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# Finally, the chance to eat healthily: Longitudinal study about food consumption during and after the first COVID-19 lockdown in Italy

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## ARTICLE INFO

**Keywords:**  
 Covid-19  
 Lockdown  
 Junk food  
 Healthy food  
 Eating styles

## ABSTRACT

With the COVID-19 outbreak, structural constraints and social psychological factors changed the dietary habits of many people. This two-wave longitudinal study performed in Italy aimed to explore people's perceptions of changes in healthy and unhealthy food consumption before and during the first lockdown and the possible persistence of such changes after its official end, as a function of the number of people cohabiting, negative emotion activation, and individual eating styles. A total of 728 Italian adults completed self-reported food consumption measures and related psychological variables at both time points. In the lockdown period, participants reported an increase in healthy food consumption and involvement in cooking and a decrease in the consumption of junk food. This general pattern was stronger for both young and restrained eaters. The intensity of negative emotions and the number of cohabitants were not associated with the examined behaviour. In the post-lockdown period, the new consumption pattern acquired during the confinement was partially discontinued: participants cut down their healthy food consumption as well as their involvement in food preparation, but they continued to reduce their junk food intake. These results suggest that people's food consumption patterns can easily improve when the situation is favourable (e.g., more time and opportunities for cooking healthy meals) and offer an interesting theoretical contribution to understanding the factors useful in promoting healthy eating, in the event of a future outbreak.

## 1. Introduction

The outbreak of COVID-19 in Italy, which was the second country to be affected by the pandemic after China, made it necessary for the government to approve a series of restrictive measures aimed at limiting the spread of the virus. In particular, the *#stayhome* decree law by the Italian prime minister (Decree of the President of the Council of Ministers D.P.C.M., 2020) established that citizens could only leave the house for documented work activities, health reasons and other emergencies. Schools, universities and all nonessential shops and industries were closed, all public events cancelled, and travel restricted. Thus, it appears clear that the first national lockdown period, officially beginning on 9 March 2020, had a significant impact on the lifestyle and habits of Italians, including their eating behaviours (Di Renzo, Gualtieri, Pivari et al., 2020; Pellegrini et al., 2020). Both structural constraints (e.g., the closure of restaurants and bars) and social psychological factors (e.g., the stress induced by this unprecedented situation, and the constant presence of family members at home) have changed the dietary habits of

many people (Scarmozzino & Visioli, 2020; World Health Organisation Regional Office for Europe, 2020). Indeed, the data collected by the Nielsen (2020) during the first weeks of lockdown in Italy highlighted a boom in purchases for certain categories of foods: for example, those suitable for a "homemade aperitif", such as frozen pizza (+45.7%), wine (+12.4%), alcoholic beers (+11.3%), cold cuts (+28.1%), mozzarella (+44.6%), sausages (+44.2%) and potato chips (+25.7%), or those labelled as "comfort food", like sweet spreads (+61.3%), ice creams (+21.5%) and wafers (+16.2%).

We devised the present longitudinal study to explore people's perception of changes in healthy and unhealthy food consumption before and during the first lockdown and the possible persistence of such changes after the official end of this lockdown, as a function of the number of people cohabiting, negative emotion activation and individual eating styles.

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<https://doi.org/10.1016/j.foodqual.2021.104275>

Received 14 December 2020; Received in revised form 10 March 2021; Accepted 24 April 2021

Available online 29 May 2021

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### 1.1. Structural and social psychological factors driving changes in food consumption during the lockdown

Undoubtedly, the national lockdown measures imposed some structural changes in Italians' eating behaviours. The closure of restaurants and bars, and even the ban on takeaway food delivery in some regions, forced many people to prepare and consume all their meals at home, for the first time in a while. Moreover, the temporary suspension of many productive activities, the related workers' layoffs or the displacement of these activities at workers' homes (i.e., remote working) led to more spare time for many people and more sustained cohabitation among families.

Beyond these structural constraints imposed on everyday life by governmental restrictions, some social psychological factors could have affected the eating habits of Italians. Firstly, spending weeks at home, in most cases with relatives, could have strengthened the so-called effect of "social facilitation of eating". According to this effect, the amount of food that a person consumes increases as the number of co-eaters increases; such effect seems to emerge when the co-eaters are family members or friends but not when they are strangers (e.g., Cavazza et al., 2011). Therefore, one question that the present study aims to explore is whether the number of cohabitants affected participants' eating habits during the lockdown.

