Short Communication

Cognitive restraint, emotional eating and uncontrolled eating: Exploring factors associated with the cycle of behaviors during the COVID-19 pandemic

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ABSTRACT

The objective of this study was to analyze the factors associated with Cognitive Restraint, Emotional Eating, and Uncontrolled Eating behaviors with perceptions of life habits, body image, eating habits, and food consumption during the COVID-19 pandemic. Sociodemographic data, eating behavior, perceptions about life and eating habits, body image, and food consumption were collected. Factors associated with each of the three eating behaviors were accessed through three multiple linear regressions controlled for age, sex, BMI, education level, and monthly income. Cognitive restraint was associated with being active during the pandemic ($\beta = 5.85$), attempted weight loss ($\beta = 11.89$), perception of overweight ($\beta = 9.10$), better eating habits in the pandemic ($\beta = 6.55$), and decreased consumption of refined cereals ($\beta = 5.60$) and fast foods ($\beta = 8.23$). Emotional eating was associated with increased stress during the pandemic ($\beta = 7.10$), worse sleep ($\beta = 4.74$), body dissatisfaction ($\beta = 4.85$), perception of overweight ($\beta = 7.45$), attempted weight loss ($\beta = 4.19$), increase in the amount of food consumed ($\beta = 9.34$), increased food delivery purchase ($\beta = 5.13$), increase in consumption of sweets and desserts ($\beta = 7.17$) and reduction in consumption of vegetables ($\beta = -5.26$). Uncontrolled eating was associated with working>8 h/day ($\beta = 4.04$), increased stress during the pandemic ($\beta = 3.65$), body dissatisfaction ($\beta = 6.59$), worse eating habits in the pandemic ($\beta = 5.21$), and an increase in the amount of food consumed ($\beta = 8.73$). Cognitive restraint behavior was associated with healthy life habits and negative body image variables. In contrast, emotional eating and uncontrolled eating were associated with negative body image and unhealthy eating habits.

1. Introduction

During the COVID-19 pandemic, one of the measures adopted to interrupt the spread of the virus was social distancing, which has become part of the new daily life of the population. However, the need for social distancing implies a radical change in lifestyle, which affects other dimensions of health, including mental health (Jiménez-Pavón et al., 2020). Stress and anxiety are the main consequences of social distancing. They are directly related to health behaviors, such as physical inactivity, lower sleep quality, body dissatisfaction, changes in alcohol and food consumption (Malta et al., 2020; Swami et al., 2021).

From a psychosocial point of view, changes in food intake can be explained by different changes in different dimensions of eating behavior, including Cognitive Restraint (CR), Uncontrolled Eating (UE), and Emotional Eating (EE) (Natacci & Ferreira Júnior, 2011). The CR behavior refers to the adoption of a mental position toward food to reduce energy intake to control body weight or improve body image perception. CR theory proposes that attempts to control weight and body shape lead individuals to organize their eating behavior around their fear of failure. This state of inhibition is often interspersed with losses of control that cause episodes of EE or UE (Natacci & Ferreira Júnior, 2011). The three domains interact with each other in such a way that

cognitive restraint individuals who have negative emotions or stressful situations can consume certain foods because of their emotional state or increase food intake as a result of this altered emotional state (Apfeldorfer & Zermati, 2001).

During the pandemic, there was an increase in the consumption of sweets, snacks, and ultra-processed foods, rich in sugar and saturated fat (Malta et al., 2020). However, results also indicate an increase in the consumption of vegetables, fruits, and beans (Sánchez-Sánchez et al., 2020). Thus, it is also essential to know what eating behaviors are related to these different food consumption patterns and their associated factors during COVID-19. However, most of the studies during the pandemic have focused on the EE dimension and associated factors (Al-Musharaf, 2020; Coulthard et al., 2021). Only one study proposed to analyze eating behavior from the perspective of these three dimensions together as an outcome, demonstrating that the social isolation process has led to an increase in the dimensions of EE and UE; however, it did not increase the dimension of CR when compared to the pre-COVID-19 period (Elmacioğlu et al., 2020). Nonetheless, no study has identified the factors associated with these behaviors together as an outcome and from the perspective of the interaction of CR, EE, and UE behaviors.

