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3

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## 15 **ABSTRACT**

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

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

## 35 **1 Introduction**

36 At the end of 2019, the highly contagious coronavirus SARS-CoV-2 causing a severe acute  
37 respiratory syndrome (COVID-19) has sparked a pandemic. Many countries worldwide were  
38 affected by the spread of this virus, forcing governments to protect their inhabitants by  
39 imposing strict rules. In France, a strict **first** lockdown took place from March 17 until May  
40 10, 2020. During this period, schools were closed, working from home was **enforced except  
41 for some specific professional domains (e.g., working in hospital, in food shops)**. Leaving  
42 your home was allowed only under certain circumstances **and only after filling in a special  
43 certificate**. Valid reasons to leave your home, **indicated on** this certificate, were for example  
44 essential work, grocery shopping, medical reasons, urgent family matters or assistance to  
45 vulnerable people, and **open-air physical** activities (limited to one hour a day at a maximal  
46 distance of one kilometer from your home).

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

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

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

67 The psychological states (fear, depressive symptoms, stress, etc.) linked to the COVID-19  
68 pandemic (Jiao et al., 2020; Wang et al., 2020) possibly also affected children's and parents'  
69 eating behaviors and consequently also their motivations when buying foods. In fact, previous  
70 studies have shown that the experience of stress and negative emotions leads people to  
71 overeat and makes them reach for so-called "comfort foods", rich in sugar and calories  
72 (Evers, Dingemans, Junghans, & Boevé, 2018; Michels et al., 2012; Rodriguez-Martin &  
73 Meule, 2015). Increased levels of boredom have previously also been associated with  
74 increased energy intake (Moynihan, van Tilburg, Igou, Wisman, Donnelly, & Mulcaire,  
75 2015).

76 Similarly, parents possibly adapted their parental feeding practices, *i.e.*, the behavioral  
77 strategies to control what, how much, when, and where the child eats (Ventura & Birch,  
78 2008), to this unseen situation. On the one hand, because of child-driven reasons: to meet the  
79 changed eating and emotional needs of their child at home. On the other hand, because of  
80 situation-driven or parent-driven reasons: changes in families' routines could for example

81 affect the timing of meals or parents could have provided foods to entertain their children  
82 while working from home. As parental feeding practices have an important influence on child  
83 eating behavior (Birch, 1999), it is of importance to explore how these practices may have  
84 changed during the lockdown to obtain a more complete picture of the impact of the COVID-  
85 19 pandemic on the food domain. Moreover, young children are very dependent on their  
86 parents for food intake (e.g., Poti & Popkin, 2011): what parents buy **and their motivations**  
87 **when buying foods for their child** influence children's eating behavior. (Rigal, Chabanet,  
88 Issanchou, Monnery-Patris, 2012). It is thus important to differentiate their food shopping  
89 motivations from adults in general.

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

## 102 **2 Method**

### 103 **2.1 Recruitment and ethics**

104 An online questionnaire was used to obtain data for this study. Parents were recruited via an  
105 agency disposing of a panel of participants all over France. Prerequisites to participate were  
106 (1) having a child aged 3-12 years, and (2) no recent changes in the parent's or child's eating  
107 behaviors due to other reasons than a change of habits linked to the lockdown (e.g., following  
108 a new diet to lose weight, changed eating behaviors because of a medical treatment, changed  
109 eating behaviors because of religious reasons). The questionnaire was anonymous and on the  
110 first page of the questionnaire, parents were required to tick a box indicating that they  
111 understood and accepted the study information and data protection policy. The questionnaire  
112 was open for participation from the 30<sup>th</sup> of April until the 10<sup>th</sup> of May, 2020 (the end of the  
113 strict lockdown in France). Participants received a voucher of six euros for questionnaire

114 completion. An ethical approval (n°20-686) was granted for this study by the Institutional  
115 Review Board (IRB00003888, IORG0003254, FWA00005831) of the French Institute of  
116 Medical Research and Health, and a study registration was done by the data protection service  
117 involved (CNRS).

