Changes in eating habits, sleep, and physical activity during coronavirus disease (COVID-19) pandemic: A longitudinal study in young Brazilian adult males

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Abstract

Background: The coronavirus disease (COVID-19) pandemic has promoted changes in lifestyle behaviors, such as food consumption, sleep, and physical activity (PA). Few longitudinal studies have investigated these changes in young adults. **Aim:** This study aimed to assess lifestyle behaviors before and during the COVID-19 pandemic in young adult males. **Methods:** 50 young adult males (18–35 years) recruited by posters and social media in Florianopolis, Brazil, provided data on food consumption, PA, and sleep in 2018–2019 (baseline) and during the pandemic in 2020 (follow-up). PA and sleep variables were assessed through self-reported questionnaires. Food records were used to evaluate food consumption. Weight was measured using Bioelectrical impedance analysis at baseline and using self-reported at follow-up. Multilevel linear regression models and generalized linear multilevel were used to test differences between baseline and follow-up. **Results:** The findings indicated significant changes at follow-up, compared to baseline. Decreased consumption of total fat ($\beta = -13.32$, 95% CI (-22.45; -4.18), $p < 0.01$), sodium ($\beta = -1330.72$, 95% CI (-1790.63; -870.82), $p < 0.01$), cholesterol ($\beta = -212.99$, 95% CI (-269.8; -156.18), $p < 0.01$), total sugars ($\beta = -65.12$, 95% CI (-80.94; -49.29), $p < 0.01$), alcohol, and sugar-sweetened beverage were observed. Despite that, a slight increase in weight was also observed (80.70 ± 16.37 kg *vs.* 82.99 ± 15.42 kg, $p = 0.000748$). Sleep duration increased ($\beta = 0.7596$, 95% CI (0.41; 1.11), $p < 0.01$), and occupational PA decreased ($\beta = -1168.1$, 95% CI (-1422.33; -913.83), $p < 0.01$), while domestic ($\beta = 394.04$, 95%CI (114.68; 673.39, $p < 0.01$)) and leisure PA ($\beta = 499.91$, 95% CI (245.28; 754.53), $p < 0.01$) increased. **Conclusion:** Our results suggest that social distancing policies positively impacted eating habits, sleep, and PA patterns. These changes are possibly linked to increased awareness of the need for a healthy lifestyle.

Keywords

lifestyle, COVID-19, physical activity, sleep, food intake

Introduction

Physical activity (PA), sedentary behavior, sleep, and diet are lifestyle behaviors that serve as pillars for good health, playing a fundamental role in maintaining good physical and mental health of several populational subgroups (Morin et al., 2020; Tremblay et al., 2010; Warburton and Bredin, 2017; Zimberg et al., 2012). An adequate engagement in these behaviors and a balanced diet is recommended by the World Health Organization (Bull et al., 2020), to prevent the burden of non-communicable diseases and other adverse health outcomes. (WHO, 2010). Since lat|e December 2019, the new disease, called coronavirus disease (COVID-19) caused by the SARS Coronavirus-2 (Rabi et al., 2020), spread into several countries being described as pandemic on March 2020 (WHO, 2020b). In an attempt to limit the spread of

the virus, governments adopted restrictive measures for population circulation. This has limited peoples' access to several services and disrupted work routines, ultimately leading to the shift of behavioral patterns, including PA,

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sedentary behavior, sleep, and diet (Ammar et al., 2020; Morin et al., 2020; Reyes-Olavarría et al., 2020; Wang et al., 2020).

The COVID-19 global pandemic posed several new challenges for the individual to maintain a healthy diet (Naja and Hamadeh, 2020). The pandemic may alter the nutrition of individuals in several ways: (1) eating behavior altered by anxiety, stress, loneliness, boredom (Di Renzo et al., 2020a; Pellegrini et al., 2020); (2) limited food access, availability and insecurity by home isolation and transport difficulties (Niles et al., 2020); (3) deregulation of the circadian cycle (Morin et al., 2020); and (4) breaking of the daily routine and PA practice, providing more time at home, and, consequently, more time to eat (Chaput et al., 2011). Together, these factors might reduce diet quality (Naja and Hamadeh, 2020), facilitate overconsumption in general (Chaput et al., 2011), and potentially lead to weight gain (Pellegrini et al., 2020).