Considering that the pandemic has the potential to change eating behaviors, it is hypothesized that CR will be associated with a healthy lifestyle and eating habits. In contrast, EE and UE will be associated with unhealthy lifestyles and eating habits. Thus, the present study aimed to analyze the association between the three dimensions of eating behavior (CR, EE, and UE) and perceptions of life habits, body image, eating habits, and food consumption during the COVID-19 pandemic.

2. Methodology

2.1. Study design and data collection

A cross-sectional web-based online survey was carried out between December 2020 and January 2021. The survey link was distributed via academic/department e-mails of a public university in the Brazilian northeast and social media (Whatsapp and Instagram) using a snowball technique (Naderifar et al., 2017).

The questionnaire consisted of 73 objective questions in Portuguese, divided into six parts. The authors designed the first 52 questions and pre-tested them before the final application; the remaining 21 questions were from the previously validated eating behavior questionnaire (Natacci & Ferreira Júnior, 2011). It required approximately 20 min to complete. Data from completed forms were imported into a Microsoft Excel spreadsheet. The survey obtained 643 responses, 40 of which were excluded due to duplicate responses, and five were excluded due to invalid answers. The study was performed in compliance with the Helsinki Declaration Guidelines and approved under number: 4,380,553 in the Ethical Committee of the Federal University of Sergipe.

2.2. Participants

The study participants were adults (18 to 59 years) and residents in the Brazilian territory. Pregnant women were not eligible to participate. The sample size was estimated with the G power software program for multiple linear regression with 26 potential predictor variables using medium effect size, p-value < 0.05, and power = 0.95, which indicated that a minimum of 245 participants were required.

2.3. Measures

2.3.1. Sociodemographic

Participants were required to respond about their age, sex, education level, marital status, and state and city of Brazilian territory to assess sociodemographic characteristics. State and city information were used to describe the sample. The states collected were categorized into Brazilian regions (northeast, southeast, or other); the cities were used to describe if the individual lived in the capital or other cities. For the purpose of analysis, the educational level was categorized into Higher education (post-graduate and graduate degree) and Lower education (high school and below).

Monthly household income was assessed according to the criteria of socioeconomic strata of ABEP, 2019 (Associação Brasileira de Empresas de Pesquisa, 2019): A: Up to USD$4,886.48 or more; B1: Up to USD $2,156.79; B2: Up to USD$1,078.79; C1: Up to USD$589.81; C2: Up to USD$334.36; D: Up to USD$137.64. The strata were divided into two categories for analysis: Higher income (strata A to B2) and Lower income (strata C1 to D). Work or study modality were also assessed: home office, working or studying out of home, or currently not working or studying, and how many hours of work or study per day: <4 h, 4–6 h, 6–8 h, >8 h/day were also assessed. The number of hours worked or studied was categorized into: Up to 8 h/day and more than 8 h/day. The Body Mass Index (BMI) was calculated using self-reported weight and height. BMI was used in the analysis as a continuous variable.

2.3.2. Perceptions on life habits during the pandemic

Participants were asked about their practice of physical activity during the pandemic (frequency and total time) and classified using the recommendation of 150 min/week (World Health Organization, 2020).

Next, the participants were asked: "How do you rate your level of social isolation during the pandemic?" and the responses were categorized into: High level of social isolation (Not leaving home and Leaving 1–2 time/week) and Low level of social isolation (Leaving > 3 times/ week). Another three questions were asked to assess the perception of stress level, changes in sleep, and consumption of alcoholic beverages during the pandemic. All questions were answered using a 5-point Likert scale. The answers were dichotomized for analysis purposes.

2.3.3. Perception on body image and satisfaction

In this section, three questions were made about perception on body satisfaction, perception of body weight and attempt to lose weight in the last six months. The two initials questions were: "Do you currently feel satisfied with your body?" and "How do you feel about your current weight?" The questions were answered using a 5-point likert scale. Moreover, a final question was asked: "Have you attempted to lose weight in the last 6 months?" with the option of answering "yes" or "no".