Secondly, particular attention should be paid to the specific stressors associated with the COVID-19 pandemic. The lack of knowledge about the disease, the sudden and unexpected nature of the pandemic, the fear of contracting the virus, the social isolation and the constant media bombardment about the spread of the virus could have caused high levels of psychological distress (Arslan et al., 2020; Capone et al., 2020; Di Renzo, Gualtieri, Pivari et al., 2020; Wang et al., 2020). It has been widely confirmed that stress and negative emotional states can affect eating behaviour, altering both the amount of food consumed (increasing or reducing it) and the choice of food (Caso et al., 2020; Hill et al., 2018; Reichenberger et al., 2018; Torres & Nowson, 2007). More specifically, negative emotions, in particular anxiety and fear, can result in excessive food consumption and a tendency to consume unhealthy foods (e.g., high-fat snack foods) as a strategy to avoid or reduce such negative emotions (Macht, 2008; Wallis & Hetherington, 2009). As pointed out by Macht (2008), the consumption of "junk food", i.e., foods high in sugars and fats and with low nutritional value (Boylan et al., 2017), stimulates the release of serotonin in the brain, increasing the sensation of pleasure. At the same time, it reduces the activity of the hypothalamic-pituitary-adrenal axis, which is widely implicated in the regulation of the stress response (Macht, 2008). However, emotions (and stress) do not impact all individuals in the same ways. Some people appear more likely than others to respond to emotions and stress by changing their food consumption. This may depend on their eating style (Conner & Armitage, 2002).

### 1.2. Eating styles

Human beings rarely regulate their food consumption relying on hunger and satiety cues. Instead, they use food to structure their days, to create opportunities to meet other people, to respond to external stimuli, to control their physical fitness, and also to regulate their emotional states.

According to Van Strien, Frijters, Bergers, and Defares (1986), we can refer to three main (and not mutually exclusive) eating styles, as individual tendencies to regulate food consumption. Emotional eating is defined as a tendency to eat as a response to negative emotional states, such as anxiety, loneliness or boredom (Alzheimer & Urry, 2019). Specifically, emotional eaters tend to consume sweets and high-fat foods to cope with stress and other emotional states, a pattern of consumption that in the long term can cause significant weight gain (Torres & Nowson, 2007). Psychological stress, negative emotions, and feelings of loneliness associated with mandatory confinement are all factors that

can increase emotionally driven food consumption (Al-Musharaf, 2020). In this regard, in a study conducted by Di Renzo, Gualtieri, Cinelli et al. (2020) on 602 Italian respondents, about half of the participants (most of whom were women) admitted to using food as a way to reduce anxiety caused by the COVID-19 outbreak and having increased their food consumption to feel better. Also, Shen et al. (2020) found that emotional eating affected some specific motives related to food consumption during the COVID-19 pandemic, including mood and sensory appeal. In particular, the authors highlighted that the consumption of certain sensorily appealing foods (e.g., foods high in fat and sugar) could serve as a distraction from the stress associated with the pandemic. Finally, they pointed out that not only consumption but also the preparation of appetising dishes can be an effective way to experience positive emotions and a sense of control despite the feelings of uncertainty associated with the pandemic (Shen et al., 2020). Consequently, it is plausible that the emotional eating style promotes not only the intake of specific food categories (for example, junk food) but also the personal involvement in cooking during the lockdown.

While the few studies that analysed eating habits during the COVID-19 pandemic focused, in most cases, on emotional eating, exploring the association between external and restrained eating styles and eating behaviours may also be worthwhile. Restrained eating refers to the conscious limitation of food consumption in order to lose or maintain weight (Van Strien et al., 1986). For this self-control to be maintained, the individual needs cognitive resources: this is why when contextual, social or emotional factors interfere with the cognitive ability to control one's eating intake, restrained eaters tend to overeat. For example, restrained eaters' self-control can be compromised when faced with a stressful situation like the COVID-19 lockdown. In such cases, food disinhibition can take over, which leads to overeating (Polivy & Herman, 2020). However, the suspension of work activities or more spare time due to remote working, together with the obligation to eat at home, could have also provided restrained eaters with the opportunity to more effectively control their food intake.