## 118 **2.2 Measures**

### 119 *2.2.1 Demographics*

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

### 131 *2.2.2 Child eating behaviors*

#### 132 *Appetite, Food enjoyment, Food pickiness*

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

#### 143 *Food responsiveness and Emotional overeating*

144 The Children's Eating Behavior Questionnaire (CEBQ; Wardle, Guthrie, Sandreson,  
145 Rapoport, 2001) was used to measure the child's levels of food responsiveness (five items;

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

### 153 *Snacking frequency and Types of snacks*

154 In France, the mid-afternoon snack (“goûter”) is a common practice and is perceived as an  
155 additional meal beside breakfast, lunch and dinner, especially in children (Francou & Hébel,  
156 2017). We therefore distinguished between the frequency of the mid-afternoon snack (which  
157 usually also includes a drink) and the frequency of other snacks/drinks in between meals. We  
158 clearly explained the difference between both types of snacking occasions to parents in the  
159 instructions of the questions. For the mid-afternoon snack, parents were asked to rate the  
160 child’s frequency of this snacking occasion on a four-point scale (*Less than once a week, 1-3*  
161 *times per week, 4-6 times per week, Every day*), for both the period before and during the  
162 lockdown. For other snacks/drinks, parents rated the frequency on a seven-point scale (*Less*  
163 *than once a week, 1-3 times per week, 4-6 times per week, once per day, Twice a day, Three*  
164 *times a day, 4 or more times a day*), also for both the period before and during the lockdown.  
165 We gave examples of possible snacks/drinks (e.g., *candy, piece of bread, fruit, compote,*  
166 *yoghurt, salty or sweet biscuits*) to illustrate that any food and drink, except water, should be  
167 counted as a snack/drink.

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

### 175 *2.2.3 Child boredom*

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

#### 179 2.2.4 Parental feeding practices

180 Parental feeding practices were derived from the Home Self-Administered Tool for  
181 Environmental Assessment of Activity and Diet Family Food Practices Survey  
182 (HomeSTEAD; Vaughn, Dearth-Wesley, Tabak, Bryant, & Ward, 2017). This 86-item  
183 instrument captures five coercive control practices (CCP), seven autonomy support practices  
184 (ASP), and twelve structure practices (SP). We selected seven practices we thought to be  
185 susceptible for change during the lockdown: Soothing with food (CCP; four items; e.g., *I give*  
186 *my child something to eat or drink when she or he is bored or worried, even if I know she or*  
187 *he is not hungry*), Guided choices - when (ASP; three items; e.g., *I let my child eat between*  
188 *meals whenever she or he wants*), Guided choices - what (ASP; three items; e.g., *I allow my*  
189 *child to choose what she or he has for snacks*), Guided choice - amount (ASP; three items;  
190 e.g., *During meals, I allow my child to decide when she or he has had enough to eat.*), Rules  
191 and limits around unhealthy foods (SP; four items; e.g., *I place limits on the sweet or salty*  
192 *snacks (candy, ice cream, cake, potato chips, tortilla chips) that my child eats*), Meal setting  
193 (SP; three items; e.g., *Do you limit snacking to designated places in your home?; I insist my*  
194 *child eats meals at the table.*), and Atmosphere of meals (SP; three items; e.g., *Dinner time is*  
195 *usually a pleasant time for the family*). Parents rated their use of these practices on a five-  
196 point Likert scale (*Never, Rarely, Sometimes, Often, Always*), for both the period before and  
197 during the lockdown. Higher scores indicated the use of more soothing with foods, more child  
198 autonomy, more rules and limits, a stricter meal setting, and a more positive meal atmosphere.  
199 The items were translated from English to French by several researchers of the team, and  
200 some questions were slightly modified; to adapt them to the French situation (e.g., mid-  
201 afternoon snack “goûter” vs. other snacks/drinks) or to be more uniform within the entire  
202 questionnaire (Appendix A).