2.3.4. Perception on eating habits during pandemic

Four questions evaluated participant perceptions on eating habits during the pandemic. The questions were: "In your opinion, your eating habits during the pandemic have been"; "Have you noticed a difference in the amount of food you are consuming during the pandemic?"; "Have you noticed a difference in the frequency of food preparation at home during the pandemic?" and "Have you noticed a difference in the frequency of purchasing ready-to-eat food via delivery during the pandemic?". All questions were answered using a 5-point Likert scale. The answers were also dichotomized for analysis purposes.

2.3.5. The three factor eating questionnaire – (TFEQ-R21)

The three-factor eating questionnaire (TFEQ-R21) validated into Portuguese (Natacci & Ferreira Júnior, 2011) was used to assess eating behavior. The TFEQ-R21 assesses three dimensions of eating behavior through 21 questions: Cognitive Restraint (CR, six questions), Emotional Eating (EE, six questions), and Uncontrolled Eating (UE, nine questions).

The scoring analysis of the questionnaire was performed according to the authors' guidelines. Item scores ranged from 1 to 4, and the subscales (CR, EE, UE) were added to calculate the individual mean of each subscale. The mean of each subscale was called the raw score. Raw scores were converted using formulas for standardization of results and comparison with other studies using this methodology (Elmacioğlu et al., 2020; Jáuregui-Lobera et al., 2014). The final score was calculated using the following formula: Behavior score: 100*[(Raw mean of the subscale - Minimum raw score) / Maximum raw score]. The values of the

final score range from 0 to 100, and higher scores indicate greater CR, EE, and UE.

2.3.6. Perception on food consumption during pandemic

Finally, the participants answered questions about perception of changes in food consumption in the pandemic. The list of foods was adapted from the food frequency questionnaire (FFQ) used in ISACAMP-Nutri. (Universidade Estadual de Campinas, 2014). The food categories evaluated were: 1) Vegetables; 2) Fresh fruit; 3) Refined cereals; 4) Packaged snacks; 5) Ultra-processed juices; 6) Sweets and desserts; 7) Processed meats; 8) Fried foods; and 9) Fast Food. For the 9 food categories, participants were asked whether consumption (a) increased, (b) remained unchanged, or (c) decreased.

2.4. Pre-test

The questionnaire developed by the authors underwent a pre-test before starting the data collection. The research group analyzed the initial questionnaire to help strengthen the available questions and answers. Next, a pilot questionnaire was applied to the target population to verify whether the elaborated questionnaire answered the following questions: Clarity and precision of the terms, quality of the data, and feedback. Thus, the questionnaire underwent subsequent corrections of the flaws and difficulties encountered by the participants. The invitation to respond to the pilot questionnaire was disseminated via the Google Forms link on social networks and in contact with national researchers in the area. The results were extracted to a Microsoft Excel table, and the data were interpreted and analyzed according to the research objective. A total of 340 responses were obtained, and after analyzing and discussing the questions and answers collected, there was a need to reformulate the "perception on life habits during the pandemic," "perception on body image and satisfaction," and "eating habits during the pandemic" sections to improve the order of responses, the flow of questions and standardize technical terms present in the questions. After the responses were reorganized, the questionnaire underwent a new analysis by the research group for the final application.

2.5. Statistical analysis

Data were analyzed using Statistical Package for Social Sciences (SPSS) version 25.0. Continuous variables were subjected to the Kolmogorov-Smirnov test to verify the assumptions of normality. A descriptive analysis was performed using absolute numbers and percentages for categorical variables and mean, standard deviation and 95% confidence intervals for continuous variables.

Three multivariate analyses by linear regression were performed using Cognitive Restraint, Emotional Eating, and Uncontrolled Eating as dependent variables. All variables which showed a $p < 0.2$ in the simple linear regression were included in the adjusted model. The stepwise method was used to simultaneously remove the weakest correlated variables and come up with a model that best explained the distribution to examine the relationship between several variables simultaneously and eliminate confounding factors. For the three multiple linear regressions analyses, the normality of the residuals was assessed, and the Durbin-Watson test verified the independence of the residuals. Multicollinearity was refuted using the variance inflation factor (VIF), and the significance of the models were assessed by ANOVA test. All analysis were controlled for sex, age, BMI, education level, and monthly income. A p-value of $p < 0.05$ was considered significant.