Finally, external eating is the tendency to eat in response to external stimuli related to food (e.g., the smell or appearance of food, seeing other people eating) regardless of the internal state of hunger and satiety (Van Strien et al., 1986). External eaters, as well as restrained eaters, are usually more likely to respond to stressful events by eating because stress seems to decrease the awareness of the self while increasing the awareness of environmental cues, including those associated with food (Heatherton & Baumeister, 1991). Since external eaters are already driven to eat by non-nutritional cues, it is plausible to imagine that the stressful condition resulting from the lockdown period, coupled with more time spent at home, may further increase this propensity (Zachary et al., 2020).

In light of the above, it is plausible that emotional, restrained and external eating styles have promoted changes in healthy and unhealthy food consumption and in personal involvement in preparation as a response to the negative emotions associated with the lockdown experience. In other words, lockdown may have prompted people already used to dealing with negative emotions by eating (i.e., emotional eaters) to use food even more as a maladaptive emotion regulation strategy. However, we cannot take for granted that food consumption worsened during the lockdown. In fact, another possibility is that some people, forced to stay at home, have had more time to prepare (healthy) meals, control their intake, and eating foods that are not often cooked and consumed (EpiCentro, 2020). In this regard, Di Renzo, Gualtieri, Pivari et al. (2020) found that, during the first lockdown, Italians increased the consumption of homemade pizza, bread and desserts, but at the same time they reduced the consumption of junk foods such as salty snacks and sugary drinks. Therefore, the question of whether Italians' food consumption has worsened or improved – and which social psychological factors promoted this – remains open.

### 1.3. The present study

The aim of this two-wave longitudinal study is to analyse how the consumption of healthy and unhealthy foods and the degree of personal involvement in cooking varied among (T1) the pre-lockdown, lockdown, and (T2) post-lockdown phases.

Our investigation focused on the following research questions:

RQ1. Did people perceive a change in their consumption of junk (e.g., snack) and healthy food (vegetables and fruits), and in personal involvement in dish preparation during the lockdown compared to the pre-lockdown phase?

RQ2. Is the perception of change associated with the number of cohabitants?

RQ3. Is this perception associated with the intensity of negative emotions experienced?

RQ4. Is this particularly true for emotional, restrained and external eaters?

RQ5. Does the worsening (or the improvement) of the diet in the lockdown period, as well as the involvement in food preparation, tend to persist or be restored after the end of the confinement constraint?

RQ6. Are these subsequent changes associated with the above-mentioned characteristics, namely, negative emotions and eating styles?

## 2. Material and methods

### 2.1. Participants and procedure

On 30 April 2020, during the lockdown phase, 370 university students attending courses in social psychology at an Italian university were invited to take part in a longitudinal study aimed at evaluating eating behaviours during the COVID-19 emergency. Students were asked to fill out personally, and to make two non-student adults fill out an online self-report questionnaire on the Google Forms platform in exchange for one university credit. Eight-hundred and sixty-eight Italian adults (62.4% women) aged from 18 to 84 years ( $M = 38.6$ ,  $SD = 16.73$ ) signed the informed consent form and filled out the first questionnaire (T1). After about two months, starting from 4 June 2020 (when the lockdown was over), a total of 728 participants (61.4% women; Mean age = 39.6,  $SD = 16.72$ ) completed the second questionnaire (T2). Statistical analyses were conducted only on participants who completed both questionnaires.

This study was conducted following receipt of ethical approval by the local committee.

### 2.2. Measures

#### 2.2.1. Demographic information

Participants were asked to provide their demographic characteristics, such as age, sex, education, marital status, profession and nationality. In addition, they were asked to indicate if they personally knew someone infected with the COVID-19 virus, and the number of cohabitants.

#### 2.3. Psychological measures

*Eating styles* were assessed with a short form (Guidetti, 2010) of the Italian version (Dakanalis et al., 2013) of the *Dutch Eating Behavior Questionnaire* (DEBQ; Van Strien et al., 1986). It consisted of 17 items divided into three subscales evaluating three different eating behaviour patterns: emotional eating (e.g., “Do you want to eat when you are in a bad mood?”;  $\alpha = 0.81$ ), restrained eating (e.g., “How often do you try not to eat between meals because you pay attention to your weight?”;  $\alpha = 0.82$ ) and external eating (e.g., “If the food tastes good, do you eat more than usual?”;  $\alpha = 0.71$ ). Participants responded on a 5-point Likert scale ranging from never (1) to very often (5). Since DEBQ measures have shown temporal stability (Dakanalis et al., 2013), eating styles were measured only at T1.