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



### 210 2.2.5 Parental motivations for buying foods

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

### 230 2.2.6 Parental eating and cooking behaviors and stress level at home

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

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

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

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

#### 246 2.2.7 *Anthropometric data for parent and child*

247 As measuring and weighing participants was impossible for the researchers during the  
248 COVID-19 lockdown, parents were asked to self-report their current weight and height, and  
249 the weight and height of their child. Parents were encouraged to report recent child  
250 measurements carried out by health professionals from the child's medical health book. If no  
251 recent measures were available in this book, or if the measurements of height and weight were  
252 not carried out within a time span of two months, we asked them to measure and/or weigh  
253 their child at home. Parents' and children's BMI were calculated by dividing their weight (kg)  
254 by their height (m) squared. For children, normed BMI z-scores were calculated using WHO's  
255 (2006) international growth standards for children.

### 256 2.3 *Statistical analyses*

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

#### 258 2.3.1 *Data cleaning*

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

#### 264 2.3.2 *Preliminary analyses*

265 Cronbach's alphas were calculated to test the psychometric properties of the measures used  
266 for evaluating child eating behaviors and parental feeding practices before and during the  
267 lockdown. When these alphas were too low (< 0.60), confirmatory factor analyses (CFA) with  
268 a SEM approach (Bollen, 1989; Kaur et al., 2006) were performed to gain more insights in the  
269 factor structures and to potentially optimize them. Acceptable Cronbach alphas were observed  
270 for all child eating behaviors (ranging between 0.79 and 0.87). For parental feeding practices,  
271 some Cronbach's alphas were acceptable (ranging between 0.63 and 0.81; for soothing with  
272 food, rules and limits around healthy food, atmosphere of meals), some were borderline  
273 acceptable (ranging between 0.52 and 0.57; for guided choices - when, and feeding on a

274 schedule) and some were found lower (ranging between 0.31 and 0.41; for guided choices –  
275 what and amount, and meal setting). In contrast, the CFAs indicated acceptable factor  
276 loadings for all practices, except for guided choices - amount. One item was deleted for this  
277 dimension because the factor loading was very low. Details are available in Appendix A.

### 278 2.3.3 Primary analyses

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

306 **3 Results**

307 **3.1 Participants**

308 A sample of 498 parents of children aged 3.0-12.3 years (47.8% boys;  $M$  age = 7.3;  $SD$  = 2.2)  
309 was retained for analyses after data cleaning. The demographics for the parents are presented  
310 in Table 1. According to parental reports of child weight and height, 8% of children aged 3.0-  
311 5.0 years **had** underweight ( $z$ -BMI < -2), 68% had a normal weight ( $-2 \leq z$ -BMI < 1), 18%  
312 were at risk for overweight ( $1 \leq z$ -BMI < 2), 5% **had** overweight ( $2 \leq z$ -BMI < 3), and 1% **had**  
313 **obesity** ( $z$ -BMI > 3) (**categories derived from** WHO, 2006). Among the children aged 5.1-  
314 12.3 years, 6% **had** underweight ( $z$ -BMI < -2), 69% had a normal weight ( $-2 \leq z$ -BMI < 1),  
315 15% **had** overweight ( $1 \leq z$ -BMI < 2), and 9% **had** **obesity** ( $z$ -BMI > 2) (**categories derived**  
316 **from** de Onis, Onyango, Borghi, Siyam, Nishida, & Siekmann, 2007). During the lockdown,  
317 the children in this study took on average 6.8 breakfasts a week at home, 6.8 lunches, and 7.0  
318 dinners. Fourteen percent of parents reported taking more breakfasts with their child during  
319 the lockdown than before, 85% reported no difference, and 1% of parents reported a decrease.  
320 For lunch, 59% of parents reported an increase in lunches taken with their child, 37% no  
321 difference, and 3% a decrease. Forty-six percent of parents reported an increase in the number  
322 of mid-afternoon snacks taken with their child, 50% no difference, and 4% a decrease. For  
323 dinner, 14% of parents reported an increase in dinners taken with their child, 86% no  
324 difference, and 1% a decrease.

