
"On mange plus gras, plus réconfortant pour que le confinement paraisse moins dur pour les enfants."	*"We eat more fatty, comforting food to make the lockdown seem less harsh for the children."*
"Avoir envie de manger tout le temps."	*"Having the urge to eat all the time."*
"Il a tendance à grignoter un peu plus car il est à la maison."	*"He tends to snack a bit more because he's at home."*

Appendix 2. Results of the comparative analyses of parents' food-related experiences during the lockdown based on parents' work status during the lockdown (Table A) and parents' perceived financial situation during the lockdown (Table B).

Table A. Percentages of parents working outside the house (Out), working from home (In), and at home without employment (No) describing content belonging to themes and subthemes for each of the three open-ended questions. Percentages of parents describing a theme are calculated in proportion to the total number of parents with that specific work situation: n=103 (Out), n=175 (In), and n=175 (No).

Theme and subtheme	Positive experiences				Negative experiences				Aspects to maintain			
	Out (%)	In (%)	No (%)		Out (%)	In (%)	No (%)		Out (%)	In (%)	No (%)	
Nothing/ No change	12.24	9.71	10.80		**34.69**	**25.71**	**22.16**	*	19.39	20.57	18.75	
Time	21.43	18.86	24.43		2.04	1.71	2.27		12.24	9.14	6.82	
Food choice												
Sustainable foods	**13.27**	**16.00**	**6.25**	**	0.00	0.57	1.14		12.24	17.71	12.50	
Healthy/ fresh foods	20.41	24.57	17.61		3.06	4.00	2.84		20.41	18.29	20.45	
Unhealthy/ palatable foods	**4.08**	**7.43**	**2.27**	*	22.45	24.00	20.45		3.06	2.86	1.14	
Quality foods and meals	3.06	5.14	2.84		0.00	0.57	0.00		4.08	2.86	1.14	
Meat and fish	1.02	1.14	0.00		1.02	0.57	0.57		2.04	0.57	0.00	
Alcohol	0.00	0.00	0.00		0.00	0.57	3.41		0.00	0.00	0.00	
Bread	**1.02**	**5.71**	**1.14**	**	0.00	1.71	0.57		1.02	0.00	1.70	
Nutrition, diversity, balance	6.12	6.86	6.82		2.04	4.00	4.55		7.14	3.43	5.68	
Foods easy to store for longer	0.00	0.00	0.00		0.00	0.57	0.57		0.00	0.00	1.14	
Food preparation												
Sociability (cook together)	23.47	27.43	21.59		0.00	0.00	0.57		15.31	18.86	11.36	
Homemade dishes	20.41	25.14	17.61		4.08	3.43	3.41		15.31	16.57	19.32	
Elaborated dishes	2.04	3.43	3.98		1.02	0.57	0.57		1.02	0.00	2.27	
Recipes	15.31	9.71	9.66		4.08	8.00	6.25		3.06	6.86	7.39	
Quickly prepared dishes	0.00	0.00	0.00		2.04	1.14	0.57		0.00	0.00	0.00	
Unspecified [a]	6.12	8.00	11.36		1.02	4.00	3.98		5.10	10.29	9.66	
Commensality (eat together, sharing)	10.20	9.14	12.50		1.02	0.00	0.00		**6.12**	**5.14**	**11.93**	**
Emotions/ meal atmosphere	6.12	5.14	6.25		3.06	6.29	7.95		3.06	2.86	1.14	
Education, transmission	4.08	4.57	5.11		0.00	0.00	0.00		2.04	0.57	0.57	
Control intake child	1.02	1.71	0.00		0.00	0.00	0.00		0.00	0.00	0.00	
Food acceptation/ rejection child	3.06	2.86	2.84		0.00	0.00	0.00		2.04	0.00	1.14	
Frequency/ quantity												
Frequency meals	0.00	0.57	2.27		14.29	12.00	13.07		1.02	1.14	1.70	
Quantity consumed	1.02	0.57	3.14		10.20	5.71	9.09		1.02	1.14	1.14	
Desire, temptation to eat/ appetite	0.00	0.00	0.00		6.12	9.71	12.50		0.00	0.00	0.00	
Food pleasure	9.18	5.14	7.39		0.00	2.29	0.57		1.02	4.00	1.70	
Health	1.02	4.00	3.98		0.00	0.57	1.70		2.04	4.00	2.27	
Weight, calories, lack of sport	0.00	0.57	2.27		8.16	8.00	6.82		0.00	0.00	0.00	
Meal planning	1.02	2.86	1.70		0.00	0.00	0.00		1.02	1.71	2.84	
Meal timing	0.00	0.00	0.00		2.04	2.86	3.41		3.06	1.14	0.57	
Meal location	0.00	0.00	0.00		0.00	0.57	0.00		0.00	0.00	1.14	
Food shopping	3.06	2.86	1.70		6.12	9.14	7.39		4.08	1.71	1.71	
Finances, prices	2.04	0.57	0.00		5.10	5.71	9.66		1.02	1.14	0.00	
Food waste	2.04	0.00	0.57		0.00	0.00	0.00		2.04	0.00	1.14	
Decorations	0.00	0.00	0.57		0.00	0.00	0.00		0.00	0.00	0.57	
Cleaning/ Tidying	1.02	0.00	0.57		0.00	0.57	0.57		0.00	0.00	0.00	
Easter	0.00	0.00	0.00		1.02	1.14	1.14		0.00	0.00	0.00	

[a]Aspects of food preparation which were unspecified (e.g., "I cook more").

Note. Percentages that present differences between the groups of parents are in bold; significance levels of Chi-squared tests: * $p < 0.10$, ** $p < 0.05$

Table B. Percentages of parents with a comfortable (Comf) and difficult perceived financial situation (Diff) describing content belonging to themes and subthemes for each of the three open-ended questions. Percentages of parents with a comfortable situation describing a theme are calculated in proportion to the total number of parents with a comfortable situation (n=239), and percentages of parents with a difficult situation are calculated in proportion to the total number of parents with a difficult situation (n=254).

Theme and subtheme	Positive experiences		Negative experiences		Aspects to maintain	
	Comf (%)	Diff (%)	Comf (%)	Diff (%)	Comf (%)	Diff (%)
Nothing/ No change	10.55	11.11	**29.96** **	**21.83**	18.99	20.63
Time	20.68	24.21	1.69	2.78	8.86	9.52
Food choice						
Sustainable foods	13.92	9.92	0.00	1.59	16.03	13.89
Healthy/ fresh foods	23.21	19.44	2.95	3.97	18.57	20.63
Unhealthy/ palatable foods	4.22	5.16	24.47	20.24	2.95	1.59
Quality foods and meals	3.80	3.57	0.42	0.00	2.95	1.59
Meat and fish	1.69	0.40	0.84	0.40	1.69	0.40
Alcohol	0.00	0.00	1.69	1.19	0.00	0.00
Bread	2.53	3.18	0.84	0.79	0.84	1.19
Nutrition, diversity, balance	8.44	5.16	**1.27** **	**5.59**	3.80	5.95
Foods easy to store for longer	0.00	0.00	0.00	0.79	0.00	0.79
Food preparation						
Sociability (cook together)	22.78	24.60	0.42	0.00	14.53	15.08
Homemade dishes	21.94	19.44	2.53	4.76	19.83	15.48
Elaborated dishes	3.80	2.78	0.84	0.40	0.84	1.19
Recipes	10.55	11.90	6.75	5.95	7.59	4.76
Quickly prepared dishes	0.00	0.00	1.27	0.79	0.00	0.00
Unspecified [a]	8.02	10.71	**2.11** *	**5.16**	9.70	9.13
Commensality (eat together, sharing)	9.70	11.51	0.00	0.80	6.75	8.73
Emotions/ meal atmosphere	6.33	5.16	3.80	7.94	**4.22** **	**1.19**
Education, transmission	3.38	5.56	0.00	0.00	0.42	1.19
Control intake child	0.84	0.79	0.00	0.00	0.00	0.00
Food acceptation/ rejection child	1.69	3.57	0.00	0.40	0.84	1.19
Frequency/ quantity						
Frequency meals	0.84	1.59	14.77	11.51	0.84	1.59
Quantity consumed	0.84	2.38	**6.33** *	**10.71**	1.27	0.79
Desire, temptation to eat/ appetite	0.00	0.00	9.28	10.32	0.00	0.00
Food pleasure	4.64	8.33	2.11	0.79	2.53	1.98
Health	**5.06** *	**1.98**	0.84	0.79	2.95	3.57
Weight, calories, lack of sport	0.00	1.98	6.75	7.94	0.00	0.00
Meal planning	2.95	1.19	0.00	0.00	2.53	1.59
Meal timing	0.00	0.40	3.80	2.78	1.69	1.19
Meal location	0.00	0.00	0.00	0.40	0.84	0.40
Food shopping	2.53	2.78	6.75	8.33	2.11	1.98
Finances, prices	0.84	0.40	**5.06** *	**9.13**	1.69	0.00
Food waste	1.27	0.40	0.00	0.00	1.27	0.79
Decorations	0.42	0.00	0.00	0.00	0.42	0.00
Cleaning/ Tidying	0.42	0.40	0.42	0.40	0.00	0.00
Easter	0.00	0.00	1.96	0.40	0.00	0.00

[a]Aspects of food preparation which were unspecified (e.g., "I cook more").

Note. Percentages that present differences between the groups of parents are in bold; significance levels of Chi-squared tests: * $p < 0.10$, ** $p < 0.05$

CHAPTER VI.

Maternal and paternal feeding practices in Denmark: similarities/differences and predictors

This chapter will be presented in the form of an article published in *Appetite*.

Article 6

Parental feeding practices and parental involvement in child feeding in Denmark: gender differences and predictors.

Philippe, K., Chabanet, C., Issanchou, S., Grønhøj, A., Aschemann-Witzel, J., & Monnery-Patris, S.

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Introduction:

Studies about fathers and feeding are scarce and little is known about predictors of paternal feeding practices and paternal involvement in child feeding. In addition, parental involvement in childcare is more stimulated by the government in some countries - like the Nordic countries - by providing good conditions to reconcile work and family.

Objectives:

The first objective of this study was to examine possible similarities and differences between Danish mothers and fathers of pre-schoolers with regard to their involvement in feeding related tasks, the number of meals they take with their child, and their feeding practices.

The second objective was to identify possible predictors of parental feeding practices and of parental involvement in feeding related tasks at home.

Focus:

Mothers' and *fathers'* feeding practices and involvement in feeding related tasks, and influencing factors.

System(s) Bronfenbrenner:

Microsystem (parents); Exosystem (work context, family, friends of parents); Macrosystem (culture, values, norms)

Parental feeding practices and parental involvement in child feeding in Denmark: gender differences and predictors.

Abstract: Studies about fathers and feeding are scarce and little is known about predictors of parental involvement in child feeding and of paternal feeding practices. Therefore, this study aimed to examine possible differences between Danish mothers and fathers with regard to their feeding practices and involvement in feeding related tasks, and to assess possible parent-related predictors of parental practices and involvement. A total of 261 mothers and 321 fathers of pre-schoolers completed an online survey with items from validated questionnaires. Gender differences were observed; fathers reported using higher levels of coercive control practices, while mothers reported using higher levels of structure practices and autonomy support practices. Both mothers and fathers reported to be highly involved in feeding their child. Regressions showed that a higher concern for child weight and a higher motivation for child preference were linked to a higher use of coercive control practices while a higher motivation for health control, cooking confidence, feeding/general self-efficacy and perceived responsibility for feeding were linked to a higher use of structure and autonomy support practices. The results of this study provide valuable insight into maternal and paternal practices in Denmark and their determinants.

Keywords: pre-schoolers, food parenting practices, fathers, mothers, gender differences

1. Introduction

Previous research has shown that eating habits established during childhood can persist into adolescence and adulthood (Nicklaus et al., 2005; Nicklaus & Remy, 2013), and that parents play a key role in the development of children's eating habits (Birch, 1999). Parental feeding practices, or the behavioural strategies parents use to control what, how much, when and where the child eats (Ventura & Birch, 2008), have been identified as possible levers to prevent the development of « unhealthy » eating behaviours and obesity in children (Birch, 1999). There is a growing consensus that the use of coercive control practices (e.g., restriction, pressure to eat) should be avoided by parents, while the use of structure practices (e.g., rules about where, when and what to eat) and autonomy support practices (e.g., encouraging balance and variety) should be encouraged among parents (see, for example, the review by Vaughn et al., 2016).

However, most studies about parental feeding were conducted with mothers. The role of fathers in feeding – their involvement in feeding and their feeding practices – has received less attention in research (Khandpur et al., 2014; Litchford et al., 2020). This gives an incomplete picture of the child's feeding environment, and does not properly correspond to the shift in gender roles observed in society. Despite mothers still being mainly responsible for the household and childrearing in Europe, fathers are gradually taking up more tasks in the household and becoming more involved in childrearing (Eurofound, 2018; European Union, 2017). This is especially true in the Nordic countries where the household tasks are more equally shared than in other European countries (Eurofound, 2018; European Union, 2017). These countries actively stimulate parental involvement in childcare by providing good conditions to reconcile work and family; e.g., with financially stimulated maternal and paternal leave and options for remote working (Greve, 2011; European Union, 2020). There are also indications that fathers are becoming increasingly involved in the food domain – for example, taking more meals with their children than fathers did years ago and participating more regularly in food related tasks such as

cooking, clean-up, grocery shopping and meal planning (e.g., Grønhøj & Gram, 2020 (Denmark); Jones et al., 2013 (US); Philippe et al., 2021 (France)). Research on this topic is however limited, as stated above.

Taken together, in order to create an optimal feeding environment for the child, it is crucial to stimulate favourable eating behaviours and feeding practices among parents, as they influence children's eating behaviour and consequently their weight status (Davison & Birch, 2001). To achieve this, it is necessary to understand how mothers AND fathers feed their child and what drives their practices or behaviours. In this context, very little is currently known about predictors of parental involvement in feeding and about parent-related predictors of feeding practices, especially in fathers (e.g., Mallan et al., 2014). Furthermore, it is interesting to study this in a country like Denmark, where gender equality is high (EIGE, 2021) and where little data is available on parental feeding practices and involvement in child feeding.

The objectives of this study were therefore twofold. The first objective was to examine possible differences between Danish mothers and fathers with regard to their involvement in child feeding (i.e., the number of meals they take with their child, their involvement in grocery shopping, cooking, etc.) and their feeding practices. The focus is on parents of children aged 3-6 years, because this can be a particularly challenging period for child feeding as this period is characterized by a peak in food rejections in children (Nicklaus & Monnery-Patris, 2018). For this first objective, we hypothesized that mothers would be more involved in feeding than fathers (Eurofound, 2018; European Union, 2017; Philippe et al., 2021). Regarding feeding practices, we hypothesized, based on the results of studies in other countries, that fathers would report higher levels of pressure to eat and food rewards, but lower levels of monitoring (Haycraft & Blissett, 2008; Hendy et al., 2009; Loth et al., 2013; Philippe et al., 2021; Tschann et al., 2013).

The second objective of this study was to identify possible parent-related predictors of parental feeding practices and of parental involvement in child feeding at home. This part was explorative and two theories and results of past empirical research were used to select possible predictors of interest. A visualization of the conceptual model used for this study is presented in Figure 1.

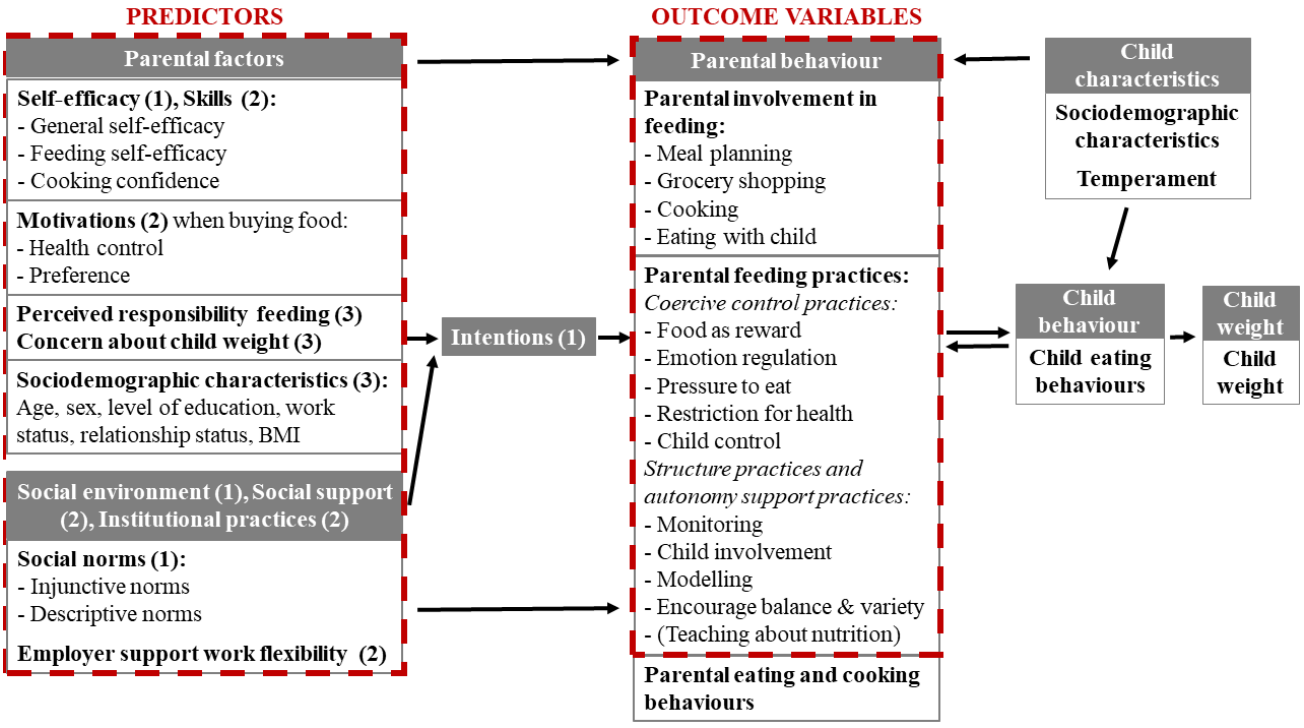

Figure 1. Conceptual model of the study. In the current study, the links between the variables in the red-dotted boxes are analysed and discussed: between parental factors/social environment/social support/institutional practices (predictors) and parental behaviour (outcome variables). (1): Elements included in the model based on the social cognitive theory of Bandura (1986). (2): Elements included in the model based on the four factor model of fathers' involvement (Lamb, 1987). (3): Elements included in the model based on previous empirical research.

The first theory of interest was the social cognitive theory of Bandura (1986) which states that people' self-efficacy, outcome expectations and social environment (e.g., social norms) give rise to intentions, which in turn lead to behaviour (i.e., parental involvement in child feeding and their feeding practices). In the context of child feeding, we assumed that parents' general self-efficacy but also their specific feeding self-efficacy and cooking self-efficacy/confidence could be possible predictors. Regarding social norms, a distinction can be made between injunctive and descriptive norms (Cialdini et al., 1991): injunctive norms refer to people's perceptions of others' attitudes about behaviours you should or should not engage in (do's and don'ts) while descriptive norms refer to people's perceptions of others' behaviours (what is commonly done by others). We hypothesized that a higher self-efficacy and stronger perception of norms of feeding would be associated with a higher involvement in feeding and the use of more favourable feeding practices (e.g., modelling, encourage balance and variety in eating).

The second theory used for selecting possible predictors was the four factor model of fathers' involvement (Lamb, 1987). This model states that fathers' involvement with their children is determined by four factors: their motivations, skills, social support and institutional practices. In short, fathers who are highly motivated, have adequate parenting skills, receive social support for their parenting, and are not undermined by work and other institutional settings will likely be highly engaged with their children. For this study, two types of motivations were selected based on previous research (Rigal et al., 2012): the motivation for health control and the motivation for accommodating

child preferences when buying food for the child. We hypothesized that parents who are highly motivated by health control would be more involved in child feeding and using more favourable feeding practices (Rigal et al., 2012, 2019). We also expected that mothers would be more motivated by health control than fathers (Cardon et al., 2019). Following the ideas of the four factor model of fathers' involvement, we also assumed that the degree to which parents feel supported by their employer to optimise work with family life (social support/ institutional setting in the theory) could be relevant for parental involvement in child feeding, and possibly also for feeding practices. Based on the theory, we hypothesized that a higher perceived support would be linked with a higher involvement in feeding and more favourable feeding practices.