*Negative emotions* were assessed at both time points using the short form of *The Positive and Negative Affect Schedule* (PANAS; Terracciano et al., 2003). In particular, participants were asked to evaluate, on a 5-point Likert scale, ranging from not at all (1) to very much (5), how intensely they experienced the following negative emotions in the previous week: distressed, upset, scared, nervous, and afraid. Cronbach's  $\alpha$  was 0.83 at T1 and 0.87 at T2<sup>1</sup>.

#### 2.4. Food consumption measures

*Perception of change in food consumption* during the lockdown compared to the pre-lockdown phase was assessed by presenting participants with a list of foods<sup>2</sup> asking them to indicate for each food whether their consumption had decreased ( $=-1$ ), remained the same ( $=0$ ) or increased ( $=1$ ). For the purposes of the analyses, a subset of foods was grouped into two categories: junk food (fried foods, mayonnaise and ketchup, salty snacks, fast foods, chocolate, candies, sweet snacks, soft drinks and ice cream) and healthy food (fruits and vegetables). We computed two indexes based on the average perception of change in junk and healthy food consumption during the lockdown compared to the pre-lockdown period.

*Self-reported frequencies of food consumption* were assessed at both time points by presenting participants with the same list of foods, asking

**Table 1**  
Means and standard deviations of measured variables.

Variable	Mean	SD	Range
1. Age	39.50	16.74	18–79
2. N. cohabitant	3.06	1.12	0–9
3. Emotional Eating	2.77	0.88	1–5
4. Restrained Eating	2.86	0.93	1–5
5. External Eating	3.09	0.70	1–5
6. Negative emotions at T1	2.74	0.88	1–5
7. Perception of change in junk food consumption	-0.18	0.36	-1–1
8. Perception of change in healthy food consumption	0.19	0.50	-1–1
9. Junk food consumption at T1	1.55	1.01	0–35
10. Healthy food consumption at T1	6.21	3.53	0–35
11. Perception of change in personal involvement in cooking at T1	0.28	0.93	1–5
12. Negative emotions at T2	2.31	0.86	1–5
13. Junk food consumption at T2	1.41	0.93	0–35
14. Healthy food consumption at T2	5.81	3.22	0–35
15. Perception of change in personal involvement in cooking at T2	-0.26	1.06	1–5

them to indicate how many servings they had eaten of each food in the previous week. The possible number of portions that participants could indicate ranged from 0 to 35 (i.e., five servings a day every day). We computed two indexes of frequency of junk and healthy food consumption both at T1 and T2.

Frequency of personal involvement in cooking was assessed in relation to three moments: pre-lockdown, lockdown and post-lockdown. Specifically, participants were asked to evaluate, on a scale ranging from never (1) to always (5), how often they prepared or participated in meal preparation before, during (both measurements were taken at T1) and after the lockdown (measured at T2). We computed two indexes of change, one subtracting the frequency of cooking pre-lockdown from the frequency of cooking during the lockdown (positive scores indicate an increase of cooking during the lockdown), and the other subtracting the frequency of cooking during the lockdown from the frequency post-lockdown (positive scores indicate an increase in cooking post-lockdown).

### 3. Results

We compared participants professing to know someone affected by the COVID-19 (n = 243) with those who did not (n = 485) with respect to all the dependent variables. No significant differences emerged (all the *ps* > 0.10), this is why we decided not to consider this variable in further analyses.

Descriptive statistics and correlations among measures are displayed in Tables 1 and 2.

RQ1. Did people perceive a change in their consumption of junk and healthy food, and in personal involvement in dish preparation during the lockdown compared to the pre-lockdown phase? A one-sample *t*-test showed that the means of perception of change in junk and healthy food consumption and in involvement in cooking were significantly different from 0, indicating that our participants reported to have increased their fruit and vegetable intake,  $t(727) = 10.33, p < .001, 95\% CI [0.15, 0.23]$  and their engagement in cooking,  $t(727) = 8.17, p < .001, 95\% CI [0.21, 0.35]$ , whereas their junk food consumption decreased compared with the pre-lockdown period,  $t(727) = -12.95, p < .001, 95\% CI [-0.20, -0.15]$ .