325

326 **Table 1.**  
 327 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 <sup>2</sup> )	3.4
Normal weight (18.5-25 kg/m <sup>2</sup> )	51.6
Overweight (25-30 kg/m <sup>2</sup> )	29.7
Obesity (≥ 30 kg/m <sup>2</sup> )	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

328

## 329 3.2 Children

### 330 3.2.1 Changes in child eating behaviors (during versus before lockdown)

331 Sixty percent of parents reported a change on at least one dimension of their child's eating  
 332 behaviors during the lockdown compared to the period before the lockdown. When looking

333 only at the children with changed behaviors, paired-samples *t*-tests resulted in a significant  
 334 increase for all behaviors but food pickiness (Table 2). The highest increases in mean score  
 335 were observed for emotional eating (+0.61) and for food responsiveness (+0.44).

336 **Table 2**

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

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

341 <sup>a</sup>Answer modalities ranged from never (1) to always (5).

342 <sup>b</sup>Answer modalities ranged from do not agree at all (1) to do completely agree (5).

343 Significant results (*p* < 0.05) in bold.

344

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

352 **Table 3**

353 Frequency of mid-afternoon snacks and of snacks/drinks in between meals for all children and all  
 354 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

355

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

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

Types of food/drinks consumed during (mid-afternoon) snacks	%	<i>M</i> ( <i>SD</i> ) before	<i>M</i> ( <i>SD</i> ) during	<i>M</i> difference	<i>t</i>	<i>p</i>
Candy, chocolate	26	2.57 (0.86)	3.47 (0.98)	0.89	<b>9.26</b>	<b>&lt;0.001</b>
Fruit juice	22	2.36 (1.01)	3.09 (1.10)	0.73	<b>7.53</b>	<b>&lt;0.001</b>
Soda	11	2.13 (0.83)	3.02 (0.99)	0.89	<b>7.24</b>	<b>&lt;0.001</b>
Chips, salty biscuits	13	2.33 (1.06)	3.17 (1.06)	0.83	<b>6.47</b>	<b>&lt;0.001</b>
Ice cream	27	2.20 (0.71)	2.66 (1.14)	0.58	<b>5.68</b>	<b>&lt;0.001</b>
Pastries, cake, sweet cookies	30	2.97 (0.95)	3.48 (1.09)	0.52	<b>4.76</b>	<b>&lt;0.001</b>
Cream dessert	15	2.20 (0.94)	2.80 (1.13)	0.61	<b>4.35</b>	<b>&lt;0.001</b>
Milks	19	2.53 (1.00)	3.06 (1.26)	0.54	<b>4.02</b>	<b>&lt;0.001</b>
Yoghurt, cheese, quark	21	2.39 (1.00)	2.90 (1.16)	0.50	<b>3.95</b>	<b>&lt;0.001</b>
<b>Fresh and dried fruits</b>	23	2.63 (1.00)	3.00 (1.15)	0.37	<b>3.29</b>	<b>0.001</b>
Nuts	10	2.23 (0.88)	2.69 (1.15)	0.46	<b>2.68</b>	<b>0.010</b>
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	<b>-2.24</b>	<b>0.027</b>

369 Answer modalities ranged from never (1) to always (5).

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

371

### 372 3.2.2 Links with child boredom, age, sex, and z-BMI

373 Forty-five percent of parents reported no change in their child's level of boredom at home  
 374 during the lockdown compared to the period before the lockdown, 53% reported an increase  
 375 in level of boredom, and 2% a decrease. A paired-samples *t*-test performed on the scores of  
 376 the children for whom changes were reported ( $n = 276$ ) indicated a significant increase in  
 377 mean score of level of boredom ( $+1.20$ ,  $t(275) = 26.82$ ,  $p < 0.001$ ;  $M_{\text{before}} = 2.28$ ,  $SD_{\text{before}} =$   
 378  $0.67$ ;  $M_{\text{during}} = 3.48$ ,  $SD_{\text{during}} = 0.70$ ).