Reduced PA levels were reported in several places for the different periods of the COVID-19 pandemic (Ammar et al., 2020; Reyes-Olavarría et al., 2020; Ruíz-Roso et al., 2020; Wang et al., 2020). With restricted access to sports clubs, gyms, and even public parks and spaces, opportunities to be active were limited. Consequently, PA time has been shown to be displaced by sedentary behavior, and not only during leisure, but also for occupational activities (Stockwell et al., 2021). The availability of time and disruption of routines also affected sleep, with a recent review suggesting that sleep duration increased in several places since the beginning of the COVID-19 pandemic.

Although a body of literature was consolidated describing the lifestyle of individual during the COVID-19 pandemic, few studies were published with data collected before the pandemic started and compared it with data collected during the pandemic period (Gallo et al., 2020; Martínez-de-Quel et al., 2021; Ruiz-Roso et al., 2020). Still, empirical evidence regarding diet, PA, and sleep changes as a result of the pandemic in Brazil remains mostly unexplored. On February 26th 2020, the Brazilian Ministry of Health confirmed the first case in Brazil (CEO, 2020). In early March 2021, Brazil ranked second globally, accounting for more than 11 million cases, and had accumulated more than 287 thousand deaths (CRC, 2021). In Brazil, actions were decentralized between its states, with social distancing and home isolation being the most prevalent preventive measure. Even though there was no lockdown, social distancing and home isolation can adversely affect several daily routines, including sleep, PA, and food patterns. Therefore, we aimed to compare lifestyle behaviors (sleep, physical activity, and food intake) between a previous moment and during the COVID-19 pandemic confinement in the young adult males. We hypothesized that the lifestyle quality worsened during social distancing compared to the pre-pandemic period.

Methods

Study design and participants

This longitudinal observational study was conducted with a convenience sample of 50 young adult males in the Federal University of Santa Catarina located at Florianopolis, Brazil. This is part of a larger project that aimed to evaluate the inflammatory potential of the diet and its relationship with anthropometric and metabolic parameters (unpublished work). For the present study, data was collected in two phases: (1) Baseline: before COVID-19 pandemic and (2) Follow-up: during COVID-19 pandemic. Figure 1 summarizes the steps applied on each stage.

Baseline data was collected from September 2018 to March 2019, and the follow-up data collection was carried out remotely from July to August 2020, as social distancing policies were in effect during this period. Participants were young adult males (18–35 years), residents in the mesoregion Florianópolis, Santa Catarina - Brazil. The participants were recruited via posters and flyers on the Federal University of Santa Catarina campus and via social media, emails, and phone calls. The eligibility criteria included (1) Body mass index (BMI) 18–34.9 kg/m^2; (2) No smoker; (3) No chronic or metabolic disease diagnosis. This study was performed under the Declaration of Helsinki and was approved by the Human Research Ethics Committee of the Federal University of Santa Catarina (protocols CAAE no: 89244718.6.00000121 and CAAE no: 68006617900000121). Participants provided written informed consent prior to any procedures and were assured all data would be used only for research purposes.

Measurement instruments

An online questionnaire was used to collect personal background data on an online survey platform, including age, socioeconomic characteristics, and if participants consume meals in front of screens. For the follow-up, this questionnaire was updated to include COVID-19-related questions, as well as self-reported information that were measured objective on the baseline (i.e. body weight). In addition, questions about self-perception of change during the social distancing were included for weight, food, and beverage consumption, with the following response options: "no change", "increased", or "decreased".

Anthropometric measures

For the baseline, weight was measured with a digital scale integrated with the BIA (InBody® 720 octapolar multifrequency) equipment. The height was measured with a portable stadiometer. BMI values were obtained by the ratio between weight (kg) per height (m) square (WHO, 1995). All the participants were evaluated in the same form.

During follow-up, body weight was self-reported via online questionnaire.