3. Results

3.1. Sample description

Table 1 shows the descriptive analysis of the sample. In supplementary table 1 are presented the descriptive analysis of the perception

Table 1
Descriptive analysis. Brazil, 2021. (n = 598).

Variable	Mean	Standard Deviation (SD)	95% Confidence Interval
Age (years)	31.76	12.32	30.77; 32.75
BMI (kg/m²)	24.37	4.71	23.99; 24.75
Cognitive Restraint	45.43	22.06	43.66; 47.21*
Emotional Eating	34.44	25.63	32.38; 36.50
Uncontrolled Eating	32.65	19.15	31.11; 34.19
		n (%)	
Sex			
Female		387 (64.7)	
Male		211 (35.3)	
Brazilian region			
Northeast		559 (93.5)	
Southeast		31 (5.2)	
Others		8 (1.3)	
Area			
Capital		320 (53.5)	
Others cities		278 (46.5)	
Education Level			
Lower education		264 (44.1)	
Higher education		334 (55.9)	
Marital Status			
Single		258 (43.1)	
Married		340 (56.9)	
Monthly Household			
Lower income		285 (47.7)	
Higher income		313 (52.3)	
Employment or Study Status			
Home office		423 (70.7)	
Working or studying out of home		141 (23.5)	
Not working or studying		34 (5.6)	
Hours of work/day			
Up to 8 h/day		424 (70.9)	
> 8 h/day		174 (29.1)	
Social Isolation Level			
Low		219 (36.6)	
High		379 (63.4)	

*Analysed by 95% confidence interval.

variables on life habits, body image and satisfaction, eating habits, and food consumption during the pandemic (Table S1).

3.2. Eating behavior

3.2.1. Cognitive restraint

The mean of cognitive restraint in the total sample was 45.43 (22.06), constituting the highest mean of all three eating behaviors dimensions by 95% confidence interval observation (Table 1). In the final model, more active during the pandemic ($β = 5.29$), weight loss attempt ($β = 11.99$), perception of overweight ($β = 8.71$), better eating habits during the pandemic ($β = 6.41$) and decreased consumption of refined cereals ($β = 5.34$) and fast foods ($β = 8.88$) were associated with cognitive restraint. The model was controlled for age, sex, income, education level, and BMI. The regression formed a good fit for the data F $(10,587) = 23.072$, $p < 0.001$, which accounted for 29.8% of the variance in increased cognitive restraint punctuation during the pandemic ($R^2 = 0.298$). Table 2 shows the crude and adjusted models.

3.2.2. Emotional eating

The mean of emotional eating was 34.44 (25.63). In the final model, increased stress during the pandemic ($β = 7.19$), worse sleep ($β = 4.89$), body dissatisfaction ($β = 4.88$), perception of overweight ($β = 7.35$), weight loss attempt ($β = 4.19$), increased amount of food consumption ($β = 9.32$), increased purchase of delivery ($β = 4.93$), increased sweets and desserts ($β = 7.14$) and decreased vegetables consumption ($β = -5.21$) were associated with emotional eating. The model was controlled for age, sex, income, education level, and BMI. The regression formed a

Table 2
Crude and adjusted analysis of independent variables in relation to Cognitive Restraint during the pandemic. Brazil, 2021 (n = 598).