The last set of predictors included in this study were parents' and children's sociodemographic characteristics, parents' perceived responsibility for feeding their child, and parents' concern for child weight. Based on the results of previous studies (e.g., Khandpur et al., 2016), we hypothesized that parents with a higher level of education will report using lower levels of coercive control practices (e.g., less pressure to eat, less restriction). We also hypothesized that parents with a higher perceived responsibility for feeding would be more involved in child feeding (Mallan et al., 2014) and that they would report using higher levels of favourable feeding practices but also higher levels of control practices (Musher-Eizenman & Holub, 2007). Here, we also expected that mothers would experience higher levels of perceived responsibility for feeding than fathers (Blissett et al., 2006). Finally, we expected that fathers as well as mothers with a higher concern for child weight would show higher levels of control practices (Costa et al., 2021; Mallan et al., 2014).

2. Methods

2.1 Recruitment and Ethics

An online questionnaire (via the online platform SurveyMonkey) was used to obtain data for this study. Mothers and fathers of children aged 3-6 years were recruited via an agency that has representative online panels of participants living all over Denmark. Prerequisites to participate were: being at least 18 years old and having at least one child aged 3-6 years. The questionnaire was anonymous and on the first page of the questionnaire, parents were required to tick a box indicating that they understood and accepted the study information and data protection policy. Participants were rewarded with points for their participation by the recruitment agency according to usual practice (determined by the average time taken to fill in the questionnaire). An ethical approval (n° 2020-99) was granted for this study by Aarhus University's Research Ethics Committee. The Danish questionnaire was pretested with two mothers and a father, who provided feedback on the understanding of the information, questions, items, and response options, and the lay-out and length of the questionnaire. Subsequently, minor adjustments were made to optimise the questionnaire. Their data was not used for the analyses of this study.

2.2 Measures

2.2.1 Sociodemographic characteristics parent and child

Parents were asked to describe the following characteristics about their child: age in years, sex, birth rank (first-born or not first-born), born at term or premature, and if the child has an illness or condition that possibly influences his/her eating (e.g., autism, swallowing difficulties). If parents have several children aged 3-6 years, they were instructed to select a child for whom they want to complete

this questionnaire, and to always think of this child when answering the questionnaire. About themselves, parents were asked to describe their age in years, sex, level of education, work status, the number of children they have, relationship status (living with a partner/single parent/other), height, weight, and if they are pregnant or not (if pregnant, the body mass index of these parents would not be calculated). Parents were also asked to describe the work status of their partner, if applicable.

2.2.2 Involvement in feeding related tasks at home

Parents were asked to report the number of breakfasts, lunches, and dinners generally taken with their child per week (ranging from 0-7 for each meal). Taking a meal with the child was defined as either eating with the child or feeding the child. Parents were also asked to report who was the main person responsible for four feeding related tasks (*i.e.,* planning meals, grocery shopping, cooking, and feeding/eating with child). The answer options were "Mainly me", "Mainly my partner", "Mainly someone else (e.g., another family member)", "Activity is shared at home", and "Not applicable" (Philippe et al., 2021). They were also asked to identify the best cook at home (Me/ My partner/ Someone else/We're equally good) and to indicate their frequency of grocery shopping (4-point scale ranging from "More than once per week" to "Less than once per week") and their frequency of cooking (5-point scale ranging from "every day" to "Less than once per week").

2.2.3 Parental feeding practices

The Comprehensive Feeding Practices Questionnaire (CFPQ, Musher-Eizenman & Holub, 2007) was used to measure parental use of feeding practices. The following dimensions were selected for the current study: food as reward (3 items, e.g., *I offer my child his/her favourite foods in exchange for good behaviour*), emotion regulation (3 items, e.g., *Do you give your child something to eat or drink if s/he is upset even if you think s/he is not hungry?*), pressure to eat (4 items, e.g., *My child should always eat all of the food on his/her plate*), restriction for health (4 items, e.g., *If I did not guide or regulate my child's eating, he/she would eat too many junk foods*), child control (5 items, e.g., *Do you let your child eat whatever s/he wants?*), monitoring (4 items, *How much do you keep track of the sweets/snack foods/high-fat foods/sugary drinks that your child eats/drinks?*), involvement (3 items, e.g., *I allow my child to help prepare family meals)*, modelling (4 items, e.g., *I model healthy eating for my child by eating healthy foods myself*), encourage balance and variety (3 items, e.g., *I encourage my child to try new foods*), and teaching about nutrition (3 items, e.g., *I discuss with my child why it's important to eat healthy foods*). Two original dimensions of the CFPQ were not included for the purpose of this study because they either describe the child's food environment rather than parental actions (healthy environment), or because they are a less common practice at pre-school age (restriction for weight control) (Philippe et al., 2021). Parents were asked to rate their agreement with each item on a five-point scale ranging from "Strongly disagree" to "Strongly agree", or from "Never" to "Always". The psychometric properties of this questionnaire have been demonstrated in the US and other countries, and for the use with mothers and fathers (e.g., Musher-Eizenman & Holub, 2007; Musher-Eizenman et al., 2009). The original English questionnaire was translated to Danish by a research team in Copenhagen for the European project HabEat. These researchers performed a back-translation and a check-up with a native English speaker fluent in Danish (Karagiannaki, Ritz, Andreasen, et al., 2021; Karagiannaki, Ritz, Jensen, et al., 2021).

2.2.4 Other parental dimensions

General self-efficacy, feeding self-efficacy and cooking confidence

Four items of the General Self-efficacy Scale (Aschemann-Witzel et al., 2020; Schwarzer & Jerusalem, 1995) were used to measure parents' general self-efficacy (*e.g., If I am in a challenging situation, I tend find a way out.*). Parents were asked to rate their agreement with each item on a five-point scale ranging from "Strongly disagree" to "Strongly agree".

Five items from the Feeding Self-Efficacy Questionnaire (Horodynski & Stommel, 2005; Koh et al., 2014) were used to measure parents' feeding self-efficacy (e.g., *I can get my child to try veggies*). Parents had to rate their confidence about these statements on a five-point scale ranging from "Not confident at all" to "Very confident".

One item (*I have knowledge and skills to prepare healthy meals for my family.*) was used to measure parents' cooking confidence (Jarpe-Ratner et al., 2016). Normally, parents have to rate their agreement with this item on a four-point scale ranging from "Strongly disagree" to "Strongly agree", but for this study it was transformed to a five-point scale (adding the option "Neutral" in the middle) to be more coherent with the rest of the questionnaire used for this study.

Injunctive and descriptive norms

Four items were developed to measure parents' perceptions of others' attitudes (injunctive norms; *My friends/partner/family/caregivers from my child's childcare think I should be actively involved in feeding my child.*), and five items were developed to measure parents' perceptions of others' behaviours (descriptive norms; *My partner/female friends/male friends/female family members/male family members is/are actively involved in feeding our child.*). The development of these items was based on items of Pedersen et al. (2015) that were used to measure injunctive and descriptive norms regarding the intake of fruits and vegetables. Parents were asked to rate their agreement with each item on a five-point scale ranging from "Totally disagree" to "Totally agree".

Motivations for buying food for child

The Questionnaire relating to Parental Motivations when buying food for children (Rigal et al., 2012) was used to capture to which extent parents are driven by health concern (3 items, e.g., *high in vitamins*) or by children's preference (e.g., *adapted to children's taste*) when buying food for their child. Parents were asked to rate their agreement with each item: *e.g.*,"For my child, I am careful to buy food which are… high in vitamins" on a five-point scale ranging from "Very wrong for me" to "Very true for me".

Employer support work flexibility

Three items were developed to measure to what degree parents feel supported by their employer to optimise work with family life (*To what degree do you feel supported by your employer to… Take parental leave/Optimise your working hours to combine work and family life/Work from home).* Parents were asked to respond on a five-point scale ranging from "Not at all supported" to "Very supported".

Concern about child weight and perceived responsibility for feeding

The Child Feeding Questionnaire (CFQ, Birch et al., 2001) was used to measure concern about child weight (3 items, e.g., *How concerned are you about your child becoming overweight*?) and

perceived responsibility for feeding (3 items, e.g., *How often are you responsible for deciding what your child's portion sizes are?*). Parents were asked to rate their agreement with each item on a five-point scale ranging from "Unconcerned" to "Very concerned" for concern about child weight, and on a five-point scale ranging from "Never" to "Always" for perceived responsibility for feeding.

2.3 Statistical analyses

R version 3.6.1 (R Core Team, 2019) was used to clean and analyse the data. The significance level was set at $p < 0.05$ for all analyses.

2.3.1 Data cleaning

Data cleaning was performed on the data of 697 participants. Questionnaires of parents were excluded for subsequent analyses when parents did not provide their consent for participation (n=40) or when they did not complete the entire questionnaire (n=20). They were also excluded when their child was younger than 3 years or older than 6.9 years (n=48), when their child had an illness susceptible of influencing his/her eating behaviour (*e.g.*, autism; n=6), or when their child was born very premature (< 33 weeks of gestation; n=1). This resulted in a cleaned sample of 582 questionnaires: 261 filled in by mothers and 321 filled in by fathers.

2.3.2 Preliminary analyses

Cronbach's alphas were calculated to test the psychometric properties of the measures used for this study. They were calculated for the entire sample together, but also separately for mothers and fathers to ensure that the psychometric properties were good for both subsamples. When alphas were too low (< 0.60), confirmatory factor analyses (CFA) with a SEM approach (Bollen, 1989; Kaur et al., 2006) were performed to gain more insights in the factor structures. Acceptable Cronbach alphas were observed for all dimensions except for the feeding practice "teaching about nutrition" (α=0.36 for the entire sample; α=0.26 for mothers only sample; and α=0.47 for fathers only sample). CFA did not help to optimise the internal consistency of this dimension and it was therefore decided to not include this feeding practice in the subsequent analyses. A lower alpha (0.54) was also observed for the practice "child control" for mothers, but this value was acceptable for fathers (α=0.81) and for the entire sample (α=0.72). For all other dimensions, Cronbach's alphas ranged between 0.63 (involvement) and 0.91 (concern about child weight/ injunctive norms) for mothers, and between 0.70 (encourage balance and variety/ motivations) and 0.91 (concern about child weight) for fathers. All alphas are presented in Appendix 1.

2.3.3 Main analyses

Scores were calculated for all multi-item dimensions by averaging the scores on the corresponding items. Independent sample *t*-tests or Chi-squared tests were performed to identify significant differences between mothers and fathers. Then, Spearman correlations were calculated to determine the associations between the different dimensions considered in this study for mothers and fathers separately.

Next, regressions were used to search for the influential predictors of parental feeding practices and of parental involvement in child feeding (in separate regressions: one regression for each practice/type of involvement). A leaps and bounds algorithm (R package leaps) was used to select a parsimonious set of influential predictors; this predictor selection aims to choose a model that is not too small (underfit, biased model) nor too large (overfit, risk of inflation of the variance, unstable parameters)

(Furnival & Wilson, 1974). For each size of the potential model, the best set of predictors was identified. Then, Mallows Cp was used to decide on the number of predictors to include in the model: the final set of predictors was obtained starting with the smallest possible model (one predictor), then gradually increasing the number of predictors, and stopping when Mallows Cp equals approximately the number of predictors + 1. The selection of predictors was conducted for each outcome variable, in other words for each parental feeding practice and each dimension of parental involvement, on the data of mothers and fathers together. After the selection of the best parsimonious set of predictors, interactions with parental sex were added, to verify if gender differences existed with regard to the most influential predictors. Only significant interaction effects were maintained in the final model. This resulted finally in a simplified model including the strongest significant predictors and the significant interaction effects with sex. Continuous predictors were centred to ensure a correct interpretation of all parameters. Finally, variance inflation factors were computed to ensure the parameters could be interpreted and would not suffer from instability linked with multicollinearity between predictors, with the unbalanced sample of mothers (45%) and fathers (55%), or with gender differences regarding the distributions of the predictors. The following variables were included as possible predictors: child demographics (age, sex, birth rank), parent demographics (age, education, work status, family situation, work flexibility) and parental dimensions (feeding/general self-efficacy, cooking confidence, descriptive/injunctive norms, motivation for buying food for child: health/preference, concern about child weight, perceived responsibility for feeding). In the models predicting parental feeding practices, the total number of meals taken with the child per week was also included as a possible predictor. For the models predicting parental involvement in child feeding, only the data of parents who were living with a partner were used, as it was assumed that single parents would always be the main responsible person for the feeding related tasks.

In addition, partial least squares (PLS) regressions (R package pls) were performed to obtain a multidimensional overview of the relations between the set of predictors and the set of parental feeding practices while accounting for multicollinearity among predictors and among outcome variables. They provide visual results that help the interpretation of the relationship among the outcome variables, among the predictors, as well as between predictors and outcome variables. PLS regression is a multivariate method between principal component analysis and multiple regression, used to predict a set of outcome variables from a set of predictors, by extracting from the predictors a set of orthogonal components with the best predictive power, that is to say, with the highest covariance with orthogonal linear combinations of outcome variables. For these analyses, all variables were standardised.

The codes used in R for all the analyses can be consulted on Zenodo (https://zenodo.org/record/5786519#.YbteXmjML4Y ; https://doi.org/10.5281/zenodo.5786518), together with the data set generated for this study, and the Danish items used. A metadata file provides information about the published data set and accompanying documents.

3. Results

3.1 Participants

The data of 261 mothers and 321 fathers of children aged 3-6 years (356 boys and 226 girls) was used for the analyses of this study. All parental demographics are presented in Table 1.

Table 1.
Demographics of parents.

	Mothers	**Fathers**
Number of participants	261	321
Age, mean (*SD*)[a]	36.52 (5.74)	38.25 (6.85)
BMI, mean (*SD*)[a]	24.61 (5.27)	25.18 (3.95)
Living with a partner/ single parent [ratios]	0.83 / 0.17	0.88 / 0.12
Number of children, mean[a]	1.82	1.52
Level of education (%):		
Lower secondary education ("Folkeskole")	1	12
Higher secondary education (student, HF, HH, HTX)	7	8
Vocational education (student-apprentice education)	16	11
Short higher studies (less than 2 years)	10	9
Mid-term higher studies (2-4 years)	39	31
Long higher studies (more than 4 years)	25	26
Ph.D	2	3
Work status (%):		
Working full-time	53	87
Working part-time	21	7
Unemployed, job seeker	7	2
Parent at home	6	1
Other (e.g., student)	13	4

[a]Note: There were 2 parents with a missing value for parent age and for number of children. There were also 19 mothers and 68 fathers with a missing value for BMI. If a mother was pregnant, her BMI score was not calculated (coded as a missing value).

3.2 Objective 1: differences between mothers and fathers?

3.2.1 Maternal vs. paternal feeding practices and other parental dimensions

Independent sample *t*-tests indicated that, on average, fathers reported higher levels of the use of emotion regulation, pressure to eat, food as reward, and restriction for health, but lower levels of the use of the practices monitoring, encourage balance and variety, and modelling than mothers (Table 2). *T*-tests also indicated that, on average, fathers reported a higher concern for their child's weight, they reported higher injunctive norms, and a higher work flexibility than mothers did. Mothers reported a higher perceived responsibility for feeding than fathers, they had higher feeding self-efficacy scores, cooking confidence scores and a higher health control motivation when buying food for their child.

Table 2.
Parental feeding practices and other parental dimensions: means, standard deviations, and significance levels of differences between mothers and fathers (independent sample *t*-tests).

	Mothers			Fathers	
Parental feeding practices (scores between 1 and 5), mean (SD):					
Food as reward (food.reward)	2.46	(1.10)	***	3.05	(1.03)
Emotion regulation (emotion.regul)	2.30	(0.89)	***	2.82	(1.08)
Pressure to eat (pressure)	3.03	(0.98)	***	3.36	(0.83)
Restriction for health (restrict.health)	3.14	(1.04)	***	3.45	(0.85)
Child control (control)	3.21	(0.57)		3.21	(0.78)
Monitoring (monitoring)	3.88	(0.79)	*	3.75	(0.76)
Involvement (involvement)	3.43	(0.85)		3.47	(0.89)
Modelling (modelling)	4.11	(0.79)	***	3.79	(0.72)
Encourage balance and variety (encourage)	4.27	(0.64)	***	3.91	(0.67)
Other parental dimensions (scores between 1 and 5), mean (SD):					
Concern about child weight (concern)	1.78	(1.09)	***	2.61	(1.24)
Responsibility for feeding (responsibility)	4.01	(0.70)	***	3.59	(0.70)
Injunctive norms (injunctiv.norm)	3.06	(1.10)	***	3.38	(0.87)
Descriptive norms (descriptive.norm)	3.67	(0.81)		3.78	(0.76)
Feeding self-efficacy (feed.efficacy)	4.07	(0.68)	***	3.89	(0.60)
General self-efficacy (self.efficacy)	3.87	(0.69)		3.80	(0.58)
Cooking confidence (cook.efficacy)	4.23	(0.87)	***	3.80	(0.90)
Motivation for buying food for child: health control (motiv.health)	4.00	(0.58)	**	3.81	(0.66)
Motivation for buying food for child: child preference (motiv.preference)	3.72	(0.62)		3.63	(0.67)
Employer support work flexibility (work.flexibility)	3.38	(0.82)	**	3.59	(0.81)

Significance levels: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

3.2.2 Maternal vs. paternal involvement in feeding related tasks

The majority of mothers and fathers in this sample indicated that they were mainly responsible for planning, buying and cooking meals in their household and for eating with the child (Table 3). Chi-squared tests showed significant differences between mothers and fathers, because many more fathers than mothers indicated that their partner is the main responsible person for a feeding related task or the best cook at home. Chi-squared tests also showed that fathers reported taking significantly more lunches with their child than did mothers. No differences were found between mothers and fathers regarding the number of breakfasts and dinners taken with their pre-schooler.

Table 3.
Mothers and fathers describing who is mainly responsible for different feeding related tasks in their household, frequencies of buying and cooking food, number of meals taken with the child., and significance levels of differences between mothers and fathers (Chi-squared tests).

	Mothers		Fathers
Plan meals (%)[a]:		***	
Mainly me	69		51
Mainly my partner	8		26
Someone else	0		1
Shared responsibility	23		22
Buy meals (%)[a]:		***	
Mainly me	62		50
Mainly my partner	9		24
Someone else	0		2
Shared responsibility	29		3
Buying frequency (%):		*	
More than once per week	58		60
Once per week	36		30
1-3 times per month	5		10
Less than once per month	1		1
Cook meals (%)[a]:		***	
Mainly me	65		52
Mainly my partner	14		26
Someone else	0		2
Shared responsibility	20		20
Cooking frequency (%):		***	
Every day	62		38
4-6 times per week	31		40
1-3 times per week	6		17
1-3 times per month	2		4
Less than once per month	0		2
Best cook (%)[a]:		***	
Me	57		47
My partner	16		36
Someone else	0		0
Equally good	27		16
Eat with child (%)[a]:		***	
Mainly me	43		38
Mainly my partner	3		17
Someone else	1		2
Shared responsibility	53		43
Number of meals (0-7), mean (SD):			
Number of breakfasts per week	5.64 (1.98)		5.64 (1.86)
Number of lunches per week	3.33 (2.05)	***	4.65 (2.25)
Number of dinners per week	6.53 (1.50)		6.18 (1.38)

Significance levels Chi-squared tests: * $p < 0.05$; *** $p < 0.001$
[a]For plans meals, buy meals, cook meals, best cook and eat with child, the ratios are only calculated for those parents living with a partner (217 mothers and 282 fathers).

3.2.3 Correlations between the different dimensions measured for parents

Figure 2 shows a graphic representation of the Spearman correlation matrixes in mothers and fathers separately. They show many significant correlations among parental feeding practices, among other parental variables, and between both sets of variables. Although they show similar patterns, differences exist between mothers and of fathers. For example, for fathers (F), the upper left corner of the matrix is coloured darker blue (indicating stronger positive correlations, e.g., between descriptive/injunctive norms and pressure to eat or restriction for health) than for mothers. For mothers (M), concern, emotion regulation, food as reward are negatively correlated with cooking confidence, feeding/ general self-efficacy, responsibility, monitoring, encourage and modelling (coloured orange) while both sets of variables show no correlation for fathers (coloured white).