Figure 1. Measurements at baseline (before the COVID-19 pandemic) and follow-up / legend: FR: food records. NDSR: Nutrition Data System for Research. BIA: Bioelectrical impedance. PSQI: Pittsburgh Sleep Quality Index. IPAQ: International Physical Activity Questionnaire.

Food consumption

Dietary intake data was collected using 3-day paper-based food records (P-FR) (nonconsecutive days, 2 on weekdays and 1 on weekends) on baseline and follow-up. A document was sent to participants explaining how to fill the records digitally and were asked to return them by e-mail. The research team was available to answer questions either by e-mail, phone, or text, at the participants need and preference. This protocol was followed both at baseline and follow-up.

The information on the P-FR was checked when the participants sent their registers to the researchers. At baseline, we transformed dietary data into grams and milliliters using a reference table (Pinheiro et al., 2004) and analyzed in The Nutrition Data System for Research (NDSR) software (University of Minnesota, MN, EUA). During follow-up, a web-based application that offers self-monitoring of food intake was used (MyFitnessPal) to analyze the food data obtained by the P-FR (Chen et al., 2015; Griffiths et al., 2018). Both methods (NDSR and MyFitnessPal) have shown to provide adequate analyze nutrient calculations (Griffiths et al., 2018), and inter-and intra-individual food consumption were adjusted for both data collection points using the method established by Iowa State University (ISU) (Nusser et al., 1996). After contacting the whole sample (n = 50) at follow-up, only 22 participants returned the complete food records and had their food consumption data analyzed.

Physical activity

The PA was assessed using International Physical Activity Questionnaire (IPAQ) on an online tool (www.webipaq. com.br). IPAQ is a self-report instrument proposed by WHO in 1998 and validated for the Brazilian population (Matsudo et al., 2001). It evaluates the time spent in PA in the previous week in activities like work, sports, and leisure. Each activity has a unique metabolic equivalent of task (MET) score, which represents the amount of energy used for a particular type of activity. All the activities that have been reported in IPAQ were transformed into MET-minutes/week (Craig et al., 2003).

Sleep

Sleep duration and quality were assessed using Pittsburgh sleep quality index (PSQI), one of most used self-reported instruments for investigating sleep quality (Bertolazi et al., 2011; Buysse et al., 1989). Participants answered the PSQI using an online tool (Google Forms), with the link provided by the researchers at both timepoints (baseline and follow-up). The PSQI is composed of 19 items, divided into 7 domains related to sleep difficulties (sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, sleep medication, and daytime sleep dysfunction). As a result, the PSQI provides an analysis of each of the 7 domains and an overall sleep quality score, which ranges from 0 to 21 points. In general, scores greater than 5 indicate poor sleep. A review of has shown that the PSQI has a strong reliability and validity among different populational groups, as is recommended for adult populations (Mollayeva et al., 2016).

Statistical analyzes

Data was presented using means and standard deviation or relative and absolute frequencies. The comparison between weight, BMI, sleep, and dietary indicators at baseline and follow-up was conducted with multilevel linear regression

models. Normality of data and model residuals were inspected for all analyzes. For the PA, Generalized Linear Multilevel Models (GLMM) were fit, using the Gamma family, as it was more appropriate for the distribution of these data (Ng and Cribbie, 2017). The differences between baseline and follow-up were calculated for the variables of interest, and their respective 95% confidence intervals (95% CI) were estimated using the linear models, with profile 95% CI being calculated for the regressions and Wald 95% CI calculated for the GLMM. Analyzes were conducted using the packages *lme4*, version 1.1-23 and *lmerTest*, version 3.1-2, for R.

Results

A total of 59 participants provided valid data at baseline and 50 on the follow-up (refused to participate (n = 8) and incomplete data (n = 1)). Specifically for the food consumption outcome, 22 participants provided full food records and were included in the analytic sample. Therefore, the final analytic sample was composed of 50 participants. Participants were 27.7 ± 4.2 years old, and the majority have 12 or more years of schooling (60%). Most were single (88%) and working from home at follow-up (52%) (Table 1).