379 **Simple regressions indicated that a higher increase in children's level of boredom at home**  
 380 **(during vs. before lockdown) was significantly linked with a higher increase in emotional**

381 overeating, in food responsiveness and in snack frequency in between meals (Table 5). Simple  
 382 regressions also indicated that child age, child sex and child z-BMI were not significant  
 383 predictors for changes in child boredom levels, neither for changes in child (mid-afternoon)  
 384 snack frequency, nor for changes in child eating behaviors, except for a significantly lower  
 385 increase in food responsiveness in children with higher BMI z-scores ( $\beta = -0.07, t = -2.96, p <$   
 386  $0.001$ ). The results of these regression analyses, significant and non-significant, can be found  
 387 in Appendix B.1.

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

Change in	Df	Estimate	Std. Error	<i>t</i>	<i>p</i>
Emotional overeating	150	0.20	0.05	<b>3.59</b>	<b>&lt;0.001</b>
Food responsiveness	224	0.14	0.04	<b>3.26</b>	<b>&lt;0.001</b>
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	<b>2.78</b>	<b>0.01</b>

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

### 393 3.3 Parents

#### 394 3.3.1 Changes in parental feeding practices

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

403



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

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

409 Answer modalities ranged from never (1) to always (5).

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

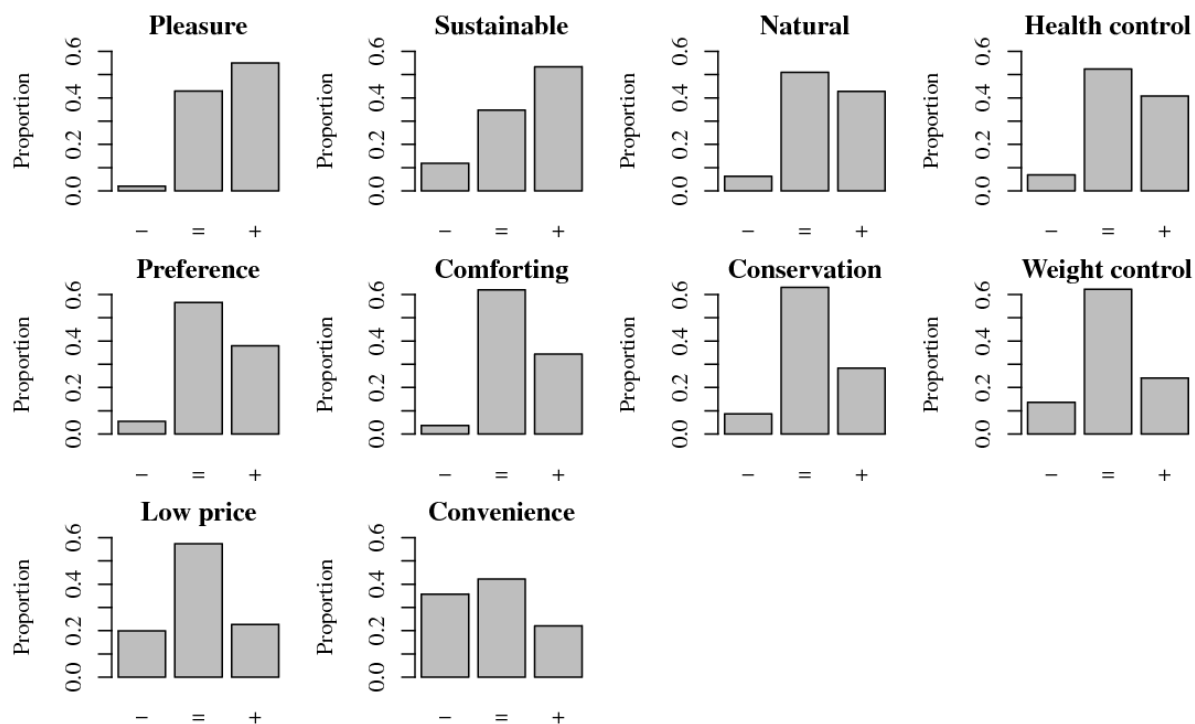
411 <sup>a</sup>Higher scores for guided choice indicate higher levels of autonomy granted to the child.