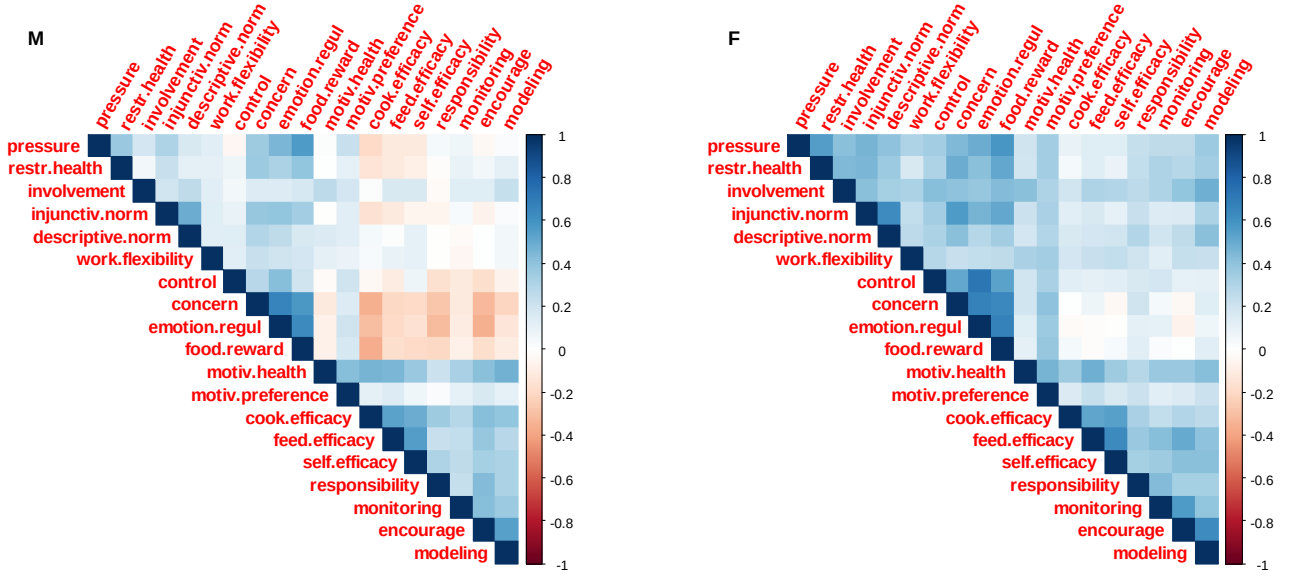

Figure 2. Graphical display of Spearman correlation matrixes for mothers (M) and fathers (F). Correlations range from dark blue (r = 1) to dark red (r = -1). The full names of the variables can be consulted in Table 2.

3.3 Objective 2: predictors of parental feeding practices and involvement in feeding related tasks

3.3.1 Predictors of parental feeding practices

Food as reward was significantly positively predicted by concern about child weight (strongest predictor; t = 12.97), motivation for child preference, and injunctive norms, and negatively predicted by child birth rank (lower in parents of younger siblings vs. first-born), work status (lower in parents working part-time vs. full-time), and feeding self-efficacy. No interaction effect with parent sex was observed. This model explained 48% of the variance (see Table 4 for all values).

Emotion regulation was significantly positively predicted by concern about child weight (strongest predictor; t = 12.16), motivation for child preference, injunctive norms, and work status (higher for middle education vs. lower education), and negatively predicted by parent BMI, perceived responsibility for feeding, child birth rank (lower in younger siblings vs. first born), feeding self-efficacy, and child sex (lower in parents of girls vs. boys). No interaction effect with parent sex was observed. This model explained 51% of the variance (see Table 4 for all values).

Pressure to eat was significantly positively predicted by injunctive norms (strongest predictor; t =4.61), motivation for child preference, concern about child weight, perceived responsibility for feeding, and child age, and negatively by parent sex (lower in mothers vs. fathers) and parent BMI. An interaction effect with parent sex was observed for cooking confidence: it had a significant negative effect in mothers and no effect in fathers. This model explained 51% of the variance (see Table 4 for all values).

Restriction for health was significantly positively predicted by concern about child weight (strongest predictor; t = 9.33), perceived responsibility for feeding, and injunctive norms. No interaction effect with parent sex was observed. This model explained 23% of the variance (see Table 4 for all values).

Child control was significantly positively predicted by concern about child weight (strongest predictor; t = 8.09), parent sex (higher in mothers vs. fathers), general self-efficacy, motivation for child preference, and work flexibility, and negatively predicted by the child's birth rank (lower in parents of younger siblings vs. first-born). No interaction effect with parent sex was observed. This model explained 26% of the variance (see Table 4 for all values).

Table 4. Regressions to explain parental feeding practices (outcome variable: controlling feeding practices: food as reward, emotion regulation, pressure to eat, restriction for health, child control) by other parent and child dimensions (predictors).

	Estimate	Std. Error	*t*	*p*
Food as reward	(*n*=582, R^2=0.48)			
Intercept [full time, first born]	2.94	0.05	62.45	**<0.001**
work [part-time]	-0.32	0.10	-3.17	**0.002**
work [other]	-0.09	0.13	-0.67	0.500
work [no work]	-0.21	0.14	-1.52	0.130
rank [other]	-0.27	0.07	-3.58	**<0.001**
concern	0.43	0.03	12.97	**<0.001**
injunctiv.norm	0.13	0.04	3.32	**0.001**
feed.efficacy	-0.16	0.05	-3.06	**0.002**
motiv.preference	0.20	0.06	3.67	**<0.001**
Emotion regulation	(*n*=495, R^2=0.51)			
Intercept [low education, boy, first born]	2.55	0.07	35.28	**<0.001**
education [middle]	0.19	0.08	2.47	**0.014**
education [high]	0.05	0.09	0.56	0.576
BMI.p	-0.03	0.01	-4.78	**<0.001**
sex.child [girl]	-0.14	0.06	-2.19	**0.029**
rank [other]	-0.19	0.07	-2.80	**0.005**
concern	0.38	0.03	12.16	**<0.001**
responsibility	-0.15	0.04	-3.37	**0.001**
injunctiv.norm	0.11	0.03	3.11	**0.002**
feed.efficacy	-0.13	0.05	-2.57	**0.011**
motiv.preference	0.20	0.05	3.82	**<0.001**
Pressure to eat	(*n*=495, R^2=0.22)			
Intercept	3.29	0.05	60.66	**<0.001**
sex.p [mother]	-0.16	0.08	-2.00	**0.046**
BMI.p	-0.02	0.01	-1.99	**0.047**
age.c	0.08	0.04	2.25	**0.025**
concern	0.11	0.04	2.95	**0.003**
responsibility	0.14	0.06	2.54	**0.011**
injunctiv.norm	0.19	0.04	4.61	**<0.001**
motiv.preference	0.24	0.06	3.85	**<0.001**
sex.p*cook.efficacy[a]	-0.17	0.08	-2.03	**0.043**
cook.efficacy [mother]	-0.19	0.07	-2.93	**0.004**
cook.efficacy [father]	-0.02	0.06	-0.37	0.710
Restriction for health	(*n*=582, R^2=0.23)			
Intercept	3.31	0.03	96.00	**<0.001**
concern	0.30	0.03	9.33	**<0.001**
responsibility	0.12	0.05	2.50	**0.013**
injunctiv.norm	0.14	0.04	3.39	**0.001**
Child control	(*n*=582, R^2=0.26)			
Intercept [father, boy, first-born]	3.25	0.04	76.55	**<0.001**
sex.p [mother]	0.20	0.05	3.74	**<0.001**
sex.child [girl]	-0.11	0.05	-2.09	**0.037**
rank [other]	-0.24	0.06	-4.40	**<0.001**
concern	0.19	0.02	8.09	**<0.001**
self.efficacy	0.13	0.04	3.23	**0.001**
motiv.preference	0.13	0.04	3.03	**0.003**
work.flexibility	0.08	0.03	2.54	**0.011**

[a] Interaction parameter. The two lines below report the two slopes (for mothers and for fathers respectively).
Significant *p*-values (<0.05) are in bold. The full names of the dimensions can be found in Table 2.
Note. Number of participants (*n*) may differ due to missing values for parental BMI.

Monitoring was significantly positively predicted by motivation for health control (strongest predictor; t = 6.14), general self-efficacy, parent age, and work status (higher in parents without employment vs. full-time working parents). An interaction effect with parent sex was observed for perceived responsibility for feeding: it was a stronger predictor for explaining fathers' use of monitoring than for mothers' use, although it was significant for both. This model explained 24% of the variance (see Table 5 for all values).

Involvement was significantly positively predicted by motivation for health control (strongest predictor; t = 6.96), injunctive norms, general self-efficacy, and concern about child weight, and negatively predicted by parent age and parent BMI. An interaction effect with parent sex was observed for age child: it had a significant positive effect in mothers, and no effect in fathers. This model explained 22% of the variance (see Table 5 for all values).

Modelling was significantly positively predicted by general self-efficacy and perceived responsibility for feeding (two strongest predictors; both t = 3.81), by child birth rank (higher in parents of younger siblings vs. first-born), injunctive norms, and parent sex (higher in mothers vs. fathers), and negatively predicted by concern for child weight and child sex (lower in parents of girls vs. boys). An interaction effect with parent sex was observed for descriptive norms and for motivation for health control: descriptive norms had a significant positive effect in fathers and no effect in mothers; motivation for health control effect was stronger in mothers than in fathers, although it was significant for both. This model explained 38% of the variance (see Table 5 for all values).

Encourage balance and variety was significantly positively predicted by motivation for health control (strongest predictor; t = 6.12), feeding self-efficacy, parent BMI, and child sex (higher in parents of girls vs. boys), and negatively predicted by concern about child weight. An interaction effect with parent sex was observed for descriptive norms and for perceived responsibility for feeding: descriptive norms had a significant positive effect in fathers and no effect in mothers; perceived responsibility effect was stronger in mothers than in fathers, although it was significant for both. This model explained 40% of the variance (see Table 5 for all values).

Table 5. Regressions to explain parental feeding practices (outcome variable: structure and autonomy support practices: monitoring, involvement, modelling, encourage balance and variety) by other parent and child dimensions (predictors).

	Estimate	Std. Error	*t*	*p*
Monitoring	(n=580, R^2=0.24)			
Intercept [father, full time]	3.74	0.05	69.07	**<0.001**
motiv.health	0.31	0.05	6.14	**<0.001**
sex.p [mother]	0.08	0.06	1.17	0.241
self.efficacy	0.15	0.05	2.93	**0.004**
age.p	0.01	0.00	2.48	**0.014**
work [part-time]	0.08	0.09	0.88	0.379
work [other]	0.15	0.11	1.30	0.194
work [no work]	0.37	0.12	3.16	**0.002**
sex.p*responsibility[a]	0.21	0.08	2.56	**0.011**
responsibility [mother]	0.14	0.06	2.19	**0.029**
responsibility [father]	0.35	0.06	6.10	**<0.001**
Involvement	(n=494, R^2=0.22)			
Intercept [father]	3.45	0.05	71.18	**<0.001**
sex.p [mother]	0.01	0.07	0.12	0.904
age.p	-0.02	0.01	-2.62	**0.009**
BMI.p	-0.02	0.01	-2.56	**0.011**
concern	0.08	0.03	2.39	**0.017**
injunctiv.norm	0.13	0.04	3.48	**0.001**
self.efficacy	0.15	0.06	2.47	**0.014**
motiv.health	0.43	0.06	6.96	**<0.001**
sex.p*age.c[a]	0.18	0.07	2.67	**0.008**
age.c [mother]	0.18	0.05	3.66	**<0.001**
age.c [father]	-0.00	0.05	-0.03	0.975
Modelling	(n=582, R^2=0.38)			
Intercept [father, boy, first-born]	3.85	0.04	86.23	**<0.001**
sex.p [mother]	0.16	0.06	2.78	**0.006**
sex.child [girl]	-0.15	0.05	-2.81	**0.005**
rank [other]	0.17	0.06	2.95	**0.003**
concern	-0.08	0.03	-3.18	**0.002**
responsibility	0.15	0.04	3.81	**<0.001**
injunctiv.norm	0.10	0.03	2.87	**0.004**
self.efficacy	0.17	0.05	3.81	**<0.001**
sex.p*descriptive.norm[a]	-0.31	0.07	-4.68	**<0.001**
descriptive.norm [mother]	-0.03	0.05	-0.65	0.52
descriptive.norm [father]	0.28	0.05	5.32	**<0.001**
sex.p*motiv.health[a]	0.22	0.09	2.56	**0.011**
motiv.health [mother]	0.53	0.07	7.65	**<0.001**
motiv.health [father]	0.31	0.06	5.58	**<0.001**
Encourage balance and variety	(n=495, R^2=0.40)			
Intercept [father, boy]	3.97	0.04	97.45	**<0.001**
sex.p [mother]	0.09	0.05	1.68	0.094
BMI.p	0.01	0.01	2.54	**0.011**
sex.child [girl]	0.12	0.05	2.37	**0.018**
concern	-0.10	0.02	-4.32	**<0.001**
feed.efficacy	0.21	0.04	4.76	**<0.001**
motiv.health	0.28	0.05	6.12	**<0.001**
sex.p*descriptive.norm[a]	-0.17	0.06	-2.74	**0.006**
descriptive.norm [mother]	0.02	0.04	0.53	0.59
descriptive.norm [father]	0.19	0.05	4.20	**<0.001**
sex.p*responsibility[a]	0.15	0.07	2.17	**0.030**
responsibility [mother]	0.26	0.05	5.15	**<0.001**
responsibility [father]	0.11	0.05	2.14	**0.033**

[a] Interaction parameter. The two lines below report the two slopes (for mothers and for fathers respectively).
Significant *p*-values (<0.05) are in bold. The full names of the dimensions can be found in Table 2.
Note. Number of participants (*n*) may differ due to missing values for parental age, work status and BMI.

The partial least squares regression (Figure 3) showed which parental feeding practices (in red) cluster together, which predictors (in black) cluster together, and which predictors relate to which feeding practices. This can be observed in the figure by the proximity of these variables to each other (at least for those which are far from the barycentre) which reflects a visualization of the loadings on the first and second component. The results showed that the first component (horizontal axis in Figure 3) is an opposition between emotion regulation (36% of the variance explained) and food as reward (30% of the variance explained) (and to a lesser extent: restriction for health, pressure to eat, and child control; < 20% of the variance explained) on the negative (left) side, and encourage balance and variety (23% of the variance explained) (and to a lesser extent: monitoring and modelling; < 20% of the variance explained) on the positive (right) side. So, positive values on the first component are linked with a low use of emotion regulation and food as reward, and a high use of encourage balance and variety. Such positive values are linked with low concern for child weight (strongest predictor, loading = -0.52; see Table 6) and high cooking confidence, feeding and general self-efficacy and high perceived responsibility for child feeding (loadings = 0.34, 0.32, 0.26, 0.30, respectively).

Low values on the second component (vertical axis in Figure 3) were linked with a high use of involvement (20% of the variance explained) and, to a lesser extent, with a high use of modelling (16% of the variance), and predicted by high levels of motivation for health control (loading = -0.459) but also high values for all other dimensions.

Regarding parent and child sociodemographic characteristics, the first component (horizontal axis in Figure 3) shows a higher use of encouragement for balance and variety and a lower use of food as reward and emotion regulation in mothers compared to fathers, but also for younger siblings compared to the first-born.

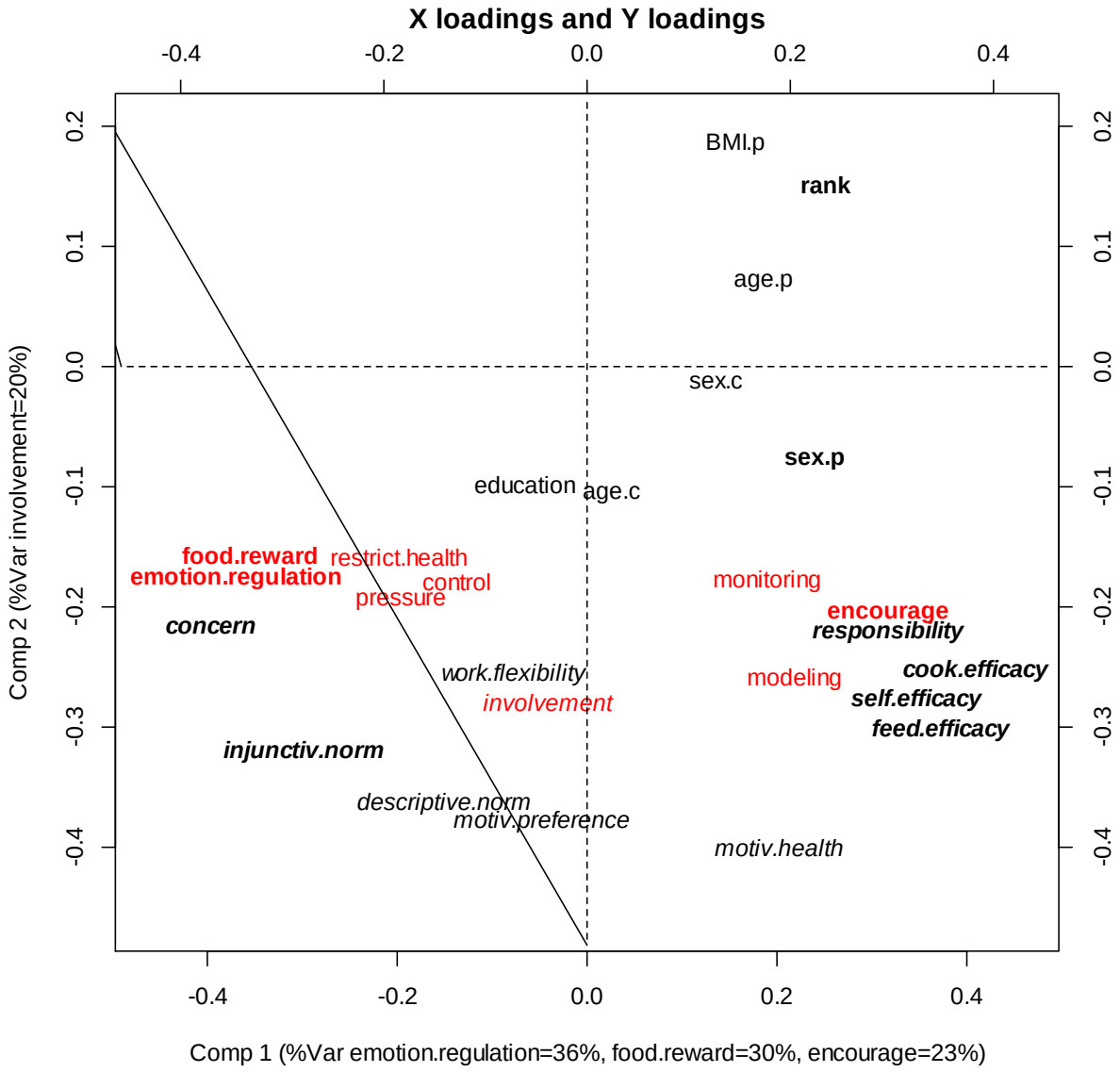

Figure 3. PLS regression to explain parental feeding practices (outcome variables; in red) by a set of predictors (in black). Projection on the first and second component. Outcome variables of which the percentage of variance explained is higher than 0.20 on the first (resp. second) component are in bold (resp. italic). Predictors with a loading weight higher than 0.20 on the first (resp. second) component are also in bold (resp. italic). The loadings of predictors and full names of the dimensions can be found in Table 6.

Table 6. Loadings of predictors for Component 1 (horizontal axis of Figure 3) and for Component 2 (vertical axis of Figure 3).

Predictor	Loading on Component 1	Loading on Component 2
Age parent (age.p)	0.15	0.06
Sex parent (sex.p)	**0.23**	-0.08
Level of education (education)	-0.07	-0.07
Body mass index parent (BMI.p)	0.19	0.18
Sex child (sex.child)	0.13	-0.00
Age child (age.c)	-0.04	-0.11
Birth order (rank)	**0.24**	0.11
Concern about child weight (concern)	**-0.52**	**-0.24**
Perceived responsibility for feeding (responsibility)	**0.30**	**-0.26**
Injunctive norms (injunctiv.norm)	**-0.29**	**-0.32**
Descriptive norms (descriptive.norm)	-0.11	**-0.32**
Feeding self-efficacy (feed.efficacy)	**0.32**	**-0.26**
General self-efficacy (self.efficacy)	**0.26**	**-0.28**
Motivation for health (motiv.health)	0.19	**-0.46**
Motivation for preference (motiv.preference)	-0.14	**-0.38**
Work flexibility (work.flexibility)	-0.13	**-0.24**
Cooking confidence (cook.efficacy)	**0.34**	**-0.21**

Note. Loadings higher than |0.20| are in bold.