RQ2-3. Is the perception of change associated with the number of cohabitants and with the intensity of negative emotions experienced? To answer these questions, we performed three regressions on the perception of change in junk and healthy food consumption and in involvement in cooking during the lockdown, entering age, gender, number of cohabitants, negative emotions at T1 and eating styles as predictors (Table 3). As concerns the perception of change in junk food consumption, the analysis showed that participants' age was significantly associated with the perception of an increase in junk food consumption, whereas a restrictive eating style was significantly associated with a decrease in junk food consumption. No other predictors showed a significant association. The same analysis performed on the perception of change in healthy food consumption showed a perfectly specular pattern of results. The third regression on T1 measures concerned the perception of change in personal involvement in cooking. In this case, participants' age ( $\beta = -0.09, p = .02$ ) was the only significant predictor: older participants tended to report a slight decrease in their involvement in cooking.

RQ4. Is this particularly true for emotional, restrained and external eaters? We tested whether eating styles moderated the relationship between negative emotion and perception of change through Process (Hayes, 2013, model 1). For perceived changes in junk and healthy food consumption, the associations among participants' negative emotions and the perception of change were not moderated by any of the eating styles (all the interactions *ps* > 0.22). Instead, participants' emotional eating style moderated the effect of negative emotions on the perception of change in personal involvement in cooking (*b* interaction = 0.09; *SE* = 0.04; *t* = 2.04, *p* = .04; 95% *CI*: [0.00, 0.17]). In particular,

**Table 2**  
Pearson's correlations among the variables.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
1. Age	–													
2. N. cohabitant	–0.10**	–												
3. Emotional Eating	–0.23**	–0.04	–											
4. Restrained Eating	–0.08*	–0.05	0.14**	–										
5. External Eating	–0.23**	0.04	0.63**	–0.04	–									
6. Negative emotions at T1	–0.23**	–0.01	0.29**	0.11**	0.24**	–								
7. Perception of change in junk food consumption	0.12**	0.04	–0.03	–0.14**	0.00	–0.06	–							
8. Perception of change in healthy food consumption	–0.12**	–0.03	0.020	0.12**	0.02	0.08*	–0.27**	–						
9. Junk food consumption at T1	–0.09*	0.07	0.09*	–0.30**	0.18**	0.02	0.23**	–0.20**	–					
10. Healthy food consumption at T1	0.08*	–0.09*	–0.06	0.23**	–0.14**	–0.04	–0.11**	0.24**	–0.18**	–				
11. Perception of change in personal involvement in cooking at T1	–0.10**	0.02	0.12**	0.04	0.11**	0.00	0.02	0.04	0.03	0.02	–			
12. Negative emotions at T2	–0.29**	0.03	0.26**	0.07	0.20**	0.51**	–0.10**	0.05	0.06	0.00	–0.01	–		
13. Junk food consumption at T2	–0.14**	0.07	0.09*	–0.26**	0.17**	0.08*	0.09*	–0.04	0.54**	–0.19**	0.02	0.06	–	
14. Healthy food consumption at T2	0.18**	–0.03	–0.07	0.21**	–0.12**	–0.06	–0.03	0.12**	–0.20**	0.69**	0.05	–0.08*	–0.17**	–
15. Perception of change in personal involvement in cooking at T2	0.16**	–0.02	–0.03	0.00	–0.08*	–0.05	–0.04	–0.01	–0.01	0.03	–0.47**	–0.04	0.02	0.02

Note. \*\*\* *p* < .01; \* *p* < .05.

**Table 3**  
Prediction of perceived change in junk and healthy food consumption during the lockdown compared to before (T1).