Independent variables	Crude Model		Adjusted Model			
	β (95% CI)	p	b	β (95% CI)	SE	p
Intercept				26.83 (15.09; 38.58)	5.97	<0.001
Working/studying >8 h/day	0.88 (−3.05; 4.82)	0.019*	–	–	–	–
More active (≥150 min/week)	10.45 (6.88; 14.03)	<0.001*	0.11	5.29 (1.98; 8.61)	3.13	0.002
Low level of social isolation	1.73 (−1.93; 5.40)	0.927	–	–	–	–
Increased stress perception	−0.17 (−3.95; 3.60)	0.928	–	–	–	–
Worse sleep perception	−3.41 (−7.18; 0.35)	0.075*	–	–	–	–
Increased alcohol consumption	1.73 (−2.63; 6.10)	0.436	–	–	–	–
Body dissatisfaction	3.83 (0.09; 7.57)	0.045*	–	–	–	–
Perception of overweight	9.85 (6.34; 13.37)	<0.001*	0.19	8.71 (4.57; 12.85)	2.10	<0.001
Weight loss attempt	15.98 (12.55; 19.42)	<0.001*	0.26	11.99 (8.59; 15.39)	1.73	<0.001
Better eating habits	9.92 (5.68; 14.17)	<0.001*	0.11	6.41 (2.47; 10.36)	2.00	0.001
Decreased amount of food consumed	2.65 (−0.93; 6.24)	0.147*	–	–	–	–
Decreased home cooking	0.58 (−7.10; 5.94)	0.861	–	–	–	–
Increased purchase of food delivery	−1.36 (−4.93; 2.21)	0.455	–	–	–	–
Increased consumption of vegetables	6.90 (3.11; 10.68)	<0.001*	–	–	–	–
Increased consumption of fresh fruit	5.65 (1.89; 9.40)	0.003*	–	–	–	–
Decreased refined cereals consumption	14.24 (8.81; 19.67)	<0.001*	0.07	5.34 (0.37; 10.31)	2.11	0.035
Decreased package snacks consumption	7.24 (3.69; 10.78)	<0.001*	–	–	–	–
Decreased ultra-processed drinks consumption	6.55 (3.03; 10.07)	<0.001*	–	–	–	–
Decreased sweets and desserts consumption	10.29 (6.12; 14.46)	<0.001*	–	–	–	–
Decreased processed meats consumption	10.09 (6.04; 14.13)	<0.001*	–	–	–	–
Decreased fried foods consumption	10.35 (6.60; 14.10)	<0.001*	–	–	–	–
Decreased fast food consumption	11.03 (7.42; 14.63)	<0.001*	0.19	8.88 (5.56; 12.21)	1.69	<0.001

R^2 = 0.298. * Variables analyzed by multiple linear regression (p < 0.2). The model was controlled for sex, age, monthly income, education level and BMI. b = Standardized beta; β = Unstandardized beta; 95% CI = 95% Confidence interval; SE = Standard error.

good fit for the data $F(13,584) = 21.984$, p < 0.001, which accounted for 32.9% of the variance in increased emotional eating punctuation during the pandemic (R^2 = 0.329). Table 3 shows the crude and adjusted models.

3.2.3. Uncontrolled eating

The mean of uncontrolled eating was 32.65 (19.15). In the final model, working >8 h/day (β = 3.85), increased stress during the pandemic (β = 3.83), body dissatisfaction (β = 6.61), worse eating

habits during the pandemic (β = 5.26), and increased the amount of food consumption (β = 8.65) were associated with uncontrolled eating. The model was controlled for age, sex, income, education level, and BMI. The regression formed a good fit for the data $F(9,589) = 20.663$, p < 0.001, which accounted for 25.3% of the variance in increased uncontrolled eating punctuation during the pandemic (R^2 = 0.253). Table 4 shows the crude and adjusted models.

Table 3
Crude and adjusted analysis of independent variables in relation to Emotional Eating during the pandemic. Brazil, 2021.