3.3.2 Predictors of parental involvement in child feeding

Little variance was explained by the models predicting different aspects of parental involvement in child feeding (R^2 ranging between 2% and 12%), except for the models explaining plan meals (R^2=17%) and cooking frequency (R^2=21%). Therefore, only the results of these last models will be described here; the results of the other models can be found in Appendix 2.

Plan meals was significantly positively predicted by concern about child weight (strongest predictor; t = 4.83; see Table 7), perceived responsibility for feeding, parent sex (higher in mothers vs. fathers). An interaction effect with parent sex was observed for child sex: in fathers, having a girl negatively predicted involvement in planning meals while there was no effect of child sex in mothers.

Cooking frequency was significantly positively predicted by parent sex (higher in mothers vs. fathers; see Table 7). An interaction effect with parent sex was observed for perceived responsibility for feeding, motivation for health control, and work status: perceived responsibility for feeding had a significant positive effect in fathers and no effect in mothers; motivation for health control had a significant positive effect in mothers and no effect in fathers. Not working significantly positively predicted cooking frequency in mothers (compared to mothers working full-time) while not working significantly negatively predicted cooking frequency in fathers (compared to fathers working full-time).

Table 7. Regressions to explain parental involvement in child feeding (outcome variable: plan meals, cooking frequency) by other parent and child dimensions (predictors).

	Estimate	Std. Error	*t*	*p*
Plan meals	(*n*=498, R^2=0.17)			
Intercept [father]	2.32	0.06	42.08	**<0.001**
concern	0.14	0.03	4.83	**<0.001**
responsibility	0.16	0.05	2.97	**0.003**
cook.efficacy	0.08	0.04	1.99	**0.047**
sex.p [mother]	0.28	0.09	2.93	**0.004**
sex.p*sex.c[a]	0.40	0.14	2.84	**0.005**
sex.c [mother]	0.06	0.10	0.60	0.550
sex.c [father]	-0.34	0.10	-3.43	**0.001**
Cooking frequency	(*n*=498, R^2=0.21)			
Intercept [father, full time]	4.10	0.05	82.58	**<0.001**
sex.p [mother]	0.33	0.09	3.67	**<0.001**
sex.p*responsibility[a]	-0.39	0.11	-3.38	**0.001**
responsibility [mother]	0.13	0.09	1.48	0.140
responsibility [father]	0.51	0.08	6.83	**<0.001**
sex.p*motiv.health[a]	0.26	0.12	2.14	**0.033**
motiv.health [mother]	0.29	0.09	3.02	**0.003**
motiv.health [father]	0.03	0.08	0.34	0.731
sex.p* no work[a]	1.33	0.43	3.09	**0.002**
no work [mother]	0.40	0.17	2.31	**0.021**
no work [father]	-0.93	0.39	-2.35	**0.019**

[a] Interaction parameter. The two lines below report the two slopes (for mothers and for fathers respectively).
Significant *p*-values (<0.05) are in bold.

4. Discussion

This study aimed to study Danish parents' feeding practices, their involvement in feeding related tasks, and possible predictors of these practices and parental involvement.

First, this study showed that many mothers and fathers in this sample declare to be highly involved in feeding their child. One-fourth of fathers reported that their partner is primarily responsible for most feeding related tasks, but otherwise both the majority of mothers and fathers living with a partner declared to be mainly responsible at home for planning meals, buying meals and cooking meals, and that they are the best cook at home. For eating with the child, the majority either say that they are mainly responsible or that the responsibility is equally shared. Even though mothers and fathers in this sample are unrelated and it is known that Danish men are often involved in household tasks (Craig & Mullan, 2010; Eurofound, 2018), these findings are remarkable. We would expect to observe more complementary findings between mothers and fathers (e.g., if the majority of mothers indicate they are mainly responsible for a task, we would also expect the majority of fathers to indicate that their partner is mainly responsible for this task or vice versa). To illustrate, a recent study with couples in France found that mothers were mainly responsible for cooking in most households, while it was often a shared responsibility to buy food and especially to eat with the child (Philippe et al., 2021). In this study, mothers and fathers showed a high agreement rate (compatible answers) about the division of responsibilities. Nevertheless, the observed phenomenon in the current study in Denmark is not uncommon either. A survey by Gullup about the division of household tasks in the US also demonstrated that interviewed men and women were each more likely to say that they personally perform an equal or larger share of the work than their partner does (Brenan, 2020). This discrepancy may possibly by explained by the "better-than-average-effect" (Folkes & Kiesler, 1991; Myers & Ridl,

1979); parents may perceive that they do more or better than their partner. This hypothesis has also been put forward about Danish parents' contrasting perceptions about their green consumer behaviour at home (Grønhøj & Ölander, 2007). Alternatively, it is also possible that those fathers who are highly involved in feeding their child are overrepresented in the study sample.

Furthermore, it was also surprising that fathers took significantly more lunches with their child than mothers. Different hypotheses may be put forward to explain this result. Again, a sample bias may play a role, but also the COVID-19 pandemic that took place during the data collection may have influenced our results: fathers may have worked from home more often, which can be supported by the observation that fathers in this sample reported greater work flexibility than mothers. Another possible explanation could be that fathers answered this specific question less carefully than mothers and did not take into account that their child eats at school on weekdays.

Second, the comparative analyses showed that fathers used significantly higher levels of so-called coercive control practices (emotion regulation, pressure to eat, restriction for health, food as reward) than mothers and lower levels of so-called structure practices (monitoring, modelling) and autonomy support practices (encourage balance and variety). Coercive control practices are feeding practices that are rather parent-centred, serving parents' goals and desires, and these practices have mainly been linked to less favourable outcomes in the child, both in mothers and fathers (Philippe et al., 2021, reviews by Litchford et al., 2020; Vaughn et al., 2016). In contrast, structure practices and autonomy support practices offer structure and encouragement to children and facilitate their competences and independence (Vaughn et al., 2016). Previous research has already shown that fathers use higher levels of coercive control practices (review by Khandpur et al., 2014; Philippe et al., 2021), the current results now also extend this to the setting of Denmark. It is interesting, however, to point out that the differences were quite small in absolute numbers: in the region of 0.5 on a scale from 0 to 5. Nevertheless, they indicate that it may be important to help fathers in limiting the use of these coercive practices in favour of the use of more supportive feeding practices in order to create a positive, structured feeding environment for the child that stimulates their autonomy and healthy eating.

This study also identified some variables that predict the use of these parental feeding practices. In the regressions, motivation for health control was the strongest predictor for all structure and autonomy support practices. Concern for child weight and motivation for child preference were the strongest predictors for the coercive control practices. Additionally, the PLS regressions indicated that a low concern for child weight and a high parental cooking confidence, feeding self-efficacy, general self-efficacy and perceived responsibility for feeding were linked with a higher use of encourage balance and variety and a lower use of emotion regulation and food as reward. In short, a higher concern for child weight and motivation for child preference were linked to less favourable feeding practices while a higher motivation for health control, confidence/self-efficacy and perceived responsibility for feeding were linked to more favourable feeding practices.

Mallan et al. (2014) have previously also shown that a higher concern for child weight was linked with a higher use of pressure and restriction. It would be interesting to study why certain parents are more concerned by their child's weight than others, especially knowing that most pre-schoolers (still) have a healthy weight before the adiposity rebound around age 6 years (Rolland-Cachera et al., 2006), and how to reduce this concern. Contrary to our expectation, we also observed that fathers in this study showed a higher concern than mothers. This could possibly be explained by a bias of sampling; fathers participating in a study on eating behaviours may be particularly concerned by children's eating.

Alternatively, it should be checked whether there are other aspects that can explain the observed relationship between parental concern and parental coercive control practices.

Further, the comparative tests showed that mothers reported higher levels of cooking confidence and feeding self-efficacy than fathers, intervention studies could examine whether increasing these in both mothers and fathers could also stimulate a higher involvement in feeding and the use of more favourable feeding practices. This idea can be supported by the results of a qualitative study of Jansen et al. (2020). They found that Australian fathers' perceived incompetence in cooking and meal planning acted as a barrier for their involvement in family meals and food labour.

Finally, changing parental motivations/attitudes when buying food for the child could also be a window of opportunity to promote the use of more favourable practices. Parents who are more concerned by child preferences are likely to be focusing on satisfying the child in the short-term (e.g., by using foods to reward children or to regulate their emotions at that moment), while more health-centred parents are likely more focused on long-term benefits for the child (Rigal et al., 2019). Thus, in line with the ideas of Bandura's social cognitive theory (1986), our results seem to indicate that parental motivations may play an important role in their behaviour (feeding practices).

In addition, it is also interesting to point out that a stronger perception of injunctive norms in mothers and fathers predicted a higher use of both – less favourable – coercive control practices and – more favourable – structure and autonomy support practices. This may suggest that perceiving expectations to be highly involved in child feeding (high injunctive norms scores) does not necessarily stimulate these parents to use "the right" types of feeding practices. Parents generally have good intentions when using feeding practices and they may not be aware that the use of coercive control practices can have counterproductive effects on the child. Thus, they may need some guidance in their choice of appropriate practices. Furthermore, it is also interesting that a stronger perception of descriptive norms predicted a higher use of modelling and encourage balance and variety, but only in fathers. Seeing other parents being involved in child feeding may thus also possibly help fathers to use appropriate practices.

The regression analyses further showed that little variance was explained by the models predicting different aspects of parental involvement in child feeding. Based on the social cognitive theory of Bandura (1986) and the four factor model of fathers' involvement (Lamb, 1987), it was, however, expected that especially social support variables and institutional practices (injunctive and descriptive social norms, employer's support for work flexibility, work status), and parental skills/self-efficacy would significantly contribute to their involvement. Only cooking frequency was found to be significantly predicted by parents' work status, in line with the results of Etilé and Plessz (2018). Instead, perceived responsibility for feeding and concern about child weight were the most common significant predictors for parental involvement. Like the study of Mallan et al. (2014), we observed that, especially in fathers, a higher perceived responsibility for feeding was positively related to parents' involvement in feeding related tasks. Qualitative studies with parents could be useful to explore in more depth which factors contribute to parents' and especially fathers' involvement in child feeding. These results could also contribute to the development of new theories or the adaptation of existing theories with a specific focus on the setting of child feeding. They can in turn provide a framework that can support and stimulate future research.

5. Strengths and limitations

Some limitations must be noted for this study. First, the data-collection took place during the COVID-19 pandemic in spring 2021. Despite the fact that parents were asked to describe whether and how their answers in this questionnaire deviated due to the COVID-19 restrictions in Denmark, it is difficult to estimate to what extent this situation really gives a distorted picture of parents' habitual practices and especially their involvement in child feeding. Deviating work and school situations in particular may have contributed to this. It is therefore important to keep this context in mind when interpreting the results. By contrast, it is likely that the pandemic will have a lasting impact on certain (food) habits and work situations (e.g., working from home more often), further research is required to clarify this in the future. A second limitation may be the slightly unbalanced sample of mothers (N=261, 45%) and fathers (N=321, 55%), which should be limited when comparing groups. However, precautions were taken during the analyses to ensure this was not an issue. Third, as mentioned previously, it is also possible that those parents who are generally interested in feeding and are involved at home are overrepresented in this study (selection bias), especially for fathers, even though the characteristics of the parents are quite diverse in this study. Fourth, all data used for this study were self-reported by parents. It is therefore possible that they do not reflect their actual involvement, feeding practices and weight, but their perceptions. Their answers may also be influenced by social desirability. Fifth, even though the financial benefits were low, participants were rewarded for questionnaire completion with points by the recruitment agency. No extensive analyses were conducted to identify possible "fake answers". Though some data cleaning was performed, we cannot exclude that some participants did not carefully answer all questions. Last, the cross-sectional design of this study does not allow to make statements about causality. Longitudinal research is necessary for this.

This study also presents several strengths. First, despite the slightly unbalanced sample, the large sample size of mothers and especially fathers is certainly a strength of this study. Studies with fathers about child feeding are rather rare and have often been performed with small sample sizes (Khandpur et al., 2014; Litchford et al., 2020). Moreover, the current study is one of the few studies that provides insight into parent-related predictors of fathers' feeding practices. It also provides insight into feeding practices used by parents in Denmark and their involvement in feeding related tasks, which has been little researched to date.

6. Perspectives

To overcome the limitations presented above, a few suggestions for future research are presented here. First, it would be interesting to replicate this study with a large and diverse sample at a time point when the COVID-19 pandemic is stabilized, and parents and children have stable work/school habits again. This will allow to compare and evaluate the impact of the pandemic on the current results, especially on parental involvement in feeding related tasks and the number of meals taken with the child. Moreover, it would be interesting to combine self-reported measures with observational measures to more properly collect data on parents' actual involvement and practices, and to further validate the questionnaires. It would also be preferable if the involved researchers weigh and measure participants in a standardized way, to be able to obtain correct BMI values and to avoid missing data (which was the case for 87 participants in this study). Second, including mother-father dyads could be an interesting method to compare mothers' and fathers' reports about their involvement in child

feeding and their practices. This could also counter the possibility that differences in practices between mothers and fathers observed in this study are not necessarily linked to gender differences but could be due to reports on different children with different eating temperaments/behaviours that influence parental feeding practices. Third, if opted for self-report measures, the use of careful data screening techniques is recommended. Last, it could be interesting to conduct cluster analyses to explore if different 'types' of fathers and mothers exist that use higher or lower levels of certain feeding practices. This could allow to target certain groups of mothers and fathers who may benefit of guidance to stimulate more favourable feeding practices at home.

7. Conclusions

Using a large sample of mothers and fathers, this study identified gender differences in parental feeding practices in Denmark and predictors of parental feeding practices and parental involvement in child feeding. Fathers tend to use higher levels of coercive control practices, while mothers use higher levels of structure and autonomy support practices. In order to help parents in limiting the use of coercive practices and stimulate the use of structure and autonomy support practices, it may be of interest to focus on limiting parents' concern about child weight (or to study where this concern originates from), to enhance parents self-efficacy (cooking/feeding/general) and to stimulate a health-centred motivation when buying food for the child instead of accommodating the child's preferences. Since this study used an explorative approach, additional research is required to confirm the predictors of parental involvement in feeding and parental feeding practices identified in this study. This is needed to be able to develop possible targeted guidance and interventions for mothers and fathers.

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Authors Contributions

KP, SI, SM-P, AG, JA-W conceptualized the study. KP and CC conducted all analyses. KP drafted a first version of the manuscript, all authors thereafter contributed to editing the manuscript. All authors read and approved the final version of the manuscript.

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Appendix 1. Cronbach's alphas for parental feeding practices and other parental dimensions

Dimension (number of items)	Cronbach's α full sample (n=582)	Cronbach's α mothers (n=261)	Cronbach's α fathers (n=321)
Parental feeding practices:			
Monitoring (4 items)	0.82	0.82	0.82
Child control (5 items)	0.72	0.54	0.81
Emotion regulation (3 items)	0.87	0.85	0.86
Encourage balance and variety (4 items)	0.73	0.72	0.70
Involvement (3 items)	0.67	0.63	0.71
Pressure to eat (4 items)	0.76	0.77	0.74
Food as reward (3 items)	0.79	0.79	0.77
Restriction for health (4 items)	0.79	0.81	0.77
Teaching about nutrition (3 items)[a]	0.36	0.26	0.47
Modeling (4 items)	0.78	0.79	0.74
Other parental dimensions:			
Concern about child weight (3 items)	0.92	0.91	0.91
Perceived responsibility for feeding (3 items)	0.75	0.76	0.71
Injunctive norms (4 items)	0.88	0.91	0.83
Descriptive norms (5 items)	0.82	0.82	0.83
Feeding self-efficacy (5 items)	0.80	0.81	0.78
General self-efficacy (4 items)	0.80	0.87	0.72
Motivation for buying food for child: health control (3 items)	0.72	0.73	0.70
Motivation for buying food for child: child preference (3 items)	0.71	0.66	0.70
Employer support work flexibility (3 items)	0.71	0.67	0.74

[a]Note: Cronbach's alphas for the dimension Teaching about nutrition were very low, therefore this dimension was not included in all subsequent analyses.

Appendix 2. Regressions to explain parental involvement in child feeding (outcome variable: plan meals, cooking frequency) by other parent and child dimensions (predictors).

	Estimate	Std. Error	*t*	*p*
Buy meals	(*n*=498, R^2=0.08)			
Intercept [father]	2.27	0.05	49.43	**<0.001**
sex.p [mother]	0.26	0.07	3.71	**<0.001**
age.c	0.09	0.03	2.60	**0.010**
self.efficacy	-0.11	0.06	-1.98	**0.048**
sex.p*responsibility[a]	-0.29	0.11	-2.73	**0.006**
responsibility [mother]	-0.00	0.08	-0.02	0.987
responsibility [father]	0.29	0.07	4.07	**<0.001**
Buying frequency	(*n*=498, R^2=0.02)			
Intercept	3.49	0.03	116.76	**<0.001**
responsibility	0.13	0.04	3.00	**0.003**
Cook meals	(*n*=498, R^2=0.10)			
Intercept [father]	2.23	0.05	46.32	**<0.001**
sex.p [mother]	0.29	0.08	3.48	**<0.001**
concern	0.13	0.03	4.51	**<0.001**
responsibility	0.22	0.05	4.11	**<0.001**
Eat with child	(*n*=498, R^2=0.12)			
Intercept [father]	2.14	0.04	54.16	**<0.001**
sex.p [mother]	0.29	0.06	4.59	**<0.001**
concern	0.15	0.02	6.07	**<0.001**
responsibility	0.17	0.05	3.51	**<0.001**
cook.efficacy	-0.07	0.03	-2.03	**0.043**
Total number of meals	(*n*=415, R^2=0.07)			
Intercept [father, low education]	17.09	0.47	36.34	**<0.001**
sex.p [mother]	-0.91	0.42	-2.19	**0.029**
education [middle]	-0.54	0.52	-1.05	0.297
education [high]	-1.58	0.57	-2.76	**0.006**
BMI.p	-0.12	0.05	-2.62	**0.009**
cook.efficacy	0.59	0.23	2.62	**0.009**
work.flexibility	0.72	0.26	2.78	**0.006**

[a] Interaction parameter. The two lines below report the two slopes (for mothers and for fathers respectively).
Significant *p*-values (<0.05) are in bold.

CHAPTER VII. General discussion

Early childhood is known as a challenging period for feeding, as it is characterized by a peak in children rejecting food (Dovey et al., 2008; Nicklaus & Monnery-Patris, 2018) and a deterioration of children's capacity to self-regulate their intake (Birch et al., 2003). Moreover, early childhood is an important period for feeding, as eating habits established early in life can track into adolescence and adulthood (Nicklaus et al., 2005; Nicklaus & Remy, 2013). If we want to promote healthy eating habits in people, it can thus be effective to start early and to stimulate healthy eating behaviours in children from an early age.

According to Bronfenbrenner (1979), a person's development results from the complex interplay between an individual and its environment. We can therefore also assume that the development of children's eating behaviours is influenced by factors within the child (e.g., temperamental traits) and in the child's environment; in the direct environment but also in more distal, indirect systems around the child.

In this doctoral project, special attention was dedicated to the influence of parents (who are part of children's microsystem), as parents are believed to play a key role in the development of children's eating preferences and behaviours (Birch, 1999). From the literature, we identified gaps with regard to the role of fathers in feeding, parental portioning practices and cultural influences. Results of studies conducted in one country may not automatically be generalized to other countries. The overall goal of this doctoral project was therefore to gain more insight into mothers' and fathers' feeding practices used for pre-schoolers in France and Denmark. Four studies were conducted to study the links between parental practices and child eating behaviours, and the factors influencing parental practices (on different levels). Three primary questions and one secondary question guided the research in this doctoral project:

1. **How do maternal and paternal feeding practices and styles relate to pre-schoolers' eating behaviours and intake regulation?** (treated in Article 1, **Chapter II**, and Article 2, **Chapter III**)
2. **Which factors (in which systems) influence parents' feeding and portioning practices?** (treated in Article 3, **Chapter IV**, Articles 4 and 5, **Chapter V**, and Article 6, **Chapter VI**)
3. **Are there gender differences with regard to parental feeding practices, parental perceptions of children's eating behaviours, parental involvement in feeding related tasks, and predictors of feeding practices?** (treated in Article 1, **Chapter II**, and Article 6, **Chapter VI**)
4. **Which child factors relate to (changes in) children's eating behaviours?** (treated in Article 2, **Chapter III**, and Articles 4 and 5, **Chapter V**)

Question one, three and four were mainly treated with a quantitative approach. For question two, a quantitative and qualitative approach was used.