412 <sup>b</sup>Meal setting refers to the place where the child eats, higher scores indicate stricter rules.

413

### 414 3.3.2 Changes in parental motivations for buying foods

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



421

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

424

### 425 3.3.3 Changes in parental eating and cooking behaviors

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

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

442 3.3.4 Links with changes in parental level of stress and parental demographics

443 *Effects of changes in parental stress level on parental feeding practices*

444 Forty-four percent of parents reported no change in their level of stress at home during the  
 445 lockdown compared to the period before the lockdown. An increase in level of stress was  
 446 reported by 42% of parents and a decrease by 14%. A paired-samples *t*-test performed on the  
 447 scores of the parents with a change in their stress level ( $n = 280$ ), indicated a significant  
 448 increase in mean score of stress level with  $+0.59$  ( $t(279) = 7.70, p < 0.001; M_{\text{before}} = 2.74,$   
 449  $SD_{\text{before}} = 0.86; M_{\text{during}} = 3.33, SD_{\text{during}} = 0.93$ ).

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

459 **Table 7**

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

Change in	Df	Estimate	Std. Error	<i>t</i>	<i>p</i>
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	<b>2.38</b>	<b>0.02</b>
Meal atmosphere	115	-0.34	0.04	<b>-7.67</b>	<b>&lt;0.001</b>
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

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

463

464 *Effects of parental demographics on changes in parental feeding practices*

465 Some parental demographics were also identified as significant predictors of changes in  
 466 parental feeding practices. Simple regressions indicated that the decrease in rules and limits  
 467 around unhealthy foods (Table 6) was even larger among parents with a higher level of  
 468 education ( $\beta = -0.08, t = -2.45, p = 0.02$ ; see Appendix B.2). Feeding on schedule decreased  
 469 on average (Table 6), but a lower decrease was observed in more educated parents ( $\beta = 0.11, t$

470 = 2.56,  $p = 0.01$ ; see Appendix B.2). In other words, parents became more permissive  
 471 regarding the times to eat, but to a lower extent among higher educated parents. Parental sex  
 472 significantly predicted changes in guided choices – when ( $\beta = 0.22$ ,  $t = 2.32$ ,  $p = 0.02$ ):  
 473 mothers showed an increase in this practice and thus granted increased autonomy to the child  
 474 in deciding when to eat, while fathers did not show such a change. Finally, a higher parental  
 475 BMI predicted a significantly lower increase in meal atmosphere quality ( $\beta = -0.03$ ,  $t = -2.47$ ,  
 476  $p = 0.01$ ). The results of all regression analyses, significant and non-significant, can be found  
 477 in Appendix B.2.

478 *Effects of parental demographics on changes in parental cooking behavior*

479 Regarding parental cooking behaviors, simple regressions indicated that a higher level of  
 480 education and a more comfortable perceived financial status predicted higher increases in  
 481 time spent cooking with the child (Table 8). However, for level of education, this result  
 482 became non-significant after adjustment for financial status in a multiple regression model ( $\beta$   
 483 = +0.05,  $t = 1.69$ ,  $p = 0.09$ ).

484 **Table 8**

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

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

487 <sup>a</sup> No work refers to those parents who were at home without work; e.g., those who were technically  
 488 unemployed due to the lockdown, parents on parental leave, students, etc.

489 <sup>b</sup> Perceived financial status ranges from less to more comfortable.

490 § No longer significant after adjustment for financial status (multiple regression).

491 \* Remains significant after adjustment for level of education (multiple regression).