From baseline to follow-up, the weight increased 2.84% (80.70 ± 16.37 kg *vs.* 82.99 ± 15.42 kg, $p = 0.000748$) as did BMI (25.20 ± 4.79 kg/m^2 *vs.* 25.93 ± 4.58 kg/m^2, $p = 0.00105$) (Figure 2(a) and (b)). The majority of participants (52%) reported an increase in weight at follow-up (Figure 2(d)).

Table 1. Sociodemographic variables of the study participants (n = 50).

Variables	Mean ± SD/n (%)
Age (years)	27.7 ± 4.2
Education	
≤11 years	2 (4)
12–17 years	30 (60)
≥18 years	18 (36)
Occupation	
Student	26 (52)
Employed	7 (14)
Student and employed	17 (34)
Marital status	
Single	44 (88)
Married	6 (12)
Monthly income (tertiles)	
<1500 BRL/m	20 (40)
1500–3500 BRL/m	14 (28)
>3500 BRL/m	16 (32)
Working remotely during follow-up	
Yes	26 (52)
No	24 (48)

n: number of events; %: percentage; SD: standard deviation; BRL: Brazilian Reais.

Differences in food consumption indicators between follow-up and baseline are displayed in Figure 3. Almost half of the participants reported increased food consumption at follow-up (Figure 3(a) and (c)). An increase in food consumption in front of the screen was observed during social distancing (54% in baseline to 78% in follow-up, Figure 3(d)).

No differences were observed for energy intake between baseline and follow-up. However, participants showed improved food quality consumption at follow-up, represented by decreased intakes of total fat, sodium, cholesterol, and total sugars, despite a decrease in the consumption of fibers (Table 2).

Differences between baseline and follow-up for PA and sleep indicators can be observed in Table 3. The volume of PA practiced in the occupation domain decreased more than 57% at follow-up. However, the PA level related to domestic activities increased by 75.1% and leisure by 150%, compared to baseline. An increase in sleep duration was also observed, with no significant differences observed for latency or sleep efficiency.

Discussion

The present study aimed to evaluate changes in lifestyle behaviors in a young adult male sample before and during the COVID-19 pandemic in a city in Southern Brazil. The main findings suggest that sleep duration, domestic and leisure PA, and diet quality increased. However, a slight increase in weight was also observed. Overall, these results suggest that the pandemic and the policies of social distancing impacted the lifestyle of our sample of Brazilian adult males.

Interestingly, the participants in our study improved food quality during isolation compared to baseline. This change was represented by a reduced intake of total fat, sodium, cholesterol, and total sugars. Moreover, most participants decreased alcohol intake during the social distancing. More time spent at home may have contributed to this change in food consumption. For instance, the reduction in coffee ingestion may have happened because participants were not at work, while the decrease in alcohol ingestion may have been due to the lack of social events. The reduction in alcohol consumption has also been observed in other studies (Ammar et al., 2020; Deschasaux-Tanguy et al., 2020; Reyes-Olavarría et al., 2020). Despite the improvement in some markers of food quality, almost half of the individuals reported an increase in the daily food amount compared to baseline. This eating behavior was observed in other studies (Di Renzo et al., 2020b; Matsuo et al., 2021; Reyes-Olavarría et al., 2020). Despite this increase in food amount, the intake of nutrients was mostly within recommended values by the DRIs. Fiber ingestion was the only exception since it was lower than the recommended values (USDA, 2002).