This final chapter will first summarise the results of the articles presented in the previous chapters (**Section 7.1.**). Then, the results and methodological considerations of this work will be discussed in the light of the scientific literature, and perspectives for future studies will be suggested (**Section 7.2.**). This will be followed by a discussion of the strengths of this project (**Section 7.3.**). The doctoral thesis will finish with a general conclusion (**Section 7.4.**).

7.1. Summary of the findings

This doctoral project aimed to gain more insight into mothers' and fathers' feeding practices used for pre-schoolers in France and Denmark. Four studies, resulting in six articles, were conducted to study the links between parental practices and child eating behaviours, possible gender differences and the different factors influencing parental practices. The main findings of each study will be summarised here.

In **Chapter II** (Study 1, Article 1), we focused on the links between parental feeding practices and child eating behaviours, and possible gender differences. The results showed that fathers and mothers (couples) perceived their child's eating behaviours in relative similar ways, despite mothers taking significantly more meals with their child than fathers. Fathers reported higher levels of the feeding practices "pressure to eat" and "food as reward", but lower levels of "family meal setting" than mothers. Moderate to high correlations were observed between mothers' and fathers' feeding practices and styles. Regression analyses showed that both maternal and paternal practices and styles predicted child eating behaviours.

In **Chapter III** (Study 1, Article 2), we took a closer look at the eating behaviour eating in the absence of hunger (EAH) and related factors. The results showed a positive association between children's EAH and their BMI z-scores. Low child inhibitory control and high maternal use of the practices "food as reward" and "restriction for health" were identified as risk factors for EAH. "Restriction for weight control" was not linked to EAH, but was predicted by child BMI z-scores. Neither of the two directionalities hypothesized between restriction and EAH ("parent-to-child", or "child-to-parent") could be rejected based on the fit indexes of the structural models.

In **Chapter IV** (Study 2, Article 3), we focused on parental food portioning practices used for pre-schoolers in France. The results of the interviews revealed that most parents are in control when serving and portioning food for their child, but, at the same time, they are also responsive to the child's requests

and characteristics. Influencing factors related to the parent, child, and social environment were identified, as well as specificities related to the French (food) culture. For parents, portioning food is an intuitive action that is guided by habits, their experience, and "knowing their child". They are confident about their portioning skills and most of them declare that they do not search for information to guide them in this action.

In **Chapter V**, we first studied possible changes in eating and feeding behaviours during the COVID-19 lockdown in France (Study 3, Article 4). The results revealed that many parents experienced changes in child eating behaviours, parental feeding practices, and food shopping motivations during the COVID-19 lockdown in France compared to the period before the lockdown. When changes occurred, child appetite, food enjoyment, food responsiveness and emotional overeating significantly increased during the lockdown. Increased child boredom significantly predicted increased food responsiveness, emotional overeating and snack frequency in between meals. When parents changed their practices, they generally became more permissive: less rules, more soothing with food, more child autonomy. They bought pleasurable and sustainable foods more frequently, prepared more home-cooked meals and cooked more with the child. Level of education and increased stress level predicted changes in parental practices and motivations.

In this chapter, we also identified which food-related changes during the COVID-19 lockdown French parents perceived as positive and negative, and which changes they would like to maintain after the lockdown (Study 3, Article 5). The results of the thematic analysis showed that positive experiences were multifactorial: parent expressed their appreciation for different food choices, increased time for food preparation and social food-related activities. For the negative experiences, the focus was predominantly on the choice for unhealthy, palatable food and on quantitative aspects: food portions, frequency of eating or food shopping outings, prices, weight, etc. What parents liked to maintain was mostly linked to food choice, food preparation and spending time together. Time was identified by parents as a future barrier to maintain the positive changes. The results also revealed many contrasts (on inter-individual level) and ambivalences (on intra-individual level). In addition, differences were observed based on parents' sex, and to a lesser extent on parents' work status and perceived financial situation. It is noticeable that it was dominantly mothers who struggled with an increased desire to eat, the temptation to eat, and with sensations of hunger during the lockdown or who reported this temptation for their child or the family in general. Moreover, mothers perceived the preparation of additional meals during the lockdown more often as a burden than fathers.

Finally, in **Chapter VI** (Study 4, Article 6), we studied Danish parents' feeding practices and involvement in child feeding, and influencing factors. The results revealed important gender

differences with regard to parental feeding practices; fathers reported using higher levels of coercive control practices, while mothers reported using higher levels of structure practices and autonomy support practices. Both mothers and fathers reported to be highly involved in feeding their child. Regressions showed that higher concern for child weight and a higher motivation to buy foods based on child preference were linked to a higher use of coercive control practices while a higher motivation for health, cooking confidence, feeding/general self-efficacy and perceived responsibility for feeding were linked to a higher use of structure and autonomy support practices.

7.2. Discussion of the findings

As summarised above, many factors have been identified as being associated with children's eating behaviours in a direct way (e.g., factors inherent to the child such as temperament, parental practices) and in an indirect way (e.g., factors influencing parental practices). In this section, we will link the results of the different articles and discuss them in the light of the literature followed by a discussion of certain methodological considerations and suggestions for future research and guidance or interventions. We will do this in the order of the four research questions that guided our work.

7.2.1. How do maternal and paternal feeding practices and styles relate to pre-schoolers' eating behaviours and intake regulation?

In **Chapter II** (Study 1, Article 1), the regression analyses showed that both maternal and paternal practices and styles were predictive of child eating behaviours. A higher use of coercive control practices (especially pressure to eat, but also restriction for health and food as reward) in mothers and fathers and a permissive or authoritarian feeding style in mothers were linked to less favourable eating behaviours in children (higher levels of food pickiness, food neophobia, EAH, and lower levels of food enjoyment). In contrast, an authoritative feeding style in fathers and higher levels of family meal setting in mothers predicted lower levels of child food neophobia. Interestingly, we also found an interaction effect for the link between parental pressure to eat and child food enjoyment: when both parents used higher levels of this coercive feeding practice, lower levels of food enjoyment were observed in the child. In **Chapter III** (Study 1, Article 2), we found that a high maternal use of food as reward and restriction for health were linked with higher levels of EAH in the child, which was linked with a higher weight status. Restriction for weight control was not linked with EAH. Restriction for health and restriction for weight control were thus differently linked to EAH.

These results are in line with previous research that also found that the use of coercive control practices and the use of a permissive or authoritarian feeding style are linked with less favourable

outcomes in the child (e.g., Galloway et al., 2006; Rigal et al., 2012; Vollmer & Mobley, 2013). It is believed that the good intentions of parents have a counterproductive effect on the child's eating behaviour. For instance, pressuring a child to eat may create a negative atmosphere around food and healthy eating, which is not productive for making the child to eat more food or try less liked foods (e.g., Galloway et al., 2006). Using food rewards in exchange for good behaviour may teach children to eat for other reasons than their inner sensations of hunger and fullness, stimulating them, for example, to eat in the absence of hunger (Remy et al., 2015). Restricting certain types of food may make these foods more attractive to children and more liked, which could stimulate them to overeat when granted access to these forbidden foods (Fisher & Birch, 1999; Jansen et al., 2007, 2008; Rollins et al., 2014). This may also explain why we found a significant link between EAH and "Restriction for health" but not between EAH and "Restriction for weight control"; restriction for health refers to restricting highly liked foods (e.g., palatable foods), while restriction for weight control refers to restricting the quantity of foods. It could thus be argued that "Restriction for health" makes parents to unintentionally increase the attractiveness of palatable food when restricting their access, which in turn triggers overconsumption when children are exposed to them. Finally, the practice family meal setting in mothers (i.e., serving the same foods to the child as to the rest of the family) was found protective against child food neophobia, which may confirm that it is important that parents decide on what the child eats (Satter, 1990; Vaughn et al., 2016) but also that food acceptance in young children is stimulated by seeing others eating the same foods (Addessi et al., 2005).

Considerations and perspectives:

Here, it is important to point out that the analyses for these articles were conducted with cross-sectional data. Therefore, no statements can be made about causal relationships between parental feeding practices and styles and child eating behaviours based on our results. In Article 2, neither of the two directionalities hypothesized between EAH and maternal restriction ("parent-to-child" and "child-to-parent" effect) could be rejected based on the fit indexes of the structural models. However, they are also inconclusive about possible causal relationships. Longitudinal studies are needed to clarify the causality between parental feeding practices and child eating behaviours.

Furthermore, previous longitudinal studies have shown that parental feeding practices can be both predictive of and by (parental perceptions of) child eating behaviours (e.g., Birch et al., 2003; Byrne et al., 2017; Jansen et al., 2018; Jansen et al., 2017; Mallan et al., 2018). However, these studies have usually exclusively been conducted with data of mothers. For Article 2, we also only conducted the analyses with a large set of data of mothers. We are aware that these results cannot automatically be generalized to fathers, which was also illustrated by the results of a study of Frankel and Kuno (2019). More (longitudinal) research is thus needed with fathers.

- ➔ Based on these considerations and previous literature, we want to stress that **longitudinal studies with large samples of mothers and fathers** are needed in the future in order to determine the causal relationships between maternal and paternal feeding practices/styles and children's eating behaviours.
- ➔ Nevertheless, despite this limitation and uncertainty about causal effects, our results are in line with previous research. They seem to confirm the importance of **guiding parents in avoiding the use of coercive control practices and in stimulating the use of structure and autonomy support practices** (Vaughn et al., 2016). However, it may warrant some additional research to find out (1) if mothers and fathers are interested in receiving this guidance and (2) how to guide parents in the best possible way. Two recent systematic reviews (Gomes et al., 2021; Snuggs et al., 2019) indicated that information-based interventions (e.g., interventions involving printed material or mobile Health/web-based interventions) had little success in changing parental feeding practices. Snuggs et al. (2019) suggest that this may be because parents have little awareness of how they influence their child's eating behaviour or because they do not see the need to change their own practices. However, if early advice on responsive feeding is provided to parents (before the child is aged 2 years, and before the onset of eating difficulties), this could result in an increased use of responsive practices and a less frequent use of non-responsive practices in infancy and early childhood (Daniels et al., 2015). It is unsure though if these results obtained with mothers can be replicated with fathers.
- ➔ Lastly, we want to note that our research on structure and autonomy support practices was rather limited. In general, research on structure and autonomy support practices is also more limited than on coercive control practices and their predictors and effects. Therefore, we suggest that **more research** must be conducted **on the links between structure and autonomy support practices and children's eating behaviours** and **how to stimulate these practices**. Gomes et al., (2021) also pointed out in their review that few web-based interventions have studied how to improve the use of autonomy support practices.

7.2.2. Which factors (in which systems) influence parents' feeding and portioning practices?

The results of **Chapter II and III** seem to confirm the existing link between parental feeding practices/styles and child eating behaviours, even though we cannot make definite statements about the causality. Nevertheless, if we would aim to guide parents in using more "favourable" practices, such as structure and autonomy support practices and appropriate food portioning practices, and in avoiding the use of coercive control, it is crucial to understand what drives parents to use certain practices and which factors may be related to parental use of certain practices.

Child behaviour

A first factor we identified as influencing parents' practices is the child's behaviour. Even though we only studied the links between parental feeding practices/styles and child eating behaviours in one direction ("parent-to-child") in **Chapter II** (Study 1, Article 1), we were aware that children are also likely to influence their parents' practices. This idea is supported by results from previous longitudinal studies (e.g., Bauer et al., 2017; Jansen et al., 2018; Jansen et al., 2017; Mallan et al., 2018). In Article 2 of Study 1 (**Chapter III**), we thus wanted to consider this hypothesis in the analyses. Here, we assumed that maternal restriction can be influenced by the child's weight (BMI z-score). Our results indicated that restriction for weight control was significantly predicted by child BMI, but restriction for health was not. We also studied both the possibility of a "parent-to-child" and a "child-to-parent" effect regarding the link between maternal restriction and child EAH. However, based on the fit indexes of the structural models, neither of the two directionalities hypothesized could be rejected. Longitudinal research will be needed to clarify this point and to confirm the link between restriction and child weight, as discussed in the previous section. In contrast, a study that clearly showed the influence of children on their parents was Study 2 (Article 3, **Chapter IV**). In this qualitative study, parents described how their food portioning practices, the timing of the meals and other feeding practices (e.g., encouraging to taste foods, pressuring to eat more) were in some cases guided by their child's food preferences, appetitive traits and temperament, age and according motor skills, requests for (serving) food, and temporal factors (e.g., children's activity level that day and their previous intake that day). This indicates that parents are to some extent responsive to their children and that they adapt their practices to their children's behaviours. This can be positive, for example when parents adjust their portion sizes to the physiological needs of their child. However, this can also be negative, for example, when parents exert more pressure to eat when their child rejects certain foods or amounts of

foods, as is it well known that this coercive control practice can have counterproductive effects on the child (Galloway et al., 2006).

Factors within the parent

Second, there are many factors within the parent that were found to relate to their feeding practices and involvement in child feeding, or to changes in their feeding practices. In **Chapter VI** (Study 4, Article 6), we found that a higher concern for child weight and a higher motivation for child preference when buying food for the child were linked to a higher use of coercive control practices while a higher motivation for health, cooking confidence, feeding/ general self-efficacy and perceived responsibility for feeding were linked to a higher use of structure and autonomy support practices. Certain demographic characteristics were also found to be predictive of parental practices, especially parent sex. In **Chapter IV** (Study 2, Article 3), we also found parents to be confident about their portioning practices, which will likely not motivate them to seek advice on appropriate practices. In this study, parents also declared to be driven in their practices by their values (e.g., avoid food waste) and their habits. Furthermore, the COVID-19 pandemic provided an excellent opportunity to study the factors that can contribute to changes in parental feeding practices. The results of Study 3 (Article 4, **Chapter V**) indicated that a change in parents' stress level, their level of education and parent sex were significantly linked to changes in their practices. In **Chapter II** (Study 1, Article 1), we also observed that parental practices and their links with children's eating behaviours were different depending on the sex of the parent. Since the research on gender differences in child feeding was one of the core objectives of this doctoral thesis, this point will be further elaborated in **Section 7.2.3**.

Factors in the mesosystem of child

Third, only few aspects in the mesosystem of child (i.e., the links between the child's microsystems) have been touched in this doctoral project; they were only spontaneously discussed to a certain extent by parents in the qualitative studies. In **Chapter IV** (Study 2, Article 3), we learned that parents' practices and their confidence about portioning food is influenced by the experience they have with feeding older siblings of the child. In addition, parents declared that they use certain practices and set certain rules, because that's how their parents did it (influence of the larger family; inter-generational transmission). Some parents also evaluated their portioning practices as appropriate based on the information about the child's weight and height they received from the paediatric doctor (another microsystem of the child). If the doctor indicates that the child is following the age-appropriate growth norms, parents assume that their portion sizes must be appropriate and this strengthens their self-confidence about their portioning practices. Even though the child's growth does not necessarily

provide certainty about the appropriateness of portion sizes and portioning practices, especially knowing that the adiposity rebound does not occur until the end of early childhood, we still think this is a positive attitude on the part of parents. It means that parents in France rely on objective information from a health professional for indications about the child's weight and growth. This is important because previous studies in other countries have shown that the perceptions parents have about the child's weight or silhouette do not always correspond to reality, especially in early childhood (see review by Rietmeijer-Mentink et al., 2013). On the one hand, if parents are unduly concerned about their child's weight, this can give rise to practices that often do not benefit the child. For example, when concerned about their child being underweight they are likely to exercise more pressure to eat, while when concerned about their child being overweight, they likely to exercise more restriction (Costa et al., 2021). As we discussed above, these coercive control practices often have an undesirable effect on the child. On the other hand, if parents underestimate or fail to recognize their child's overweight, they will probably be reluctant to adjust their portioning practices or other feeding practices.

Furthermore, we can also assume that the parent's partner has an influence on feeding and portioning practices. In previous studies, mothers indicated that they sometimes feel undermined by their partner, who is too indulgent and does not seem to be concerned with the health of the child but above all puts the children's enjoyment and their preferences first (Douglas et al., 2014; Lora et al., 2017). Our results did not confirm this, quite the contrary. In **Chapter IV** (Study 2, Article 3), most parents explained in the interviews that they thought they have similar practices as their partner and see themselves as a team (this was not discussed in detail in the article). In **Chapter II** (Study 1, Article 1), we found a similar finding: 95% of mothers and 91% of fathers responded “Rather yes” when asked if they had similar feeding practices and ideas concerning feeding their child as their (ex-)partner. Significant correlations were also observed between fathers’ and mothers’ feeding practices and styles in this study. These results seem to suggest that partners influence each other’s practices. They possibly discuss their practices with each other or they adapt their practices to one another in some way. This may be positive, if both parents apply structure and autonomy support practices, but negative if parents stimulate each other in using coercive control practices. This was also illustrated in Article 1 (**Chapter II**) by the interaction effect we found: if both mother and father use a higher level of pressure to eat, this was linked to a lower food enjoyment in the child. Both the concordant use of coercive feeding practices and the discordant use of feeding practices in households may be linked to worse outcomes in the child (Harris et al., 2018).

Factors in the exosystem of child

Fourth, several factors in the exosystem of the child (i.e., social settings that do not contain the child but nevertheless affect his/her experiences in immediate settings) were identified as having a possible indirect effect on child eating behaviours. In **Chapter V** (Study 3, Article 4 and 5), we observed that parents' work situation during the COVID-19 lockdown (working outside the home, working from home, at home without work) was linked to certain changes in their eating, feeding and cooking behaviours and their motivations when buying food for the child. In the qualitative study, time was also identified by parents as a cornerstone for changes in their behaviours, and as a possible barrier for maintaining positive changes experienced during the lockdown. In **Chapter VI** (Study 4, Article 6), we also found that injunctive norms were predictive of parental and especially paternal feeding practices. What fathers' (think their) friends/family/partner approve or disapprove may thus influence their behaviours.

Factors in the macrosystem of child

Fifth, several factors in the macrosystem of the child (i.e., the large context in which a child develops) have been identified as influencing parental feeding and portioning practices in the previous chapters, even though parents never described this influence explicitly. French food culture was a returning topic throughout this doctoral project. In different studies, we observed that many families seem to adhere to the "French eating model". They take three meals a day (with lunch and dinner consisting of different components) and most children have a daily mid-afternoon snack. They usually eat at the table at set times with other family members and value food pleasure to a great extent, even though the qualitative analyses of the COVID-19 study (Article 5, **Chapter V**) indicated that many parents also struggle with finding a balance relative to food pleasure. In addition, they highly value the consumption of a diversity of foods; this subject is also dominant in French food recommendations. Less attention is paid in guidelines to self-regulation of eating and portion sizes, which may also explain why parents do not know about recommendations for determining portion sizes for their children. Moreover, according to the parents in Study 2 (Article 3, **Chapter IV**), this information is also not passed on by the paediatric doctor when the child is in early childhood, and parents also simply do not look for this information. This is a striking difference with the infancy period, in which both parents and paediatricians find it important to obtain or provide information about quantities and sizes of food and milk portions for children (De Rosso et al., 2021). It may however also be useful and valuable to have health professionals passing on evidence-based information in the early childhood period and later on about children's self-regulation of intake and recommendations concerning intake.

This can help parents to be attentive and responsive to their child's physiological needs, and to avoid feeding for external reasons (children's emotions, rewards, parents' desires). In addition, we think that cultural differences may (partly) account for differences we found between the results in France and Denmark. Fathers may be more involved in feeding-related tasks in Denmark because gender equality and fathers' participation in childrearing are more embedded in their culture and supported by laws and facilities (Eurofound, 2018; Greve, 2011). Lastly, from the interviews in Study 2 (Article 3, **Chapter IV**), we understood that cultural (family) values and norms are passed on from one generation to the other.

Factors in the chronosystem of child

The COVID-19 pandemic provided an excellent opportunity to study how changes in people's environment can influence their eating habits. In **Chapter V** (Study 3, Articles 4 and 5), we found that most parents reported at least one change in their child's eating behaviours, their own cooking or eating behaviours, their feeding practices and their motivations when buying food. A diversity of positive and negative food-related changes has been described and parents shared which changes they would like to maintain if deemed possible. The lockdown itself did not directly produce all these changes, but indirectly through, for example, the change in the time use of families, the limitations in their mobility and the availability of certain foods.

Considerations and perspectives:

The results of the COVID-19 study (**Chapter V**) seem to show that drastic changes in the environment, imposed from the outside, can help families modify their behaviour. This insight may be interesting for future research into behavioural changes in (eating) behaviour, especially knowing that it is generally hard to change people's habits (Wood & Rünger, 2016).