	Perception of change in junk food consumption			Perception of change in healthy food consumption		
	B	SE	β	B	SE	β
Intercept	-0.18*	0.11		0.15	0.14	
Female gender	0.03	0.03	0.04	-0.01	0.04	-0.01
Age	0.00**	0.00	0.12	-0.00**	0.00	-0.11
N. cohabitant	0.01	0.01	0.04	-0.02	0.02	-0.04
Negative emotions T1	-0.01	0.02	-0.04	0.03	0.02	0.06
Eating styles						
Restrictive	-0.05***	0.01	-0.13	0.06**	0.03	0.11
Emotional	0.00	0.02	0.00	-0.03	0.03	-0.05
External	0.01	0.03	0.02	0.02	0.03	0.02
Fit of the model	Adj. R <sup>2</sup> = 0.03			Adj. R <sup>2</sup> = 0.02		
	F(7, 720) = 3.72, p = .001			F(7, 720) = 3.15, p = .003		

Note. \*\*\* p < .001 ; \*\* p < .01 ; \* p < .05.

participants characterised by low scores of emotional eating style reported to have decreased their personal involvement in cooking as a function of their negative emotions (-1SD, b = -0.13; SE = 0.06; t = 2.23; p = .03; 95% CI [-0.24, -0.02]), whereas this association was not significant for participants more characterised by an emotional eating style (all the ps > 0.22).

**RQ5. Do the worsening or the improvement of the diet in the lockdown period, as well as the involvement in food preparation, tend to persist or to be restored after the official end of the lockdown?** To test whether in the post-lockdown period participants changed the habits acquired during the lockdown, we ran a paired-sample t-test comparing the same variables measured at T1 and at T2. The differences were all significant, indicating that after the lockdown, our participants decreased their consumption of fruits and vegetables t(727) = 4.02, p < .001, 95% CI [0.20, 0.59], junk food t(727) = 4.04, p < .001, 95% CI [0.07, 0.21] and their involvement in cooking, t(727) = 6.72, p < .001, 95% CI [0.19, 0.34].

**RQ6. Are these subsequent changes associated with negative emotions and eating styles?** We performed three regressions on the self-reported frequencies of junk and healthy food consumption, as well as personal involvement in cooking at T2, controlling for the same frequencies reported at T1, age and gender, entering the negative emotions assessed at T2, and the three eating styles. The first regression performed on frequency of junk food consumption in the post-lockdown period (T2) showed that this was strongly associated with the same frequency at T1. Net of this effect, self-reported junk food consumption decreased with participants' age, was slightly lower for female participants, and, more interestingly, significantly decreased for those participants characterised by a restrictive eating style (Table 4). The moderation analysis showed that the effect of negative emotions expressed by participants at

T2 was not significantly moderated by any of the eating styles (all the ps > 0.37). A mirror and similar pattern emerged from the regression on the healthy food consumption, and once again participants' eating styles did not moderate the associations between their negative emotions and their consumption of healthy food (Table 4). Finally, we performed the same regression on the difference between the frequency of personal involvement in cooking during and after the lockdown. This difference significantly increased with participants' age (β = 0.15; p < .001). No other significant effects nor moderation of the eating styles emerged (all ps > 0.24).

#### 4. Discussion

In contrast with the circulating cliché of the lockdown as a time of bingeing, the present study empirically documented that our participants perceived, on average, an improvement in their eating habits during this peculiar period: they reported an increase in their intake of healthy food and their involvement in cooking while claiming a decrease in the consumption of junk food. These data may seem at odds with those reported by the Nielsen (2020) and cited in the introduction, however, it should be noted that our sample was not representative of Italians, for example our participants had higher educational qualification (85% of them have at least a high school diploma) in respect to the Italian population and thus they may have healthier eating habits than the average of Italians. In addition, the purchase of a higher number of "junk food" does not necessarily result in increased consumption of such foods. Indeed, in that period, the so-called "stock-effect" may have prompted many Italians to buy more food than necessary for fear of not finding certain products in the medium to long term (Amicarelli & Bux, 2020).

The healthy pattern found was stronger for both young and restrained eaters. This is an interesting finding because it concerns a potential positive effect of the restrictive eating style, which contrasts with previous literature mostly focusing on the negative consequences of restraint (for a review, cf. Polivy & Herman, 2020). Our study showed that restrained eaters, along with women and young people, took the greatest advantage of the lockdown in terms of improvements in eating habits. Apparently, the constraints imposed by the pandemic offered to restrained eaters the opportunity to maintain control over their diet. Although restraint is only slightly associated with health motivation (e.g., Arbit et al., 2017), restrained eaters' greater attention to what they eat and their ability to self-regulate seem to help them make healthy choices when the situation is favourable.