Increased awareness of the need for a healthier food pattern, especially during the pandemic, could be one of
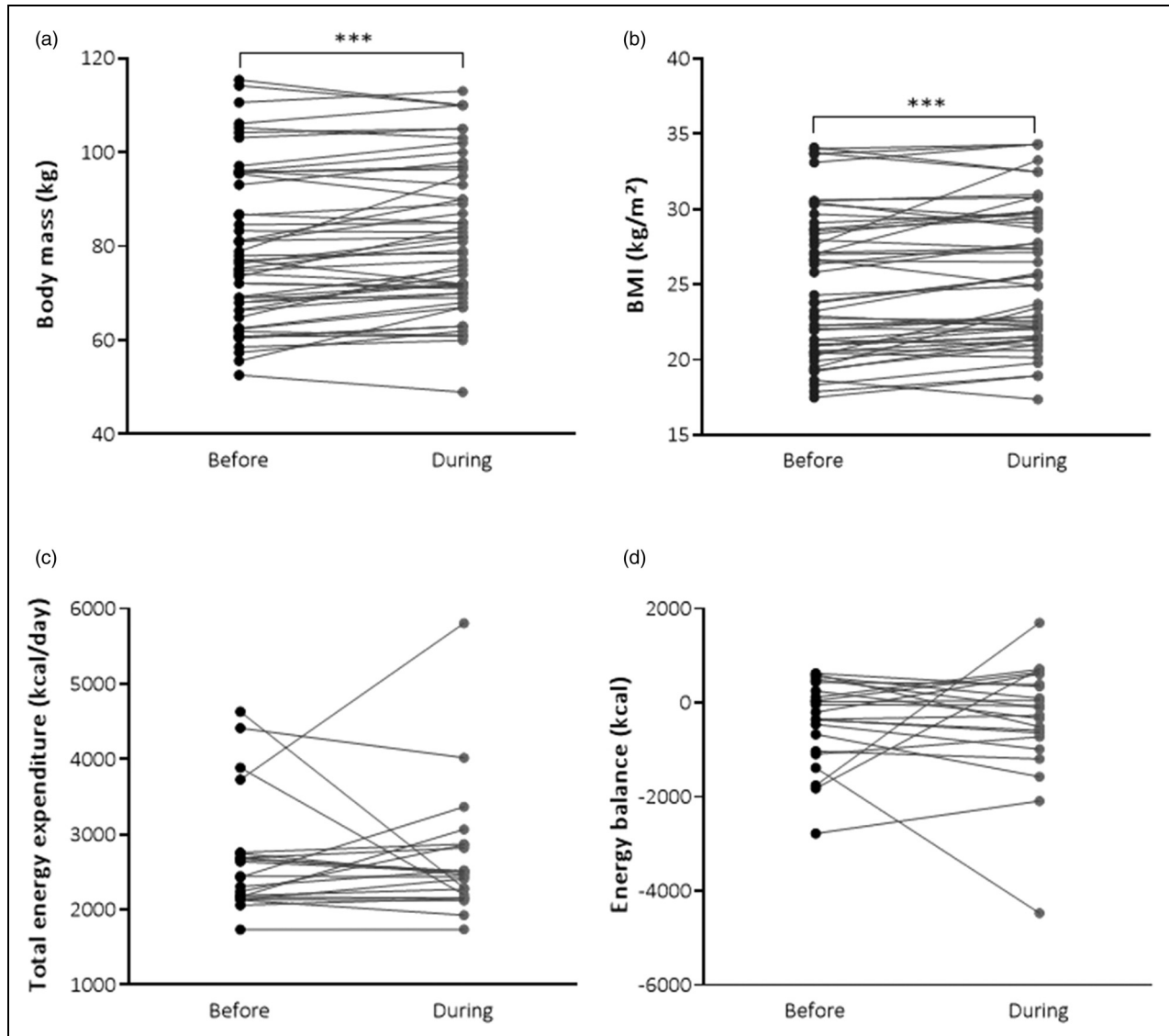
Figure 2. Body mass and body mass index (BMI) changes from baseline to follow-up (a) body mass and (b) BMI changed from baseline to follow-up (*= $p < 0.05$). (c) Delta body mass and BMI were calculated using the difference between follow-up and baseline. (d) Self-perception of body mass change at follow-up (n = 50).

the factors that justified the shift towards healthier food consumption. During the pandemic, the WHO, among several other organizations, has encouraged individuals to prioritize fresh products, adopt a varied and healthy diet, prepare home-cooked meals, enjoy family meals, and limit the consumption of ultra-processed foods (WHO, 2020a). Also in this context, homemade recipes and the frequency of cooking have increased during the pandemic (Deschasaux-Tanguy et al., 2020; Di Renzo et al., 2020b; Matsuo et al., 2021; Reyes-Olavarría et al., 2020). This behavior is associated with healthier food choices and fewer fast-food meals (Larson et al., 2006).