➔ This may mean that it could be profitable in future interventions or health campaigns to focus on **structural changes in people's environment in order to stimulate healthy nutrition,** instead of on information-driven strategies. Nudging could be an interesting strategy: it uses choice architecture - the ways decisions are framed or presented - to modify choosers' behaviour (Thaler & Sunstein, 2008). It has already been found useful in promoting healthier eating in children (e.g., Just & Wansink, 2009; Zeinstra et al., 2021), but efficacy of nudging interventions may vary across contexts and the long-term effects are unclear (Raihani, 2013). More research is thus warranted. Furthermore, **governments** can also explore how to **optimize people's nutritional environment**. For example, implementing policies such as a sugar tax (Arantxa Cochero et al., 2017) or laws about food labelling and advertising (Smith Taillie et al., 2020) have been found to be effective in

reducing the intake of products high in sugar, also over a longer period. Governments could also do efforts to ensure that products' portion sizes are regulated, and to study how working conditions could be optimized in order to facilitate families' cooking and eating behaviours.

The findings listed above illustrate well that parental practices are influenced by many factors on different levels, and that differences may exist with regard to parents' sociodemographic characteristics (level of education, sex, work situation, finances) and (food) culture.

➔ This may call for the need of **targeted interventions or guidance adapted to the characteristics of different groups of parents**. This has already been suggested before (Bender & Clark, 2011; Guldan et al., 2000; Marshall et al., 2021; Musher-Eizenman et al., 2009), but it is good to stress this again based on new results obtained in a non-anglophone culture. In order to prepare this guidance or these interventions, research should be conducted with representative population samples or with specific target groups. This can also show whether all groups are open to guidance or (what kind of) interventions and what an appropriate way or medium would be to reach these groups.

7.2.3. Are there gender differences with regard to parental involvement in feeding related tasks, parental perceptions of children's eating behaviours, parental feeding practices, and predictors of feeding practices?

Parental involvement in feeding related tasks

Regarding parental involvement in feeding related tasks, we observed in **Chapter II** (Study 1, Article 1) that mothers in France were either mainly or equally in charge for the feeding related tasks. Mothers also took significantly more breakfasts, lunches and dinners with their child. In Denmark (**Chapter VI**; Study 4, Article 6), both the majority of mothers and fathers reported to be mainly in charge for the feeding-related tasks in their household. No significant differences were found between the number of breakfasts and dinners mothers and fathers take with their child, but fathers surprisingly reported to take more lunches with their child than mothers. It is unclear how these results in Denmark can be explained, possibly the COVID-19 lockdown at the time of data collection plays a role. The difference in results between France and Denmark is also remarkable. Culture may play a role here; studies have already pointed out that fathers in Denmark are in general quite involved in childrearing and in participating in household tasks (Eurofound, 2018).

Parental perceptions about child eating behaviours

Regarding parental perceptions about child eating behaviours, we found out in **Chapter II** (Study 1, Article 1) that mothers and fathers generally have similar perceptions about their child. Interestingly, we observed that their perceptions were more similar about qualitative aspects of their child's eating (food neophobia, pickiness, enjoyment, appetite) than about quantitative aspects (eating in the absence of hunger and eating compensation ability; two aspects of self-regulation of eating). Accordingly, previous studies reported gender differences with regard to perceptions about children's self-regulation of eating; mothers rated their child as higher in self-regulation of eating compared to fathers (Frankel et al., 2018; Frankel & Kuno, 2019).

In the discussion section of Article 1, we proposed some hypotheses to explain this lower agreement. We think that it could be possible that parents find it more difficult to evaluate children's ability to self-regulate because this is based on children's inner sensations of hunger and satiety, which may not always be easy to read. Alternatively, French parents might just be more attentive to "qualitative" aspects of their child's eating, like their food pleasure and food rejections because they represent important values in the French food culture (Ducrot et al., 2018; Riou et al., 2015). It is also possible that parents may be less exposed to situations in which they could observe the expression of children's regulation of food intake. This last hypothesis may be supported by the results of Study 2 (Article 3, **Chapter IV**). When parents were asked if their child would be able to self-regulate their intake, many parents declared that the child would serve too much or too little, but they admitted at the same time that it was a guess because they "never tested it". When portioning food for their child, parents tend to keep control, which therefore does not give children the opportunity to show their parents to what extent they can regulate their intake.

Parental feeding practices and styles

Regarding parental feeding practices and styles, we observed both in **Chapter II** (Study 1, Article 1) and **Chapter VI** (Study 4, Article 6) that fathers reported using higher levels of coercive control practices while mothers reported using higher levels of structure and autonomy support practices. This difference is important, because previous studies as well as our Study 1 (**Chapter II and III**) demonstrated that both in mothers and fathers, coercive control practices are linked to less favourable eating behaviours in the child. Moreover, for fathers, most results even remained significant after controlling for the effect of maternal feeding practices (**Chapter II**). This shows that, even when assuming that mothers are the main responsible person for feeding and controlling for their impact, fathers do have their additional significant impact on the child's eating behaviours. Differences were

also found for the links between child eating behaviours and maternal or paternal feeding practices. An authoritarian feeding style was predictive of higher levels of food neophobia in the child, but only in mothers. Conversely, an authoritative feeding style was predictive of lower levels of food neophobia, but only in fathers.

Predictors of feeding practices

Regarding predictors of feeding practices, we observed in **Chapter VI** (Study 4, Article 6) that several gender differences were revealed. It is interesting to underline that we found that descriptive norms were predictive for parents' use of modelling and encourage balance and variety, but only in fathers. This again indicates that the results obtained from studies with mothers should not automatically be generalized to fathers.

Considerations and perspectives:

Fathers reported to be involved in different aspects related to feeding their child, in Denmark even more than in France. Many differences have also been observed between mothers and fathers in both countries.

➔ These findings confirm the call for **more studies with fathers** (e.g., Khandpur et al., 2014). For **quantitative studies**, we suggest that large and diverse samples of fathers will be used to obtain a representable idea of fathers' involvement in feeding, their practices, the predictors of these practices, and the effects of their practices on children's eating behaviour. It is possible though that certain measures and methods of recruitment and data collection should be adapted and validated, or created for the use with fathers (Daniels et al., 2020; Khandpur et al., 2014; Litchford et al., 2020; Peeters et al., 2019). **Qualitative studies** could be valuable for developing these adapted measures, but also to gain a deeper insight into paternal perspectives about child feeding, barriers and facilitators for their involvement, and the use of certain practices. **When comparing practices or perceptions of fathers and mothers**, it is also important to aim for the **use of balanced samples**.

➔ The **interactions between mothers and fathers** (e.g., the use of concordant and discordant practices) and their effects on children should also be explored more thoroughly with a large sample of couples or with samples of parents who are separated, and in longitudinal designs. It could also be interesting to broaden this and, for example, study how differences in feeding practices and styles between parents and the childcare centre or school of the child, or between parents and members of the larger family can influence children's eating behaviour.

➔ Both in France and Denmark, we found that fathers reported using higher levels of coercive control practices than mothers. In addition, we found that gender differences exist with regard to predictors of feeding practices. This may give rise to the idea that **targeted information or interventions for fathers could be helpful** (as also suggested in a more general way in the previous box under section 7.2.2.). In this way, we can adjust it to their specific needs (e.g., enhancing their feeding self-efficacy and cooking confidence) and reach them better. Nevertheless, again, it must be checked whether fathers are open to this. A recent study with fathers (Jansen, Harris, et al., 2018) showed that fathers would prefer a family-focused intervention over an intervention specifically aimed at fathers. Fathers also showed a preference for online delivery of interventions because of their convenience and the ease of sharing information with the rest of the family. Opinions were divided on the implementation of interventions through the workplace. Fathers acknowledged that it could be convenient as they spend many hours at work, but they also showed a lack of interest in participating in this context because they mistrust the personnel delivering the intervention.

Our results also showed that dimensions related to children's self-regulation were less conclusively reported by parents (mothers versus fathers) than other eating behaviours. On the one hand, this may indicate a vulnerability of parent-report measures: in certain cases they may reflect the parents' perceptions of children's eating behaviours (that appear to be gendered) rather than their actual eating behaviours. On the other hand, this may indicate that parents are little aware of their child's self-regulatory capacities and thus have difficulties to report these.

➔ Therefore, we suggest that some **caution** may be appropriate in future studies **when parent-reported measures are used to study children's self-regulation of eating or when interpreting the results**. Tan and Holub (2011) previously also suggested that parent-reported measures might tap into different aspects of children's self-regulation of eating than behavioural eating tasks. More research is needed to explain these differences. Additional external validation of questionnaires may also be interesting. This can be obtained by comparing the results of the questionnaires with those of behavioural eating tasks in experimental but also in more ecological settings (at home, in the school environment). Nevertheless, parent-reported measures seem a very useful tool for studying self-regulation of eating in an easy way on a large scale.

➔ In addition, it may be important to **create more awareness among parents about children's capacity to self-regulate their food intake** and how to maintain/stimulate this capacity. Parents can, for example, help their children to listen to their inner sensations of hunger and fullness and encourage them to adjust their intake to match this. When parents are open to exploring these self-regulatory capacities with their child, they will probably also gain a better picture of these

capacities themselves and this can ensure that their perceptions are closer to the child's actual behaviours. This can also translate into more truthful data obtained via parent-reported questionnaires.

7.2.4. Which child factors relate to (changes in) children's eating behaviours?

The fourth question in this doctoral project was to assess child factors that could relate to (changes in) children's eating behaviours. Children's temperament (inhibitory control) and children's emotions/ their level of boredom were investigated in this project.

Temperament

In **Chapter III** (Study 1, Article 2), we observed that a lower inhibitory control in children was linked to higher levels of EAH. This in line with results of previous studies (Tan & Holub, 2011) and indicates that children's temperament can indeed act as a weakness or protective factor in relation to children's eating behaviour and weight status. This highlights that it can be interesting to take children's temperament into account when planning (systemic) interventions to stimulate a healthy diet and eating environment in children.

Emotions/boredom

In **Chapter V** (Study 3, Article 4), we found that 60% percent of parents reported a change in at least one dimension of their child's eating behaviour during the lockdown compared to the period before the lockdown. Particularly strong increases in "food approach" behaviours such as emotional eating and food responsiveness in children were reported. Children's snack frequency in between meals also increased significantly. When studying possible influencing factors of these changes in children' eating behaviours, the regression analyses indicated that a greater increase in children's level of boredom at home (during vs. before the lockdown) was significantly linked with a greater increase in emotional overeating, food responsiveness, and snack frequency in between meals. Later in this chapter (Study 3, Article 5), we observed a similar finding in the analysis of parents' answers to the open questions. Parents indicated that food was a way to cope with the emotional challenges that arose during the lockdown. Stress, anxiety, and tiredness were frequently mentioned (for themselves), but also that more time at home and boredom induced more snacking or stimulated the preparation of more energy-dense, sugary food. For example, one parent stated: *"My daughter is bored so she wants to snack between meals from time to time."*.

These results seem to indicate that children's emotions, and particularly boredom in the context of the COVID-19 lockdown, can influence their eating behaviours. Children may have tried to "fill up" their time with eating or found comfort and enjoyment in food during this unusual, monotonous period. This finding is worrying because it suggests that these children did not merely rely on their internal cues of hunger and fullness when asking for food, which is crucial for an optimal self-regulation of food intake. Especially if this is applied systematically, this can be detrimental to children and their weight status in the long term. A recent study with youth aged 4-25 years found that participants with severe obesity reported higher levels of emotional eating and eating when bored, and higher levels of stress (Thaker et al., 2020). We must thus strive to stimulate children in eating in response to their physiological sensations instead of their emotions or boredom or other external factors.

Here it is also interesting to point out that children's boredom was elicited by changes in their environment. The unseen COVID-19 pandemic (chronosystem) has led governments to impose severe restrictions to limit their freedom of movement as much as possible to limit the spread of the virus (change in macrosystem: rules). In France, these restrictions meant that schools were closed (change in microsystem: no school), working from home was made compulsory if possible (change in exosystem: parents's work, and consequently also the child's microsystem: parents at home). All these changes in different systems of the child made the child to spend most time at home, inducing boredom and other emotions. This illustrates again how factors on different levels can influence children's eating behaviours.

Considerations and perspectives:

When we compared our results on the impact of boredom on children's eating behaviours to results from previous studies, it was striking how limited the literature on this subject is, especially among children and adolescents. This is surprising since boredom in children and adolescents obviously does not occur exclusively during COVID-19 lockdowns. The results of a study in the US with nationally representative samples of adolescents indicated, for example, that approximately 20% of the participants reported high levels of boredom (Martz et al., 2018). The authors of the few studies citing the topic of bored-eating also reported conceptual and methodological difficulties for studying bored-eating. For example, results from interviews with mother highlighted that bored-eating is viewed as a distinct construct, and may be a more common practice in children than emotional- or stress-eating (Hayman et al., 2014). Therefore, it may be necessary to present and study bored-eating separately from other emotions (Hayman et al., 2014; Koball et al., 2012).

➔ Together with these authors, we therefore suggest that future studies **investigate the subject of bored-eating more deeply and develop appropriate measures** if deemed necessary. Questionnaires and certainly observational studies may be appropriate to investigate this. Knowing that levels of boredom may be associated with different characteristics (e.g., age, sex, socioeconomic status, factors linked to parent, peer, school and extracurricular contexts) (Martz et al., 2018), it also seems important to be sensitive to possible inter-individual differences among children and adolescents. Studying eating in response to other emotions than boredom may obviously also be interesting in the future, but the literature on this is already more extensive.

We conclude this section discussing the results with a graphical presentation (Figure 3). This summarises the perspectives we have just suggested in the boxes above based on the results and accompanying considerations.

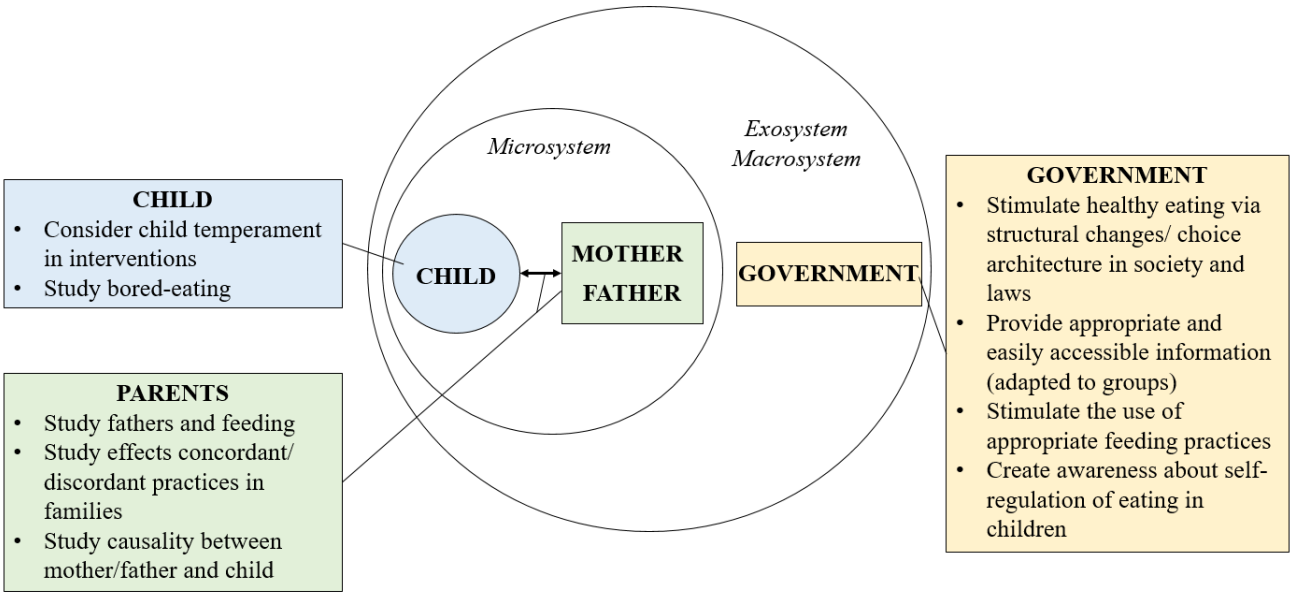

Figure 3. Overview of the perspectives suggested in this doctoral thesis based on the results of the studies and considerations.

7.3. Strengths of the doctoral project

This doctoral project aimed to gain more insight into mothers' and fathers' feeding practices used for pre-schoolers in France and Denmark. To do so, four studies were conducted to study the links between parental practices and child eating behaviours, and the factors influencing parental practices. Despite a number of methodological considerations that need to be taken into account when

interpreting the results of our studies (discussed in every individual paper and in the boxes above), the studies and the doctoral project as a whole also present many strengths. We will list four main strengths here.

First, our studies tapped into a number of topics that were rather unexplored; either generally or specifically in France or Denmark. For example, in general, the following topics were rather unexplored:

- The links between couples' feeding practices/styles and child eating behaviours (Article 1, **Chapter II**)
- The effect of the COVID-19 lockdown on families' eating and feeding behaviours (Article 4 and 5, **Chapter V**)
- The (parent-related) predictors of paternal feeding practices (Article 6, **Chapter VI**)

Specifically in France or Denmark, the following topics were rather unexplored:

- Paternal feeding practices in France and Denmark (Article 1, **Chapter II** and Article 6, **Chapter VI**)
- Parental portioning in France (Article 3, **Chapter IV**).

Second, for most quantitative studies, we also had fairly large sample sizes, which can reinforce the results. It is certainly an achievement to have recruited so many fathers for different studies, especially knowing that it is not easy to recruit fathers for studies on child feeding (e.g., Jansen, Harris, et al., 2018). Previous studies with fathers have often been performed with small sample sizes (< 100) (Khandpur et al., 2014; Litchford et al., 2020). For future studies with fathers, we would definitely recommend - from our own experience - to collaborate with recruitment agencies, but we also noticed that handing out two paper questionnaires to parents of children (one for parent 1, one for parent 2), motivated fathers to complete the questionnaire.

Third, it is good to mention again that this doctoral project took place during the COVID-19 pandemic and associated lockdowns. Not only were efforts made to conduct the foreseen research despite the pandemic, but the unique situation has also been used to evaluate the impact of COVID-19 lockdown on families' eating, cooking and feeding behaviour. The results of the quantitative and qualitative analyses were valuable as they provided insight into situational factors inducing changes in families eating habits that are interesting beyond the COVID-19 situation.

Finally, we also think that, as a whole, our studies provide rich insight into parental feeding and portioning practices and factors (on different levels) influencing these practices. It nicely illustrates how children, their parents and their behaviours and practices cannot be seen separately from their

context. Moreover, it may give rise to the idea that a systemic approach can be interesting for stimulating healthy eating in children. This approach could take into account characteristics of the child and implicate both parents of the child. Other actors in the child's microsystem, such as the child's school or kindergarten or other family members could also be involved. This also brings us to an important last point. Even though it is known that parents play a key role in the development of children's food preferences and eating behaviours (Birch, 1999; Ventura & Birch, 2008) and this doctoral project focused specifically on parental feeding and portioning practices, we want to stress that parents do not carry the sole responsibility for stimulating healthy eating habits in their child. Parents should be supported by the government and its policies, health professionals, and the child's childcare/school. They should make correct and easy-to-understand information available for parents and children (e.g., about feeding practices, nutritional guidelines, self-regulation of eating), but also do efforts to change the choice architecture and food-related policies in the society (in childcare/schools, supermarkets, restaurants, commercials on television). All together, these efforts from parents and the systems around can help to stimulate healthier eating in children from a young age and lower risks for weight difficulties.

7.4. General conclusion

This doctoral project aimed to gain more insight into mothers' and fathers' feeding practices used for pre-schoolers in France and Denmark. The results of four studies, presented in six articles, provided interesting insight into the links between maternal and paternal feeding practices and child eating behaviours and uncovered many gender differences. A systemic look at the results showed that parental feeding and portioning practices are influenced by many factors at different levels. The results indicate which steps still need to be taken to overcome methodological limitations, which issues need to be further explored taking into account parental diversity, and how mothers and fathers can be helped to create a positive and healthy eating environment for their child. We also suggest that governments can play an important role in this and that not only information-based support should be looked at but also more structural changes in society.