492

### 493 *Effects of parental demographics on changes in parental motivations for buying foods*

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

505 Furthermore, in simple regressions, parents with a higher level of education showed a higher  
506 increase in the motivation to buy healthy foods ( $\beta = 0.13, t = 3.25, p < 0.001$ ), foods linked to  
507 weight control ( $\beta = 0.12, t = 2.37, p = 0.02$ ), comforting foods ( $\beta = 0.12, t = 2.28, p = 0.02$ ),  
508 and sustainable foods ( $\beta = 0.17, t = 5.04, p < 0.001$ ) than parents with a lower level of  
509 education. In a simple regression model, perceived financial status also significantly predicted  
510 changes in the motivation to buy foods related to weight control ( $\beta = 0.13, t = 2.08, p = 0.04$ ),  
511 but in a multiple regression model, both the effects of level of education and financial status  
512 became non-significant after adjustment for each other's effect. Also, in simple regressions,  
513 parents with a more comfortable perceived financial status showed a higher increase in the  
514 motivation to buy sustainable foods ( $\beta = 0.14, t = 3.19, p < 0.001$ ) and single parents showed  
515 a lower increase in this motivation ( $\beta = -0.37, t = -2.57, p = 0.01$ ) compared to parents with a  
516 less comfortable financial status and parents with a partner. In a multiple regression, level of  
517 education and family situation ("single parent") remained significant predictors for  
518 sustainability after adjusting for each other's effects, but not financial status. Finally, parents  
519 with a higher BMI showed a lower increase in the motivation to buy foods that can easily be  
520 preserved ("conservation") ( $\beta = -0.04, t = -2.22, p = 0.03$ ). The results of all regression  
521 analyses, significant and non-significant, can be found in Appendix B.3.

522

## 523 **4 Discussion**

524 This study wanted to evaluate possible changes in eating and feeding habits in families with  
525 young children during the COVID-19 lockdown in France, versus the period before the

526 lockdown. The results showed that not all, but a majority of parents reported some changes in  
527 their child's eating behaviors, in their feeding practices, their food shopping motivations, and  
528 in their own eating and cooking behaviors. This clearly indicates that the lockdown had an  
529 important impact on families' eating and feeding habits at home.

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

551 Moreover, even though the COVID-19 lockdown was an unusual situation, the increased  
552 manifestation of these food approach behaviors and their link with child boredom could be  
553 cause for concern. It suggests that these children did not merely rely on their internal cues of  
554 hunger and satiety when asking for foods/drinks (crucial for an optimal self-regulation of food  
555 intake); and ignoring internal cues could possibly make children overeat and induce weight  
556 gain if maintained for a long period (Kral, Allison, Birch, Stallings, Moore, & Faith, 2012;  
557 Monnery-Patris et al., 2019). With age, research has shown that children rely less on their  
558 internal cues for their food intake (e.g., Fox, Devaney, Reidy, Razafindrakoto, & Ziegler,  
559 2006). It is therefore important to encourage children (and their **caregivers**) from a young age

560 to listen to their inner sensations for food intake, and to maintain this even in more  
561 challenging situations. Parents and schools could play an important role in guiding children in  
562 using adaptive self-regulation strategies and in modeling these strategies. In both children and  
563 adults, several types of interventions such as mindfulness-based interventions and appetite  
564 awareness trainings have been proposed to increase awareness of hunger and satiety cues,  
565 with various levels of success (e.g., in adults: Alberts, Thewissen, & Raes, 2012; Craighead &  
566 Allen, 1995; Kristeller & Wolever, 2010; Van de Veer et al., 2012; in children: Bloom,  
567 Sharpe, Mullan, Zucker, 2013; Boutelle, Peterson, Rydell, Zucker, Cafri, Harnack, 2011;  
568 Johnson; 2000; Lumeng et al., 2017). Some interventions were for example successful in the  
569 short term, but not in the long term (Bloom et al., 2013). Reigh and colleagues (2020) recently  
570 also suggested a technology-enhanced intervention for preschoolers, using an interactive  
571 character-based technology platform and educational materials for parents, to improve  
572 preschoolers' energy intake regulation and their knowledge related to hunger, fullness and  
573 digestion. In their pilot study, preschoolers' (N=33) knowledge increased significantly and  
574 boys' short-term energy compensation improved following a 4-week intervention.