Our study observed an increased consumption of some food groups, such as fruits, vegetables, and legumes (40%), fat, sugar, and salt (40%), and animal protein sources (52%). These results are consistent with available

literature. For example, Wang and colleagues observed that more than 30% of individuals reported an increase in the consumption of vegetables, fruits, and dairy products during the pandemic, while there was an increase of 30% in the consumption of snacks (Wang et al., 2020). Maintaining a healthy diet during the COVID-19 pandemic time is of paramount importance to ensure the proper functioning of the body and the immune system reducing the risk of infections (Gombart et al., 2020) and influencing the inflammatory status (Minihane et al., 2015).

The increase in sleep duration may be seen as positive, as the average sleep duration of the sample was within the adequate sleep duration thresholds for adults (Watson et al., 2015) in the follow-up, while it was shorter during the baseline. A similar result was observed in previous studies analyzing lockdown conditions (Di Renzo et al.,
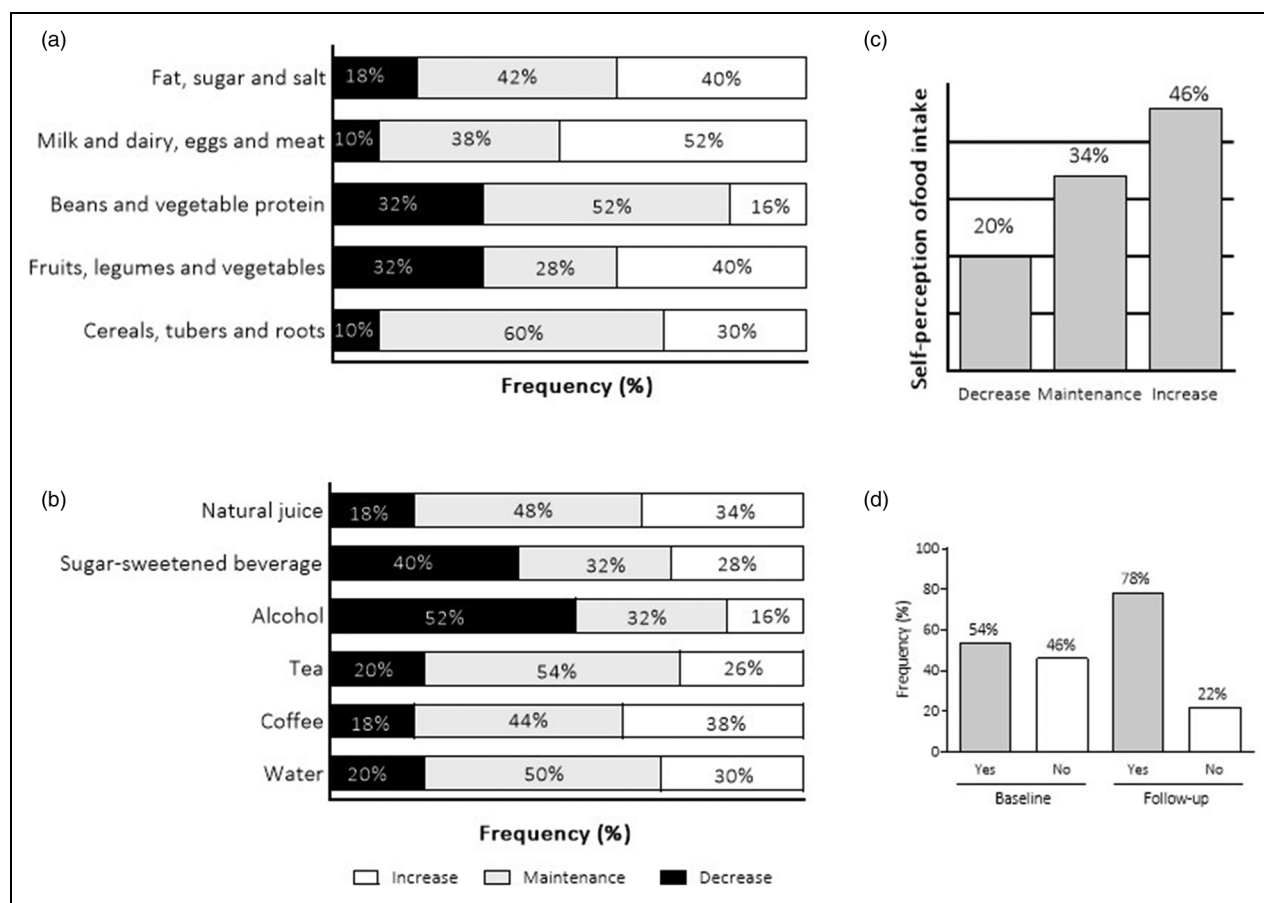
Figure 3. Differences between food consumption between baseline and follow-up. (a) Differences in the intake of food groups (a) and beverages (b) between baseline and follow-up. (c) Self-perception of food consumption during follow-up (d) food consumption in front of the screen at baseline and follow-up. (n = 50).