Comprehensive summary of the doctoral thesis in French

Préface

Ce projet de thèse fait partie du projet européen Edulia (Innovative Training Networks Marie Sklodowska-Curie, convention de subvention n° 764985). Ce projet "*répond au besoin urgent de la société européenne de trouver de nouvelles façons de s'attaquer au problème croissant de l'obésité, en promouvant une alimentation plus saine dès l'enfance, dans un contexte de choix. Sur la base des relations entre la perception sensorielle, le plaisir, le choix des aliments et le comportement alimentaire, le projet visait à rechercher de nouvelles approches pour inciter les enfants à aimer et à choisir activement des aliments sains, en développant des habitudes alimentaires plus saines.*" (Edulia, 2017, p. 75)

Le programme Edulia repose sur un réseau pluridisciplinaire et intersectoriel. Pour animer ce programme ambitieux, onze doctorantes ont été recrutées dans six pays pour étudier spécifiquement quels sont les multiples freins à une alimentation saine pour les enfants, et comment les combattre. Le projet se compose de huit modules de travail, chacun ayant ses propres objectifs spécifiques et des résultats prédéfinis. Mon projet de thèse fait partie d'un module visant à étudier le rôle des facteurs psychosociaux (parents, frères et sœurs et pairs) et des facteurs cognitifs influençant le comportement alimentaire des enfants d'âge préscolaire et des préadolescents. Au sein de ce module, ma thématique de recherches portait sur l'étude des liens entre les pratiques éducatives des parents en matière d'alimentation d'une part, et d'autre part les comportements alimentaires et d'autorégulation de la consommation chez les enfants d'âge préscolaire (2-6 ans). Idéalement, les résultats avaient pour ambition de permettre de générer des indications/recommandations sur la manière dont nous pouvons accompagner au mieux les parents dans l'alimentation de leur enfant, et dans la création d'un environnement alimentaire positif et sain pour l'enfant (par exemple, par des recommandations pratiques, des interventions, etc.)

Par ailleurs, les projets ITN nécessitent des périodes de détachement dans des laboratoires autres que le laboratoire d'accueil principal. Durant ce travail de thèse, j'ai été principalement basée à Dijon, en France, au Centre des Sciences du Goût et de l'Alimentation (CSGA), où j'ai mené la plupart de mes recherches sous la supervision de Sylvie Issanchou et Sandrine Monnery-Patris. Malgré la pandémie de COVID-19, j'ai également réussi à effectuer deux détachements pendant mon projet de thèse. Un premier détachement de deux mois (septembre-octobre 2019) au centre de recherche de l'Institut Paul Bocuse (IPB, Ecully, France), et un second de six mois (août 2020-janvier 2021) au

centre MAPP de recherche sur la création de valeur dans le secteur alimentaire de l'Université d'Aarhus (Danemark).

1. Introduction générale

Ce travail de thèse se concentre principalement sur la période de la prime enfance (“early childhood”; 2-6 ans), les comportements alimentaires des enfants durant cette période et les facteurs d'influence.

1.1. Comportements alimentaires dans la prime enfance

Au début de la petite enfance, vers l'âge de deux ans, les enfants affichent un désir croissant d'autonomie et d'indépendance. Ils veulent prendre des décisions concernant leurs actions et les accomplir de manière autonome (par exemple, pour s'habiller, dessiner, jouer). Ce désir croissant d'autonomie et d'indépendance s'exprime également pour l'alimentation. La période de la prime enfance est généralement décrite comme une période difficile au plan alimentaire. La mobilité des enfants s’affirme et la motricité fine se développe rapidement au cours de ces premières années de la vie ; aussi les jeunes enfants veulent-ils manger de manière autonome (“moi-tout seul”) et expriment clairement leurs goûts et leurs rejets pour les aliments présentés, tant verbalement que comportementalement.

La période de la prime enfance est une période particulièrement intéressante pour l'étude des comportements alimentaires, car différents processus et évolutions ont lieu à cet âge. Cette période est ainsi caractérisée par un pic de rejet des aliments non familiers par les enfants (Dovey et al., 2008; Nicklaus & Monnery-Patris, 2018; Rioux et al., 2017) et par une détérioration des capacités des enfants à autoréguler leur consommation (Birch et al., 2003). À l'âge de deux ans, la croissance des enfants ralentit également, après une poussée de croissance, ce qui signifie qu'ils ont besoin de moins de calories et peuvent présenter une diminution de l'appétit (Graber, 2021). Durant la petite enfance, le plaisir alimentaire, notamment sensoriel, joue également un rôle central dans l'alimentation, les cognitions des enfants liées à la nourriture et à la consommation étant moins déterminantes pour les choix alimentaires que pour les mangeurs adultes (Nicklaus, 2016).

En outre, la prime enfance est non seulement une période intéressante en ce qui concerne les comportements alimentaires des enfants, mais aussi une période de développement importante pour l'alimentation. Des études ont montré que les habitudes alimentaires (ex., les préférences alimentaires, la variété des aliments, l'apport alimentaire, les traits alimentaires) établies tôt dans la vie peuvent se poursuivre à l'adolescence et à l'âge adulte (Nicklaus et al., 2005; Nicklaus & Remy, 2013). Si l'on

veut promouvoir des habitudes alimentaires saines chez le mangeur, il apparaît donc crucial de favoriser et stimuler des comportements alimentaires sains chez les enfants dès leur plus jeune âge. Par ailleurs, depuis les années 1980, la prévalence du surpoids et de l'obésité chez les enfants et les adolescents a augmenté dans de nombreux pays (GBD 2015 Obesity Collaborators, 2017). Selon une récente méta-analyse (Garrido-Miguel et al., 2019) incluant 32 études avec des données provenant de 27 pays européens, environ 17,8 % des enfants âgés de 2 à 7 ans sont en surpoids ou présentent une obésité. Il s'agit d'une prévalence inquiétante sachant que l'obésité infantile peut être associée à de nombreux troubles médicaux, sociaux, psychologiques, émotionnels et sanitaires à court et à long terme (pour des revues, voir Kelsey et al., 2014; Pulgarón, 2013; Rankin et al., 2016; Reilly et al., 2003). De plus, le rebond pondéral (“adiposity rebound”), c'est-à-dire le moment où l'indice de masse corporelle (IMC) augmente après une phase de stabilisation, a lieu à la fin de la période de la petite enfance (vers l'âge de 6 ans) (Dietz, 1997). Un début précoce du rebond d'adiposité a été considéré comme un facteur prédictif de l'obésité dans l'enfance et à l'âge adulte (Cole, 2004; Rolland-Cachera & Cole, 2019; Whitaker et al., 1998). Dans l'ensemble, ces études soulignent d’une part que des efforts doivent être envisagés à un âge précoce pour prévenir le surpoids et l'obésité infantiles, et d’autre part que favoriser la promotion de comportements alimentaires sains à un jeune âge peut jouer un rôle important à cet égard.

1.2. Facteurs d'influence

Afin de promouvoir une alimentation saine chez les enfants dès leur plus jeune âge, il est important de comprendre quels sont les facteurs qui contribuent au développement précoce des comportements alimentaires et des préférences alimentaires chez les enfants.

Il est connu qu'une personne est le produit de ses gènes/prédispositions biologiques et de son environnement, et il est prouvé que les comportements alimentaires ont de fortes héritabilités. Les revues de Wood (2018a, 2018b) indiquent que ces héritabilités peuvent varier entre 49-74% au cours de la première année de vie, et entre 62-75% dans la petite enfance. Néanmoins, il existe également des données qui indiquent que les traits héréditaires ou leur expression peuvent encore être influencés par l'environnement de l'enfant (Wood et al., 2020).

Reposant sur une approche systémique, cette thèse a pour projet d’identifier les facteurs dans l'environnement de l'enfant qui peuvent influencer ses comportements alimentaires. La théorie des systèmes écologiques de Bronfenbrenner (1979) nous a semblé particulièrement pertinente pour opérationnaliser ces différentes influences. Cette théorie stipule que les enfants grandissent dans un système complexe de relations qui sont influencées par de multiples niveaux de l'environnement, allant

de l'environnement familial immédiat de l'enfant (le microsystème de l'enfant) à son environnement plus large englobant la culture, les normes et les valeurs (le macrosystème de l'enfant). Bronfenbrenner a divisé l'environnement d'un enfant en cinq niveaux ou systèmes dits imbriqués : le micro-, le méso-, l'exo-, le macro- et le chronosystème (pour une image; voir Figure 2, page 22). Selon Bronfenbrenner, l'environnement d'une personne est dynamique et en constante évolution, et chaque personne est à la fois un produit et un producteur de son propre environnement.

En ce qui concerne le comportement alimentaire des enfants, nous pouvons donc également supposer que les facteurs d'influence peuvent être à la fois intrinsèques à l'enfant (par exemple, les traits de tempérament) mais aussi extrinsèques, c'est-à-dire dans l'environnement de l'enfant : dans l'environnement direct de l'enfant mais aussi dans des systèmes plus distants et indirects autour de l'enfant. Dans cette thèse, une attention particulière sera accordée au microsystème de l'enfant, en particulier aux parents, et aux macro- et chronosystèmes de l'enfant qui influencent les parents et donc indirectement l'enfant.

1.3. Objectifs de la recherche et plan de la thèse

L'objectif général de ce projet doctoral était "d'étudier les liens entre les pratiques alimentaires des parents et les comportements alimentaires et l'autorégulation de la consommation des enfants d'âge préscolaire". A partir d'une analyse de la littérature, un certain nombre de sujets ont été identifiés qui semblaient intéressants et particulièrement pertinents par rapport à l'objectif général du projet et par rapport au projet européen Edulia :

- Une revue de la littérature a ainsi révélé que le nombre d'études sur les pères et l'alimentation est encore limité, en général mais aussi en particulier en France. Par conséquent, un premier objectif de ce projet serait d'étudier les pratiques éducatives en matière d'alimentation des pères et les éventuelles différences entre les mères et les pères concernant l'alimentation de leur enfant. En outre, étant donné qu'un détachement et une étude correspondante étaient prévus au Danemark, où les pères sont culturellement plus impliqués dans l'alimentation que dans de nombreux pays d'Europe, le sujet des pères et de l'alimentation semblait très pertinent pour ce projet de doctorat.
- Nous avons découvert que la littérature sur le sujet des pratiques éducatives des parents en matière de détermination des tailles de portion était jusqu'à présent assez limitée et encore inexplorée en France. Peu de données scientifiques sont aujourd'hui disponibles, par exemple, sur les motivations qui sous-tendent les décisions des parents lorsqu'ils déterminent la taille des portions pour leur enfant et sur l'utilisation par les parents des sources d'information et des recommandations sur ce sujet.

- En outre, un troisième axe d'étude a porté sur les facteurs influençant les pratiques parentales en matière d'alimentation et de determination de la taille des portions, afin de mieux décrire la diversité des pratiques utilisées par les parents, mais aussi d'identifier les éventuels obstacles et/ou facilitateurs à un changement dans ces pratiques. D'après la théorie des systèmes de Bronfenbrenner, nous avons supposé que ces facteurs pouvaient être intrinsèques à l'enfant ou situés dans différents systèmes autour de l'enfant et des parents. Par exemple, sachant que des spécificités culturelles peuvent exister autour de l'alimentation et des pratiques éducatives, nous avons considéré la culture (alimentaire) (macrosystème) comme un thème pertinent pour interpréter les résultats tout au long de ce projet. Grâce à mon implication au sein du projet européen Edulia, les recherches ont pu être conduites en France et lors de mon détachement au Danemark, permettant ainsi d'investiguer l'influence culturelle sur les pratiques éducatives.

Enfin, il est important de recadrer ce projet dans son contexte. En effet, une grande partie des recherches de ce projet ont été menées pendant la pandémie de COVID-19. D'une part, ce contexte a fourni une occasion unique d'enquêter sur cette situation inédite et d'en étudier l'impact sur les habitudes alimentaires des familles françaises (impact chronosystème). D'autre part, cela signifiait que le calendrier et les méthodes de plusieurs études devaient être adaptés aux possibilités de la situation (par exemple, en privilégiant l'utilisation de questionnaires en ligne et d'entretiens téléphoniques).

Ce projet de thèse a permis la conduite de quatre études complètes, dont trois ont été menées en France et une au Danemark. L'objectif général de chaque étude était de mieux comprendre les pratiques éducatives des parents en matière d'alimentation utilisées pour les enfants d'âge préscolaire. Certaines études se sont plutôt centrées sur les liens entre ces pratiques et les comportements alimentaires des enfants, tandis que d'autres études ont plutôt évalué lesfacteurs des différents systèmes qui influencent les pratiques éducatives des parents. Chaque étude avait une orientation et un objectif spécifique. Ensemble, ces études contribuent à envisager l'alimentation selon une approche systémique qui met en lumière plusieurs systèmes qui se complètent pour comprendre l'utilisation et les effets des pratiques alimentaires des parents sur différents aspects du comportement alimentaire infantile. Le tableau 2 ("Table 2") présente l'ensemble des études et des articles issus de ces études avec leurs caractéristiques (population, pays, méthode, objectif(s) principal(aux) et système Bronfenbrenner).

Dans l'ensemble, trois questions principales ont orienté la recherche dans ce projet de doctorat:

1. Comment les pratiques et les styles éducatifs maternels et paternels en matière d'alimentation sont liés aux comportements alimentaires et à la régulation de la consommation des enfants d'âge préscolaire ?

2. Quels sont les facteurs (dans quels systèmes) qui influencent les pratiques éducatives des parents en matière d'alimentation et de la gestion des portions ?

3. Existe-t-il des différences entre les sexes en ce qui concerne l'implication des parents dans les tâches liées à l'alimentation, les perceptions parentales des comportements alimentaires des enfants, les pratiques éducatives des parents, et les prédicteurs des pratiques éducatives ?

Une question supplémentaire a également orienté notre recherche :

4. Quels sont les facteurs intrinsèques à l'enfant qui sont liés aux (changements dans les) comportements alimentaires des enfants ?

Table 2. Aperçu des études et articles issus du projet de thèse et de leurs caractéristiques (en français).

Étude/Article	Population	Pays	Méthode	Objectif(s) principal(aux)	Système Bronfenbrenner
Etude 1 – Article 1	105 mères et 105 pères (105 couples) d'enfants âgés de 2 à 6 ans	France	Questionnaire avec questions fermées	- Identifier les éventuelles différences entre les sexes en ce qui concerne les pratiques/styles éducatifs des parents en matière d'alimentation et les perceptions parentales des comportements alimentaires de l'enfant. - Évaluer les associations entre les pratiques/styles éducatifs de la mère et du père et les comportements alimentaires de l'enfant.	Microsystème
Etude 1 – Article 2	621 mères d'enfants âgés de 2 à 6 ans	France	Questionnaire avec questions fermées	- Évaluer l'influence des variables liées au comportement alimentaire des enfants, le manger en l'absence de faim (EAH) et l'appétit, sur le z-score de l'IMC des enfants, et l'influence du contrôle inhibiteur de l'enfant et des pratiques d'alimentation contrôlantes de la mère sur l'EAH.	Microsystème
Etude 2 (entretiens) – Article 3	32 mères et 5 pères d'enfants âgés de 3 à 5 ans	France	Entretiens téléphoniques semi-structurés + courte enquête	- Décrire la variété des pratiques éducatives des parents en matière de gestion des tailles des portions utilisées pour les enfants français d'âge préscolaire et identifier les facteurs qui sous-tendent ces pratiques.	Microsystème Mesosystème Macrosystème
Etude 3 (COVID-19) – Article 4 (volet quantitative)	357 mères et 141 pères d'enfants âgés de 3 à 12 ans	France	Questionnaire avec questions fermées et ouvertes	- Évaluer les changements dans les comportements alimentaires des enfants, dans les comportements alimentaires et culinaires des parents, dans les pratiques éducatives des parents et dans les motivations des parents à faire des achats alimentaires pendant le confinement, par rapport à la période précédant le confinement.	Microsystème Exosystème Macrosystème Chronosystème
Etude 3 (COVID-19) – Article 5 (volet qualitative)	357 mères et 141 pères d'enfants âgés de 3 à 12 ans	France	Questionnaire avec questions fermées et ouvertes	- Explorer quels changements liés à l'alimentation les parents ont perçu comme positifs pendant le confinement (1), quels changements ils ont perçu comme négatifs (2) et quels changements ils aimeraient maintenir après le confinement (3).	Microsystème Exosystème Macrosystème Chronosystème
Etude 4 (Danemark) – Article 6	261 mères et 321 pères d'enfants âgés de 3 à 6 ans	Danemark	Questionnaire avec questions fermées	- Identifier les éventuelles différences entre les sexes en ce qui concerne les pratiques éducatives des parents, l'implication des parents dans l'alimentation des enfants et les éventuels facteurs connexes. - Identifier les prédicteurs des pratiques éducatives des parents.	Microsystème Mesosystème Exosystème Macrosystème

2. Résumé des articles

Etude 1, Article 1

Are food parenting practices gendered? Impact of mothers' and fathers' practices on their child's eating behaviors.

Philippe, K., Chabanet, C., Issanchou, S., & Monnery-Patris, S.

2021

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Introduction et but de l'étude : La période de 2 à 6 ans est caractérisée par un pic de rejets alimentaires chez les enfants ainsi que par une détérioration de leur capacité d'autorégulation énergétique. Les recherches antérieures se sont principalement centrées sur les liens entre les pratiques éducatives maternelles en matière d'alimentation et les comportements alimentaires des enfants. Le rôle des pratiques paternelles et de la convergence/divergence de ces pratiques entre les parents a reçu beaucoup moins d'attention. L'objectif de cette étude est de combler cette lacune en examinant l'effet de convergence/divergence des pratiques éducatives en matière d'alimentation entre les parents sur différentes facettes du comportement alimentaire de l'enfant.

Matériel et méthodes : Les deux parents de 105 enfants français âgés de 2,01 à 6,51 ans (51 filles, *M* âge = 3,88, *ET* = 1,40) ont rempli un questionnaire en ligne ou une « version papier » comportant des items issus de différents questionnaires validés (ex. CEDQ, CFPQ) permettant ainsi de calculer des scores pour différentes dimensions relatives aux comportements alimentaires des enfants (ex. plaisir à manger, néophobie alimentaire) et aux pratiques/styles éducatifs parentaux (ex. pression à manger, style permissif).

Résultats : Les mères et les pères perçoivent les comportements alimentaires de leur enfant de manière relativement similaire (corrélations de Pearson pour les dimensions comprises entre 0,34 (compensation calorique de l'enfant) et 0,78 (petit appétit) (*M* = 0,60)). Les mères se perçoivent comme étant principalement responsables des tâches liées à l'alimentation et prennent significativement plus de repas (petit-déjeuner, déjeuner, dîner) avec leur enfant que les pères. Les pères ont déclaré imposer plus de pression à manger à l'enfant et donner plus de récompenses alimentaires. Dans les analyses de régression, les pratiques et les styles éducatifs en matière d'alimentation des mères et des pères se sont avérés des prédicteurs des comportements alimentaires des enfants. Aussi, des effets d'interaction entre les pratiques des parents ont été observés. Dans les

ménages où la mère et le père utilisent tous deux des niveaux plus élevés de pression à manger, l'enfant montre un niveau de plaisir à manger significativement plus faible.

Conclusion : Nos résultats soulignent ainsi l'importance de prendre en compte le rôle spécifique de chaque parent, ainsi que la convergence/divergence de leurs pratiques en matière d'alimentation dans l'étude des déterminants éducatifs et psychosociaux des comportements alimentaires des enfants. Ces données pourraient à terme permettre la formulation de recommandations plus adaptées et nuancées pour accompagner les deux parents dans la mise en place d'habitudes alimentaires plus favorables à la santé et au bien-être de leur enfant.

Etude 1, Article 2

Young children's eating in the absence of hunger: links with child inhibitory control, child BMI, and maternal controlling feeding practices

Philippe, K., Chabanet, C., Issanchou, S., & Monnery-Patris, S.

en révision dans *Frontiers in Psychology*

Introduction et but de l'étude : Les capacités des enfants à autoréguler leur consommation alimentaire sont associées à leur statut pondéral. En outre, ces capacités, de même que le comportement de "manger en l'absence de faim" (eating in the absence of hunger; EAH), sont supposées être influencées par des facteurs inhérents à l'enfant (tempérament) et à son environnement (pratiques éducatives controllantes des parents). La littérature sur ce sujet est variée et présente des résultats contradictoires. De plus, peu de travaux ont abordé cette question auprès de la population française. Cette étude visait à mieux comprendre les associations entre l'EAH des jeunes enfants, le contrôle inhibiteur, l'indice de masse corporelle (IMC) et plusieurs pratiques alimentaires contrôlées par la mère. En outre, pour mieux évaluer la relation entre les variables liées aux enfants et celles liées à la mère, le lien entre l'EAH et la restriction a été exploré séparément dans deux directions : " enfant vers parent " ou " parent vers enfant ".