Independent variables	Crude Model		Adjusted Model			
	β (95% CI)	p	b	β (95% CI)	SE	p
Intercept			5.29 (8.32; 18.91)	6.93	0.445	
Working/studying > 8 h/day	3.36 (-1.20; 7.92)	0.149*	–	–	–	–
Less active (≤150 min/week)	1.15 (-3.10; 5.41)	0.595	–	–	–	–
Low level of social isolation	−2.94 (-7.20; 1.31)	0.174*	–	–	–	–
Increased stress perception	15.44 (11.22; 19.65)	<0.001*	0.13	7.19 (3.25; 11.14)	2.00	<0.001
Worse sleep perception	10.36 (6.05; 14.66)	<0.001*	0.08	4.89 (1.04; 8.74)	1.96	0.013
Increased alcohol consumption	7.78 (2.74; 12.82)	0.003*	–	–	–	–
Body dissatisfaction	16.47 (12.32; 20.63)	<0.001*	0.09	4.88 (0.67; 9.08)	2.14	0.024
Perception of overweight	16.42 (12.45; 20.39)	<0.001*	0.14	7.35 (2.33; 12.38)	2.55	0.004
Weight loss attempt	10.92 (6.76; 15.09)	<0.001*	0.07	4.19 (0.44; 7.94)	1.90	0.028
Worse eating habits	14.07 (9.18; 18.96)	<0.001*	–	–	–	–
Increased amount of food consumed	17.07 (13.13; 21.02)	<0.001*	0.17	9.32 (5.62; 13.02)	1.88	<0.001
Decreased home cooking	8.05 (0.50; 15.60)	0.037*	–	–	–	–
Increased purchase of food delivery	11.88 (7.83; 15.92)	<0.001*	0.09	4.93 (1.27; 8.58)	1.86	0.008
Decreased consumption of vegetables	−3.56 (-7.99; 0.87)	0.115*	−0.09	−5.21 (-9.05; −1.38)	1.95	0.008
Decreased consumption of fresh fruit	−0.74 (-5.13; 3.64)	0.739	–	–	–	–
Increased refined cereals consumption	1.98 (-4.45; 8.43)	0.545	–	–	–	–
Increased package snacks consumption	4.96 (0.80; 9.12)	0.019*	–	–	–	–
Increased ultra-processed drinks consumption	1.97 (-2.15; 6.10)	0.348	–	–	–	–
Increased sweets and desserts consumption	12.00 (7.16; 16.84)	<0.001*	0.11	7.14 (2.80; 11.48)	2.21	0.001
Increased processed meats consumption	4.93 (0.16; 9.71)	0.043*	–	–	–	–
Increased fried foods consumption	−0.74 (-5.13; 3.64)	0.739	–	–	–	–
Increased fast food consumption	6.51 (2.23; 10.78)	0.003*	–	–	–	–

R^2 = 0.329. * Variables analyzed by multiple linear regression (p < 0.2). The model was controlled for sex, age, monthly income, education level and BMI. b = Standardized beta; β = Unstandardized beta; 95% CI = 95% Confidence interval; SE = Standard error.

4. Discussion

This article sought to analyze the association between perceptions of health-related habits (life habits, body image, eating habits and food consumption) with CR, EE and UE behaviors during the COVID-19 pandemic. The dimension of eating behavior with the highest mean in the sample was cognitive restraint, and this dimension was associated with better eating habits, being more active, having attempted to lose weight in the last 6 months, having the perception of being overweight and decreased consumption of fast foods and refined cereals during the pandemic. The emotional eating dimension was associated with a greater number of variables such as an increase in the amount of food consumed during the pandemic, having the perception of being over-weight, having attempted to lose weight in the last 6 months, increased stress, worse sleep, increased purchase of food delivery and decreased consumption of vegetables during the pandemic. The uncontrolled eating dimension was associated with an increase in the amount of food consumed, worse eating habits, increased stress, working or studying >8 h/day and body dissatisfaction.

4.1. Cognitive restraint

Although developing healthier behaviors, as demonstrated in the present study, the CR state is often interspersed with episodes of disinhibition of food control (Natacci & Ferreira Júnior, 2011). CR also debilitates the individual emotionally, causing individuals to eat for comfort (Apfeldorfer & Zermati, 2001). These findings can also be justified by the emphasis that contemporary society places on the ideal of thinness by providing a sociocultural environment that justifies weight loss. This fact may have been aggravated in the pandemic by the increased time spent on social media that has the potential to aggravate body dissatisfaction and concern with appearance (Ahuja et al., 2021). These factors were associated with CR in the present study.

This perspective becomes even more critical, especially in the most affected patients, those more sensitive to mood disturbances or those at risk of eating disorders, considering that having better eating and life habits are not necessarily related to healthy eating behaviors. As seen in the case of CR, a practice promoted by the media, accepted by the family and recommended by professionals nowadays (Alvarenga et al., 2015), and may bring episodes of EE and UE, especially with increased stress during the pandemic.

4.2. Emotional eating

Emotional eating behavior is one in which emotions lead to food choices associated with the emotional context experienced by the individual. It was also possible to associate stress during the pandemic with higher EE scores in a study carried out in Saudi Arabia (Al-Musharaf, 2020); however, unlike the present study, they did not find an association with worse sleep quality. We believe that the association between worse sleep and EE in our study was caused by the ability of sleep disturbances to trigger EE (Palmer & Alfano, 2017).