Table 2. Differences of nutrient and energy consumption indicators between baseline and follow-up (n = 22).

	Baseline Mean ± SD	Follow-up Mean ± SD	Difference Mean (95%CI)	*P*-value
Energy intake (kcal:)				
Total	2267.36 ± 468.3	2308.83 ± 633.45	41.47 (−220.61; 303.55)	0.76
Carbohydrates	1104.42 ± 317.9	1163.33 ± 417.1	58.92 (−98.48; 216.31)	0.471
Protein	360.57 ± 63.81	406.97 ± 106.49	46.4 (−5.32; 98.12)	0.0932
Total fat	799.76 ± 145.5	679.91 ± 173.26	−119.85 (−202.08; −37.63)[a]	0.00944
Nutrients:				
Carbohydrates (g)	276.1 ± 79.48	290.83 ± 104.27	14.73 (−24.62; 54.08)	0.471
Total fat (g)	88.86 ± 16.17	75.55 ± 19.25	−13.32 (−22.45; −4.18)[a]	0.00944
Proteins (g)	90.14 ± 15.95	101.74 ± 26.62	11.6 (−1.33; 24.53)	0.0932
Sodium (mg)	3675.75 ± 615.54	2345.03 ± 1195.28	−1330.72 (−1790.63; −870.82)[a]	0.0000125
Cholesterol (mg)	325.85 ± 135.95	112.86 ± 1.68	−212.99 (−269.8; −156.18)[a]	< 0.000001
Total sugars (g)	96.14 ± 33.79	31.02 ± 20.2	−65.12 (−80.94; −49.29)[a]	< 0.000001
Fibers (g)	20.19 ± 8.38	15.63 ± 5.74	−4.57 (−7.91; −1.22)[a]	0.0142

SD: standard deviation; 95%CI: 95% confidence interval; Differences were tested with Multilevel Linear Regressions; [a]Indicate statistical significance at *p* < 0.05.

2020b; Wang et al., 2020). This increase in sleep duration may be partially attributable to a decrease in time spent in other work and leisure activities that were not permitted at the time of the follow-up, such as going to bars, clubs, gyms, and other social spaces. This increase in sleep duration could be a positive change for health as maintaining adequate quality, and quantity of sleep is a protective factor for several health-related outcomes (Reutrakul and

Table 3. Differences of sleep and physical activity indicators between baseline and follow-up (n = 47).

	Baseline Mean ± SD	Follow-up Mean ± SD	Difference Mean (95%CI)	*P*-value
Physical activity domains (METs/week)				
Total	3608.89 ± 8518.54	3393.17 ± 4049.38	86.14 (−2174.13; 2346.41)	0.940456
Occupational	2026.77 ± 8267.47	859.62 ± 2229.87	−1168.1 (−1422.33; −913.83)[a]	< 0.001
Active transportation	700.00 ± 878.00	773.68 ± 2255.39	73.26 (−231.71; 378.23)	0.628
Domestic	526.00 ± 688.94	920.85 ± 2096.85	394.04 (114.68; 673.39)[a]	0.0057
Leisure	354.04 ± 349.13	851.66 ± 1417.42	499.91 (245.28; 754.53)[a]	0.000119
Physical activity volume (METs/week)				
Walking	1535.06 ± 2889.77	1250.49 ± 2463.95	−285.1 (−579.1; 8.82)	0.33
Moderate	1289.36 ± 2361.59	1472.77 ± 2407.56	182.8 (−270.92; 636.53)	0.524
Vigorous	784.68 ± 4187.75	682.55 ± 1328.31	−102.1 (−1246.27; 1042.01)	0.8611
Sleep				
Latency (minutes/night)	28.45 ± 28.30	31.09 ± 27.61	2.638 (−6.53; 11.8)	0.575
Duration (hours/night)	6.46 ± 0.96	7.22 ± 1.16	0.7596 (0.41; 1.11)[a]	0.000102
Efficiency (%)	89.35 ± 14.93	90.59 ± 12.19	1.238 (−3.85; 6.33)	0.636