575 The results of our study further showed that when feeding practices were adapted, there was a  
576 significant trend to more permissive, child-centered and pleasure-oriented practices: parents  
577 reported less rules and limits, more soothing with food and gave more autonomy to the child  
578 in deciding when, what, how much and where to eat. Regarding the types of foods offered  
579 during snacking, we also observed increased intake of so-called "comfort foods". The theory  
580 of division of autonomy states that parents should be mainly responsible for what, when and  
581 where the child eats, but the child for the amount of food eaten (Satter, 1990; Vaughn et al.,  
582 2015). Here, we could thus argue that parents may have become a bit too permissive  
583 regarding the types of foods offered during the lockdown, there was also a significant  
584 decrease in structure of the meals (timing of meals, place). By contrast, the increases in  
585 guided choices (i.e., more child autonomy) may indicate that parents had the opportunity to  
586 listen better to children's needs and demands, and to respond to them in a more responsive  
587 way (even though we are aware that these child demands were not only based on children's  
588 internal cues, as discussed above). Interestingly, our results also showed that parental level of  
589 stress played a role in changes in parental feeding practices during the lockdown: higher  
590 increases in stress predicted higher increases in giving autonomy to the child regarding the  
591 amount to eat, and no improvement in meal atmosphere quality (in contrast to parents with no  
592 increases in stress).

593 Furthermore, parents showed many changes in their motivations when buying foods for their  
594 children. Highest increases in motivations were observed for buying pleasurable foods,  
595 sustainable foods, natural foods and healthy foods. These findings are in accordance with the  
596 findings of a French survey that was carried out by Ipsos during the lockdown in April 2020  
597 for L'Observatoire E.Leclerc des nouvelles consommations: they found that French  
598 consumers aged 16-75 years turned more to products of French origin (45%), fresh products  
599 (37%) or products from short circuits (37%). Sixty-three percent of consumers claimed that  
600 they consumed more local products in order to support the local economy during the  
601 lockdown. For the parents in our study, pleasure also became an important motivation, and  
602 this is in line with the observed increases in snack frequency in both parents and children,  
603 increased emotional eating in both, and the increase in the preparation of comforting  
604 foods/recipes during the lockdown. From a cultural point of view, family meals in France  
605 were already known to be strongly pleasure-oriented (Lhuissier et al., 2013), and the  
606 lockdown seemed to have reinforced this. Convenience became less important for many  
607 parents, which can be supported by their reported increase in the preparation of home-cooked  
608 meals and their increase in time cooking with their children. Di Renzo and colleagues (2020)  
609 also observed this increase in homemade recipes during the lockdown in Italy.

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



626 al., 2019) and are less likely to restrict their child's intake of unhealthy foods (Wijtzes,  
627 Jansen, Jansen, Jaddoe, Hofman, Raat, 2013).

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

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

648 Meanwhile, this study also has several strengths. To our knowledge, it is the only study that  
649 looked in a more systemic way at changes in families' food habits during the COVID-19  
650 lockdown, including eating and cooking behaviors, parental feeding practices and parental  
651 motivations when buying foods for the family. Other studies tend to focus uniquely on adults  
652 or on children. Our sample may not be entirely representative of the national population in  
653 France: there was for example a relatively small sample of parents with a low level of  
654 education (33.5% in our sample compared to approximately 55% in the French population  
655 (Insee, 2016)), and the majority of our participants were female (71.7%). However, we  
656 managed to recruit parents with diverse profiles, also in terms of work status, perceived  
657 financial situation, relationship status, and BMI categories (of both children and adults) that  
658 were very close to representativeness in the French population (Argouarc'h & Picard, 2018;  
659 Verdot, Torres, Salanave, Deschamps, 2017). This enabled us to obtain a broad idea of the

660 changes in eating and feeding habits in young children and their parents in France, and of the  
661 parental characteristics that were linked to these changes.

## 662 **5 Conclusion and perspectives**

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

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## 679 **Authors Contributions**

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

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