One study pointed out that the EE score is higher when starting a diet for aesthetic reasons (Jáuregui-Lobera et al., 2014). The result of the present study may imply that body dissatisfaction and negative perceptions related to the body, when added to greater stress during the pandemic, can lead individuals to have episodes of disinhibition, leading them to consume food as a result of their emotions. This hypothesis can be confirmed by a study carried out in the United Kingdom, where the stress related to the COVID-19 pandemic was associated with the greater drive for thinness in women. The authors suggest that the change in routine caused by the pandemic led women to feel dissatisfied with their bodies and increased restrictive eating and unhealthy weight management practices (Swami et al., 2021). It is known that individuals who suppress cognitions, such as restrained eaters, tend to eat as a result of their emotions, and when this occurs, there is a search for foods with high energy content and rich in sugar and fat (Coulthard et al., 2021). In the present study, EE was associated with an increase in the amount of food consumed and increased consumption of sweets and desserts. In addition to this, it is easy to acquire these foods via delivery apps, which may increase their consumption (Horta et al., 2021). Therefore, we believe this facility justifies the association between EE and increased delivery purchases in our sample.

Surprisingly, our study also found that decreased vegetable consumption was associated with a lower EE score. Therefore, a reduction in vegetable consumption for our sample would reduce the EE score during the pandemic. We hypothesized that this result occurred due the Compensatory Health Beliefs (Knäuper et al., 2004); according to this mechanism, individuals tend to engage in a healthy behavior (i.e., increasing consumption of vegetables) to compensate or counteract an unhealthy behavior (i.e., stress, worse sleep, increased amount of food consumed or consumption of sweets and fast foods). These findings suggest that healthy eating can be part of a compensatory strategy.

4.3. Uncontrolled eating

A recent study showed a significant increase in the UE score during the pandemic (Elmacioğlu et al., 2020). An association was found between UE and working >8 h/day. It is known that the pandemic exposed workers to the home office and narrowed the boundaries between work and personal life (Shimazu et al., 2020). This context has the potential to increase stress and consequently trigger UE episodes.

The association between stress, worse eating habits, and increased food consumption with UE behavior can be explained by the tendency of stressed people to exhibit a lower level of eating competence, poorer quality of diet, and to overeat; moreover, increased food consumption was previously associated with higher stress and UE behavior (Alvarenga et al., 2015; Elmacioğlu et al., 2020).

4.4. Strengths and limitations of the study

As far as we know, this is the first study to assess factors associated with CR, EE and UE behaviors as an outcome and together during the pandemic. Previous studies have only focused on factors associated with EE; however, eating behavior can be understood as a cycle, where individuals can present a behavior over a period of time, and then for some specific reason trigger another type of eating behavior. Therefore, exploring the factors that influence dietary restraint and disinhibitory behaviors is important to assess the real impact of the pandemic on different dysfunctional eating behaviors. Although our results are consistent with studies carried out before the pandemic, we have some limitations. The cross-sectional characteristic of the study does not allow us to verify the precise interaction between changes from the restraint to the disinhibitory state, and therefore longitudinal studies are needed during the pandemic to identify these questions. Furthermore, the sample is not representative and should not be generalized to the entire population, as most of the sample has a high level of internet access. We also cite the use of self-reported variables on weight, height and perceptions of habits and behaviors during the pandemic as a limitation, however, this is a common limitation in behavioral studies during the pandemic and recent research has also used this method, which we consider to be viable and important for research conducted in times of uncertainty (Al-Musharaf, 2020; Coulthard et al., 2021).

4.5. Recommendations for future practice and research

Analyzing the associations between dysfunctional eating behaviors and factors related to the pandemic is essential for the management and guidelines to change behavioral patterns, especially during this period of intense changes in the population's routine. There was a significant and negative change in the quality of sleep, stress, physical activity, and food consumption during the pandemic (Malta et al., 2020), in addition to the

Table 4

Crude and adjusted analysis of independent variables in relation to Uncontrolled Eating during the pandemic. Brazil, 2021.