Although participants perceived an improvement in their consumption habits, we must acknowledge that their junk food intake was much higher than recommended, whereas their fruit and vegetable intake was much lower. Indeed, the junk food consumption score is the mean of nine different items, thus the average intake at T1 was about two portions per day of food that should be eaten in moderation or not at all. As

**Table 4**  
Prediction of frequencies in junk and healthy food consumption at T2.

	Junk food consumption			Healthy food consumption		
	B	SE	β	B	SE	β
Intercept	1.09***	0.22		0.65	0.63	
Female gender	-0.15*	0.06	-0.08	0.23	0.18	0.03
Age	-0.01**	0.00	-0.11	0.02***	0.00	0.12
Consumption at T1	0.45***	0.03	0.49	0.61***	0.02	0.67
Negative emotions T2	0.01	0.04	0.01	-0.22	0.11	-0.06
Eating styles						
Restrictive	-0.11**	0.03	-0.11	0.22*	0.10	0.06
Emotional	-0.03	0.04	0.03	-0.08	0.13	-0.02
External	0.04	0.05	0.03	0.14	0.16	0.03
Fit of the model	Adj. R <sup>2</sup> = 0.32			Adj. R <sup>2</sup> = 0.50		
	F(7, 720) = 57.16, p < .001			F(7, 720) = 103.87, p < .001		

Note. \*\*\* p < .001 ; \*\* p < .01 ; \* p < .05.

the healthy food score is the mean of two items, the average consumption at T1 was 1.77 a day, in contrast with the minimum of five portions usually recommended (World Health Organization, 2019). This is in line with surveys (e.g., Imamura et al., 2015; Rippin et al., 2017) indicating poor dietary quality across Europe and the rest of the world.

The enforced sharing of space with other family members was not associated with perception of change in food consumption pattern, as the number of cohabitants did not affect any of our dependent variables. This may be because the change imposed by the lockdown constraints in terms of meal consumption may have concerned more the environment a meal is consumed in instead of the number of co-eaters. In other words, in that period people had to consume all meals at home rather than at a bar or restaurant, and with family members rather than friends and colleagues, but we do not know whether this involved a significant increase in the number of co-eaters.

Surprisingly, in contrast with most previous literature, the intensity of negative emotions was not associated with the examined behaviours, not for the total sample nor for emotional, restrained and external eaters. This might be due to the relatively low mean level of negative emotions experienced by our participants, even though the variable is normally distributed around the mean. In addition, emotions became even less negative at T2, and their effect on eating behaviour remained not significant. It is worth noting that our participants have been recruited in one of the less affected Italian regions during the first outbreak; people living in the most affected areas likely felt stronger negative emotions, which may have had different effects on eating. A more promising interpretation of this unexpected result concerns the particular situation in which the negative emotions were felt: being worry in the comfort of one's home, with dilated times to spend doing one's favourite activities and/or with family, may be a consolation for most people, even if characterised by high levels of emotional, restrained or external eating. These results were consistent with other studies showing that negative affect does not always increase food consumption compared with positive affect (see for instance, Evers et al., 2009; Evers, Adriaanse, de Ridder, & de Witt Huberts, 2013; Zhu et al., 2013) and emotional eating does not always moderate the relation between negative emotion and eating (e.g., Adriaanse et al., 2011; Conner et al., 1999; O'Connor & O'Connor, 2004; Evers et al., 2009; Royal & Kurtz, 2010). According to Altheimer and Urry (2019), this may depend on the specific type of emotion and the social context of consumption: further studies could explore the effect of social influence on emotional eating.

As for the post-lockdown period, our results indicate that overall the new consumption pattern acquired during lockdown was partially broken: indeed, participants cut down their healthy food consumption as well as their involvement in food preparation; however, somewhat surprisingly, these participants kept reducing their junk food intake. This is an interesting finding suggesting that unhealthy consumption habits are due more to lifestyle than to individual propensity. Once individuals return to normal life, it could be difficult to have time to cook and eat fruit and particularly vegetables which may require longer preparation times. In line with this interpretation, the comparison of the consumption of the two categories separately at T1 and T2 highlighted that this decrease appeared more pronounced for vegetables  $t(727) = 3.64, p < 0.01, 95\% CI [0.21, 0.72]$  (from  $M = 6.44$  to  $M = 5.98$ ) than for fruit  $t(727) = 2.66, p = .008, 95\% CI [0.08, 0.57]$  (from  $M = 5.97$  to  $M = 5.64$ ). Instead, curbing junk food intake might be easier once this habit has been established during the lockdown: getting back to one's routine seems even to help reduce further this unhealthy consumption. This is consistent with recent findings suggesting that the importance of health and weight control as food choice motives increased after the lockdown

(Snuggs & McGregor, 2021).