Matériel et méthodes : Pour ce faire, les mères de 621 enfants âgés de 2,00 à 6,97 ans (51% de garçons, M = 4,11 ans, ET = 1,34) ont rempli un questionnaire comportant des items issus de questionnaires validés. Une modélisation par équation structurelle a été utilisée pour analyser les données.

Résultats : Les résultats ont montré, quelle que soit la directionnalité considérée, une association positive entre l'alimentation des enfants en l'absence de faim et leurs z-scores d'IMC. La restriction pour la santé et la restriction pour le contrôle du poids étaient liées différemment à l'EAH et aux z-scores de l'IMC des enfants. Ainsi, un faible contrôle inhibiteur de l'enfant, des récompenses alimentaires et la restriction pour la santé ont été identifiés comme des facteurs de risque d'EAH. La restriction pour le contrôle du poids n'était pas liée à l'EAH, mais était prédite par les z-scores de l'IMC de l'enfant.

Conclusion : Les interventions visant à améliorer les capacités des enfants à autoréguler la prise alimentaire pourraient envisager de favoriser des interventions en faveur de l'autorégulation générale des enfants, de l'autorégulation de la prise alimentaire, et/ou de promouvoir des pratiques alimentaires parentales adaptatives.

Etude 2, Article 3

How do French parents determine portion sizes for their pre-schooler? A qualitative exploration of the parent-child di-vision of responsibility and influencing factors.

Philippe, K., Issanchou, S., Roger, A., Feyen, V., & Monnery-Patris, S.

2021

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Introduction et but de l'étude : Des portions importantes peuvent inciter les enfants à trop manger, altérer leurs capacités d'autorégulation et provoquer une prise de poids. Cependant, on sait peu de choses sur la façon dont les parents déterminent la taille des portions pour leurs enfants.

Matériel et méthodes : En utilisant des entretiens semi-structurés avec 5 pères et 32 mères d'enfants d'âge préscolaire, cette étude a examiné les pratiques des parents français en matière de gestion des tailles des portions. La répartition de la responsabilité entre le parent et l'enfant dans la détermination de la taille des portions a été explorée, ainsi que les facteurs d'influence et les sources d'information possibles.

Résultats : Les parents ont décrit un large éventail de pratiques. Pour la plupart d'entre eux, la détermination de la taille des portions est une action intuitive qui dépend des habitudes, et qui découle principalement de l'expérience de l'alimentation de leur enfant et de l'expression de son appétit. Peu de parents accordent de l'autonomie à leur enfant pour la détermination des portions et le service des aliments, surtout pour la première portion. De nombreux facteurs d'influence ont été identifiés, notamment des facteurs liés à l'enfant (ex. l'appétit, les préférences alimentaires), aux parents (ex. éviter le gaspillage alimentaire) et des facteurs externes (ex. l'influence des frères et sœurs de l'enfant, la culture alimentaire française). La plupart des parents ne recherchent pas d'informations/recommandations pour guider leurs pratiques.

Conclusion : Il est important de stimuler une autorégulation optimale de consommation chez les enfants et les parents peuvent jouer un rôle crucial à cet égard. Cette étude a permis d'identifier les barrières et les facilitateurs pour guider les parents dans la détermination des tailles des portions appropriées et aider à impliquer l'enfant dans ce processus décisionnel.

Etude 3, Article 4 (volet quantitatif)

Child eating behaviors, parental feeding practices and food shopping motivations during the COVID-19 lockdown in France: (how) did they change?

Philippe, K., Chabanet, C., Issanchou, S., & Monnery-Patris, S.

2021

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Etude 3, Article 5 (volet qualitatif)

Contrasts and ambivalences in French parents' experiences regarding changes in eating and cooking behaviours during the COVID-19 lockdown.

Philippe, K., Issanchou, S., & Monnery-Patris, S.

en révision dans *Food Quality and Preference*

Introduction et but de l'étude : La pandémie liée au COVID-19 a conduit la France à imposer un confinement strict, affectant les habitudes des familles dans de nombreux domaines. Le volet quantatif de cette étude visait à évaluer les changements possibles dans les comportements alimentaires des enfants, les pratiques éducatives parentales en matière d'alimentation et les motivations d'achat des aliments, pendant le confinement par rapport à la période avant confinement. Le volet qualitatif visait à explorer comment les parents ont perçu des changements liés à l'alimentation pendant le confinement.

Matériel et méthodes : Pendant le confinement, les parents de 498 enfants âgés de 3 à 12 ans (238 garçons; M = 7,32; ET = 2,27) ont répondu à une enquête nationale en ligne comprenant les items issus de questionnaires validés (ex. CEDQ, CEBQ, HomeSTEAD). Ils ont décrit leur situation et celle de l'enfant pendant le confinement, et rétrospectivement sur la période le précédant (volet quantitatif). L'enquête comprenait aussi trois questions ouvertes (volet qualitatif) pour lesquelles les parents pouvaient partager leurs expériences positives et négatives concernant l'alimentation familiale durant cette période confinée, et ce qu'ils aimeraient maintenir au-delà.

Résultats : Dans le volet quantitatif de l'étude, de nombreux parents ont signalé des changements dans les comportements alimentaires des enfants (60%), dans les pratiques éducatives (65%) et dans les motivations d'achat des aliments (85%). Lorsque des changements étaient décrits, l'appétit de l'enfant,

le plaisir à manger, la « réactivité aux aliments », le « manger émotionnel » et la fréquence des collations augmentaient. Aussi, 53% des parents rapportaient une augmentation du niveau d'ennui de leur enfant. L'ennui accru des enfants prédisait de manière significative une augmentation de la « réactivité aux aliments » et de la fréquence des collations entre les repas. Lorsque les parents ont changé leurs pratiques, ils sont devenus plus permissifs : moins de règles, plus d'apaisement avec la nourriture (« soothing with food »), plus d'autonomie accordée à l'enfant dans le choix des aliments à consommer, dans les quantités consommées, et du lieu de consommation. Les parents achetaient plus fréquemment des aliments « plaisir » et durables, préparaient plus de repas « faits maison » et cuisinaient davantage avec l'enfant. Ces changements de pratiques et motivations des parents étaient expliqués par le niveau d'étude, la situation professionnelle et financière et l'augmentation du niveau de stress.

Les analyses du volet qualitatif révèlent, sur le versant vécu positivement, une réappropriation de l'alimentation tant sur la qualité des aliments choisis (locaux, frais…) que sur les pratiques (importance du « fait-maison », de la transmission…), et un plaisir affirmé de cuisiner ensemble et de partager les repas. Sur le versant négatif, les parents soulignent la surcharge imposée par la fréquence des repas à préparer, le stress et la surconsommation. Ce que les parents aimeraient maintenir était principalement lié au choix des aliments, à leur préparation et au temps passé ensemble. Le temps a été identifié par les parents comme un obstacle futur au maintien des changements positifs. Les résultats ont également révélé de nombreux contrastes (au niveau inter-individuel) et ambivalences (au niveau intra-individuel). En outre, des différences ont été observées en fonction du sexe des parents et, dans une moindre mesure, de leur statut professionnel et de leur situation financière perçue. Il est intéressant de souligner que ce sont principalement les mères qui ont été confrontées à un désir accru de manger, à la tentation de manger et à des sensations de faim pendant le confinement ou qui ont rapporté cette tentation pour leur enfant ou la famille en général. De plus, les mères percevaient plus souvent que les pères la préparation de repas supplémentaires pendant le confinement comme une charge.

Conclusion : Le confinement a entraîné des changements notables dans les habitudes alimentaires des familles : les comportements et pratiques sont devenus plus centrés sur l'enfant, et plus axés sur les valeurs de plaisir, de commensalité et de durabilité. Les résultats donnent un aperçu de ce qui peut contribuer à modifier les habitudes alimentaires des familles au-delà de la pandémie.

Etude 4, Article 6

Parental feeding practices and parental involvement in child feeding in Denmark: gender differences and predictors.

Philippe, K., Chabanet, C., Issanchou, S., Grønhøj, A., Aschemann-Witzel, J., & Monnery-Patris, S.

en préparation

Introduction et but de l'étude : Les études sur les pères et l'alimentation sont rares et on sait peu de choses sur les prédicteurs de l'implication des parents dans l'alimentation des enfants et sur les pratiques édiucatives des pères en matière d'alimentation. Par conséquent, cette étude visait à examiner les différences possibles entre les mères et les pères danois en ce qui concerne leurs pratiques alimentaires et leur implication dans les tâches liées à l'alimentation, et à évaluer les prédicteurs possibles de ces pratiques et de l'implication des parents.

Matériel et méthodes : Au total, 261 mères et 321 pères d'enfants d'âge préscolaire ont répondu à une enquête en ligne comportant des éléments tirés de questionnaires validés.

Résultats : Des différences entre les sexes ont été observées ; les pères ont déclaré utiliser des niveaux plus élevés de pratiques de contrôle coercitif, tandis que les mères ont déclaré utiliser des niveaux plus élevés de pratiques de structure et de soutien à l'autonomie. Les mères et les pères ont déclaré être très impliqués dans l'alimentation de leur enfant. Les régressions ont montré qu'une plus grande préoccupation pour le poids de l'enfant et une plus grande motivation pour les préférences alimentaires de l'enfant étaient liées à une plus grande utilisation des pratiques de contrôle coercitif, tandis qu'une plus grande motivation pour la santé, la confiance en sa cuisine, l'auto-efficacité alimentaire/générale et la responsabilité perçue de l'alimentation étaient liées à une plus grande utilisation des pratiques de structure et de soutien à l'autonomie.

Conclusion : Les résultats de cette étude fournissent un aperçu précieux des pratiques maternelles et paternelles au Danemark et de leurs déterminants qui pourraient être utiles pour des interventions ciblées.

3. Discussion des résultats

Nos études ont permis d'identifier de nombreux facteurs qui sont associés aux comportements alimentaires des enfants de manière directe (par exemple, des facteurs inhérents à l'enfant tels que le tempérament, les pratiques parentales) et de manière indirecte (par exemple, des facteurs influençant les pratiques parentales). Sur la base des résultats des études, nous suggérons quelques perspectives pour des études futures.

3.1. Comment les pratiques et les styles éducatifs maternels et paternels en matière d'alimentation sont liés aux comportements alimentaires et la régulation de la consommation des enfants d'âge préscolaire ?

Les résultats de l'Article 1 et 2 sont conformes aux recherches antérieures qui ont également constaté que le recours à des pratiques de contrôle coercitif et l'utilisation d'un style permissif ou autoritaire sont liés à des résultats moins favorables chez l'enfant (ex. Galloway et al., 2006; Rigal et al., 2012; revue par Vollmer & Mobley, 2013). Cependant, il est important de souligner que les analyses de ces articles ont été réalisées avec des données transversales. Par conséquent, aucune conclusion ne peut être établie sur les relations de causalité entre les pratiques et les styles éducatifs des parents et les comportements alimentaires des enfants sur la base de nos résultats. Toutefois, nous soulignons que des **études longitudinales avec de grands échantillons de mères et de pères** seront nécessaires à l'avenir afin de déterminer les relations de cause à effet entre les pratiques et les styles éducatifs maternels et paternels et les comportements alimentaires des enfants. Néanmoins, nos résultats semblent confirmer l'importance de **guider les parents en évitant l'utilisation de pratiques de contrôle coercitif et en stimulant l'utilisation de pratiques de structure et de soutien à l'autonomie** (Vaughn et al., 2016). Cependant, des recherches supplémentaires sont requises pour déterminer (1) si les mères et les pères seront intéressés à recevoir ces conseils et (2) comment guider les parents de la meilleure façon possible. Enfin, nous suggérons que **davantage de recherches** doivent être menées sur les liens entre les **pratiques de soutien à la structure et à l'autonomie** et les comportements alimentaires des enfants et sur la manière de stimuler ces pratiques.

3.2. Quels sont les facteurs (dans quels systèmes) qui influencent les pratiques éducatives des parents en matière d'alimentation et de la gestion des portions ?

Les résultats de nos études indiquent que les pratiques alimentaires et de détermination de la taille de portion sont influencées par les comportements de l'enfant, par des facteurs internes au parent et par des facteurs du méso-, exo-, macro- et chronosystème de l'enfant (articles 3-6).

Les résultats de l'étude COVID-19 (Chapitre V) semblent montrer que des changements drastiques dans leur environnement, imposés de l'extérieur, peuvent aider les familles à modifier leur comportement. Cela peut signifier qu'il pourrait être profitable, lors de **futures interventions ou campagnes de santé, de se concentrer sur les changements structurels de l'environnement des personnes afin de stimuler une alimentation saine,** plutôt que sur des stratégies axées sur l'information.

Les résultats présentés ci-dessus illustrent que les pratiques parentales sont influencées par de nombreux facteurs à différents niveaux, et que des différences peuvent exister en ce qui concerne les caractéristiques sociodémographiques des parents (niveau d'éducation, sexe, situation professionnelle, finances) et la culture (alimentaire). En conséquence, ces études soulignent ainsi l'intérêt d'**interventions ciblées ou de conseils adaptés aux caractéristiques des différents groupes de parents**.

3.3. Existe-t-il des différences entre les sexes en ce qui concerne l'implication des parents dans les tâches liées à l'alimentation, les perceptions parentales des comportements alimentaires des enfants, les pratiques éducatives des parents, et les prédicteurs des pratiques éducatives ?

Des similitudes et des différences ont été observées entre les mères et les pères en France et au Danemark. Ces résultats confirment la nécessité de **mener davantage d'études sur les pères, tant quantitatives que qualitatives**. Les **interactions entre les mères et les pères** (par exemple, l'utilisation de pratiques concordantes et discordantes) et leurs effets sur les enfants devraient également être explorés de manière plus approfondie avec un grand échantillon de couples ou avec des échantillons de parents séparés, et dans des modèles longitudinaux. Tant en France qu'au Danemark, nous avons constaté que les pères ont déclaré utiliser des niveaux plus élevés de pratiques de contrôle coercitif que les mères. En outre, nous avons constaté que des différences entre les sexes existent en ce qui concerne les prédicteurs des pratiques d'alimentation. Cela peut renforcer l'idée que **des informations ou des interventions ciblées pour les pères** pourraient être utiles. De cette manière, nous pourrions les adapter à leurs besoins spécifiques (par exemple, en améliorant leur auto-efficacité en matière d'alimentation et leur confiance en cuisine). Néanmoins, là encore, il convient de vérifier si les pères sont ouverts à ce type d'accompagnement.

Nos résultats ont également montré que les dimensions liées à l'autorégulation de consommation des enfants étaient rapportées de manière moins concluante par les parents (mères versus pères) que les autres comportements alimentaires. D'une part, cela peut indiquer une vulnérabilité des mesures

déclaratives des parents : dans certains cas, elles peuvent refléter la perception qu'ont les parents des comportements alimentaires des enfants (qui semblent être genrés) plutôt que leurs comportements alimentaires réels. D'un autre côté, cela peut suggérer que les parents sont peu conscients des capacités d'autorégulation de leur enfant et qu'ils ont des difficultés à en faire état. Par conséquent, nous suggérons **qu'une certaine prudence soit de mise dans les études futures lorsque des mesures déclaratives par les parents sont utilisées pour étudier l'autorégulation de consommation des enfants** ou lors de l'interprétation des résultats. En outre, il peut être important de **sensibiliser davantage les parents à la capacité des enfants à autoréguler leur consommation alimentaire** et à la manière de maintenir/stimuler cette capacité. Les parents peuvent, par exemple, aider leurs enfants à écouter leurs sensations intérieures de faim et de satiété et les encourager à adapter leur consommation en conséquence. Lorsque les parents sont disposés à explorer ces capacités d'autorégulation avec leur enfant, il est probable qu'ils se fassent une meilleure idée de ces capacités eux-mêmes, ce qui peut faire en sorte que leurs perceptions soient plus proches des comportements réels de l'enfant.

3.4. Quels sont les facteurs intrinsèques à l'enfant qui sont liés aux (changements dans les) comportements alimentaires des enfants ?

Les résultats de l'Etude 1, Article 2, indiquent qu'un contrôle inhibiteur plus faible chez les enfants est lié à des niveaux plus élevés d'EAH. Cela corrobore les résultats d'études antérieures (Tan & Holub, 2011) et indique que le tempérament des enfants peut effectivement agir comme un facteur de faiblesse ou de protection par rapport au comportement alimentaire et au statut pondéral des enfants. Cela souligne qu'il peut être intéressant de prendre en compte le tempérament des enfants lors de la planification d'interventions (systémiques) visant à stimuler une alimentation et un environnement alimentaire sains chez les enfants.

Les résultats de l'Etude 3, Article 4, indiquent qu'une augmentation plus importante du niveau d'ennui des enfants à la maison (pendant versus avant le confinement) était significativement liée à une augmentation de la suralimentation émotionnelle, de la réactivité alimentaire et de la fréquence des collations entre les repas chez les enfants. Dans l'Article 4, nous avons observé un résultat similaire dans l'analyse des réponses des parents aux questions ouvertes. Ces résultats semblent indiquer que les émotions des enfants, et notamment l'ennui dans le contexte du confinement lié au COVID-19, peuvent influencer leurs comportements alimentaires. Les enfants ont peut-être essayé de "remplir" leur temps en mangeant ou ont trouvé du réconfort et du plaisir dans la nourriture pendant cette période inhabituelle et monotone. Ce résultat est inquiétant car il suggère que ces enfants ne se sont pas fiés à

leurs signaux internes de faim et de satiété lorsqu'ils demandaient à manger, ce qui est pourtant crucial pour une autorégulation optimale de la prise alimentaire. En particulier si ce comportement se reproduit régulièrement ou fréquemment, il peut être, à long terme, préjudiciable au statut pondéral des enfants. En comparant nos résultats sur l'impact de l'ennui sur les comportements alimentaires des enfants aux résultats d'études antérieures, il est frappant de constater à quel point la littérature sur ce sujet est limitée, en particulier chez les enfants et les adolescents. C'est pourquoi nous suggérons que **les études futures approfondissent le sujet de l'ennui chez l'enfant en lien avec l'alimentation** et développent des mesures appropriées si nécessaire.

3.5. Points forts du projet doctoral

Malgré un certain nombre de considérations méthodologiques qui doivent être prises en compte lors de l'interprétation des résultats de nos études, les études et le projet doctoral dans son ensemble présentent également de nombreux points forts.

Premièrement, nos études ont abordé un certain nombre de sujets qui étaient plutôt inexplorés, que ce soit en général ou spécifiquement en France ou au Danemark.

Deuxièmement, pour la plupart des études quantitatives, nous disposions également d'échantillons de taille assez importante, ce qui peut renforcer les résultats. C'était un défi de recruter autant de pères pour différentes études, d'autant qu'il n'est pas facile de recruter des pères pour des études sur l'alimentation des enfants (ex. Jansen, Harris et al., 2018).

Enfin, nous pensons également que, dans leur ensemble, nos études apportent un éclairage riche sur les pratiques maternelles/paternelles en matière d'alimentation et de détermination de la taille de portion et les facteurs (à différents niveaux) influençant ces pratiques. Elles illustrent comment les enfants, leurs parents et leurs comportements et pratiques ne peuvent être considérés séparément de leur contexte. En outre, elles soutiennent l'idée qu'une approche systémique peut être intéressante pour stimuler une alimentation saine chez les enfants. Cette approche pourrait prendre en compte les caractéristiques de l'enfant et impliquer les deux parents de l'enfant. D'autres acteurs du microsystème de l'enfant, tels que ceux émanant de l'école de l'enfant ou d'autres membres de la famille pourraient également être impliqués.

3.6. Conclusion générale

Ce projet de thèse visait à mieux comprendre les pratiques alimentaires des mères et des pères utilisées auprès d'enfants d'âge préscolaire en France et au Danemark. Les résultats de quatre études (présentées dans six articles) ont fourni un aperçu intéressant des liens entre les pratiques alimentaires maternelles et paternelles et les comportements alimentaires des enfants et ont mis en évidence de nombreuses différences entre les sexes. Un regard systémique sur les résultats a montré que les pratiques éducatives des parents en matière d'alimentation et de gestion des tailles des portions sont influencées par de nombreux facteurs à différents niveaux. Les résultats indiquent quelles mesures doivent encore être prises pour surmonter les limites méthodologiques, quelles questions doivent être approfondies en tenant compte de la diversité des parents, et comment aider les mères et les pères à créer un environnement alimentaire positif et sain pour leur enfant. Nous suggérons également que les gouvernements peuvent jouer un rôle important dans ce domaine et qu'il convient d'envisager non seulement un soutien basé sur l'information mais aussi des changements plus structurels dans la société.

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