Independent variables	Crude Model		Adjusted Model			
	β (95% CI)	p	b	β (95% CI)	SE	p
Intercept				22.33 (12.68; 31.99)	4.91	<0.001
Working/studying >8 h/day	4.22 (0.78; 7.65)	0.016*	0.09	3.85 (0.82; 6.88)	1.54	0.013
Less active (≤150 min/week)	1.19 (-2.01; 4.40)	0.466	–	–	–	–
Low level of social isolation	1.43 (-1.77; 4.64)	0.380	–	–	–	–
Increased stress perception	9.07 (5.84; 12.30)	<0.001*	0.09	3.83 (0.75; 6.91)	1.56	0.015
Worse sleep perception	6.16 (2.89; 9.43)	<0.001*	–	–	–	–
Increased alcohol consumption	5.95 (2.15; 9.74)	0.002*	–	–	–	–
Body dissatisfaction	12.04 (8.90; 15.18)	<0.001*	0.16	6.61 (3.40; 9.83)	1.63	<0.001
Perception of being overweight	9.39 (6.33; 12.45)	<0.001*	–	–	–	–
Weight loss attempt	5.22 (2.05; 8.40)	0.001*	–	–	–	–
Worse eating habits	12.45 (8.81; 16.10)	<0.001*	0.11	5.26 (1.64; 8.88)	1.84	0.004
Increased amount of food consumed	13.18 (10.22; 16.14)	<0.001*	0.22	8.65 (5.66; 11.64)	1.52	<0.001
Decreased home cooking	2.80 (-2.90; 8.50)	0.335	–	–	–	–
Increased purchase of food delivery	6.89 (3.81; 9.97)	<0.001*	–	–	–	–
Decreased consumption of vegetables	−1.03 (-4.37; 2.31)	0.545	–	–	–	–
Decreased consumption of fresh fruit	−0.08 (-3.39; 3.21)	0.958	–	–	–	–
Increased refined cereals consumption	−0.16 (-5.01; 4.69)	0.948	–	–	–	–
Increased package snacks consumption	1.77 (-1.36; 4.91)	0.267	–	–	–	–
Increased ultra-processed drinks consumption	1.56 (-1.54; 4.67)	0.324	–	–	–	–
Increased sweets and desserts consumption	6.59 (2.91; 10.27)	<0.001*	–	–	–	–
Increased processed meats consumption	4.30 (0.71; 7.89)	0.019*	–	–	–	–
Increased fried foods consumption	4.48 (1.14; 7.82)	0.009*	–	–	–	–
Increased fast food consumption	4.43 (1.20; 7.65)	0.007*	–	–	–	–

$R^2 = 0.253$. * Variables analyzed by multiple linear regression ($p < 0.2$). The model was controlled for sex, age, monthly income, education level and BMI. b = Standardized beta; β = Unstandardized beta; 95% CI = 95% Confidence interval; SE = Standard error.

increased influence of social media, which has the power to increase body dissatisfaction.

Thus, the data from this study can enable nutritionists and behavioral professionals to identify and work on nutritional counseling and a good relationship with food more assertively. Identifying factors associated with CR, EE, or UE behaviors during the pandemic can facilitate behavioral diagnosis during this period and assist in managing the dysfunctional eating behavior that the individual is expressing during the pandemic. Furthermore, these results can support behavioral intervention strategies such as intuitive eating and mindful eating and advanced therapies such as cognitive behavioral therapy and acceptance and commitment therapy (Alvarenga et al., 2015). In addition, exploring the relationship between behaviors from a theoretical perspective can help professionals identify the cycle of restriction and disinhibition behaviors through lifestyle and eating habits.

5. Conclusion

Our results showed that dysfunctional eating behaviors are present and associated with perceptions about lifestyle and eating habits during the pandemic, regardless of age, gender, BMI, education level, and income. However, restrictive behavior had the highest average in the sample, and this behavior was associated with variables negative body image; this has the potential to trigger emotional eating and uncontrolled eating behaviors when associated with greater stress during the pandemic, which in turn are associated with an intake of energy-dense foods. These disinhibitory behaviors are associated with worse habits and food consumption, which can increase the incidence of obesity and non-communicable chronic diseases, considered risk factors for aggravation and mortality from COVID-19. More longitudinal studies should reveal the relationship between behaviors to provide more guidance to the population in this and future pandemics.

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.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.foodqual.2022.104579.

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