The general reduction we observed in junk food consumption was more pronounced in women, older persons (whose junk food intake decreased less during the lockdown) and restrained eaters. The latter two categories also depart from the general reduction in fruit and vegetables, as they seem to increase their consumption of those foods. In addition, the overall decline observed for the engagement in food preparation does not hold true for older people and women, i.e., those who were more likely used to cooking before the lockdown and likely took up this role again soon after.

Some drawbacks of the present study must be acknowledged: first, due to the unplanned nature of the first lockdown, we did not assess participants' food consumption prior to the lockdown, and thus we had to rely on their subjective perception of behavioural change. Second, we did not include in the questionnaire questions about participants' lockdown experience (e.g., whether they spent their lockdown with their families or with peers in case of non-resident students) that may have influenced eating behaviours. Finally, though quite heterogeneous in terms of age and gender, our sample was not representative of the Italian population and this reduces the generalisability of results.

## 5. Conclusions

Notwithstanding its limitations, this work has the strength of taking an extraordinary opportunity to investigate what happens when people actually have time and cognitive resources to deal with their food consumption practices. Our results suggest that people may be more motivated to eat healthy foods than we believed and could actually improve their diet if they had the opportunity. During lockdown, people have had more time for cooking and were not exposed to the many temptations one can face in everyday life, e.g., junk food stands in coffee shops and supermarkets, vending machines at the workplace, or smell of fried food coming out from takeaways while walking down the street. As time constraints and lack of willpower are among the most common barriers to healthy eating (Pinho et al., 2018), it is plausible that removing those barriers results in better food consumption practices. When those barriers were restored after the end of the lockdown, our participants returned to their lower consumption of fruit and vegetables. Instead, they reported eating even less junk food, suggesting that the lockdown could have lasted long enough to disrupt unhealthy habits (Gardner et al., 2020). Given the exploratory nature of this study, future research could exploit any further lockdown periods to test whether our results apply to other contexts, characterised by different emergency levels, cultural aspects and for individuals with diverse food choice motives.

## 6. Footnote

- 1 It is worth noting that the T2 data gathering began on the 4th of June 2020. The official end of the lockdown was the 3rd of June. However, the easing of restrictions had already begun starting from 18 May: most shops were reopened, free movement was allowed to citizens within their Region, swimming pools and gyms were also reopened before the official end. Therefore, we have reason to believe that the questions about emotions felt the previous week referred to emotions presumably elicited by this reopening perspective.
- 2 The complete list of foods included in the questionnaire is the following: Fried foods; Milk and yoghurt; Fresh cheeses (e.g. mozzarella, ricotta, stracchino); Aged cheeses (e.g. gorgonzola, scamorza, provolone); Mayonnaise and ketchup; Pre-packaged salty snacks (e.g. potato chips, tuc, roasted peanuts); Fish and Crustaceans; High-fat meats (e.g. precooked meats, hot dogs, sausage, beef

steaks, minced meats); Fast food; Chocolate or chocolates; Candies; Packaged sweet snacks (e.g. packaged biscuits, snacks); Pizza and focaccia; Sausages (e.g. salami, pancetta, ham, mortadella, bresaola); Carbonated and/or sugared drinks; Fruit; Vegetables; Homemade cakes and biscuits; Ice cream; Bread, breadsticks and crackers; Pasta and rice.

### CRedit authorship contribution statement

**Daniela Caso:** Conceptualization, Investigation, Methodology, Writing – original draft, Writing – review & editing. **Margherita Guidetti:** Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing. **Miriam Capasso:** Conceptualization, Methodology, Data curation, Writing – original draft. **Nicoletta Cavazza:** Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing.

### Declaration of Competing Interest

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

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