Legend: SD: standard deviation; MET: metabolic equivalent; 95%CI: 95% confidence interval; Differences for physical activity indicators were tested with Multilevel Generalized Linear Models for Gamma distributions; Differences for sleep indicators were tested with Multilevel Linear Regressions; [a]Indicate statistical significance at *p* < 0.05.

Van Cauter, 2018; Wright et al., 2015; Zimberg et al., 2012). Future studies should address the behaviors that were displaced for sleep and monitor if the changes in sleep duration will be maintained or reversed as the pandemic progresses.

Physical activity has also been observed to change from baseline to the COVID-19 follow-up. Unlike some studies, the participants in our study reported reduced occupational PA and increased leisure and domestic PA. Except for the study of Di Renzo and colleagues (Di Renzo et al., 2020b), which found a higher frequency of training during the pandemic, most studies showed that a reduction in the PA frequency during the pandemic occurred (Ammar et al., 2020; Deschasaux-Tanguy et al., 2020; Górnicka et al., 2020; Reyes-Olavarría et al., 2020; Wang et al., 2020). It is not entirely clear why some studies showed an increase while others showed a decrease in time spent in PA, one possible explanation is that for some activities, the required space (e.g. clubs and gyms) might not be available for the duration of the lockdowns, as for other people, the availability of time, which was one of the main barriers for the engagement in PA (Daskapan et al., 2006), might have increased with the decreased load of other activities. Overall, this change might be beneficial, as leisure-time PA can positively impact health, including immune function, and that can be beneficial in this pandemic (Warburton and Bredin, 2017). In addition, the decrease in occupational PA might also benefit participants, as it has been shown to increase the risk for health outcomes, as opposed to leisure-time PA (Gupta et al., 2020).

Despite the improvement of the food quality, represented by the reduction of total fat, sodium, cholesterol, total sugars intake, and physical activity maintenance, our volunteers increased their weight during the quarantine. Home confinement is a favorable environment for weight gain and could exacerbate obesity in adults, increasing the risk of chronic diseases if the weight gain persists (Bhutani and Cooper, 2020). These bodily changes can be motivated by behavioral changes resulting from isolation, which include boredom and anxiety, as evidenced in previous studies (Deschasaux-Tanguy et al., 2020; Di Renzo et al., 2020a). However, we cannot exclude the possibility of some portion of the gained weight is lean body mass.

Our study has some limitations. First, the sample size was small and not representative of young adults of Florianópolis, and thus, the results of this study cannot be generalized. Second, the use of non-validated or standardized questionnaires and the self-report of body mass might induce some bias. Nonetheless, this method was chosen to assure participants' safety and improve adherence. Using a web-based application to analyze food consumption during social isolation might also induce some measurement error compared to our baseline questionnaire; however, we have used a previously validated tool (Chen et al., 2015; Griffiths et al., 2018). Lastly, because the baseline measurements took place before the beginning of the pandemic, we cannot assume all observed changes were caused by the quarantine period only. The strengths of our study were: (1) the inclusion of several indicators of lifestyle behaviors; (2) all data (food intake, PA, sleep, and body mass) were collected prospectively instead of retrospectively, being less susceptible to bias, and; (3) we assessed food consumption using 3 food records to minimize day-to-day variation and obtain the current consumption. Further, in both moments, we adjusted the inter- and intra-individual food consumption. It is important to highlight that adaptations were necessary for the execution of this and other studies in times of the COVID-19 pandemic (Jung et al., 2021). In our study, we applied methodological and analytical adaptability to face the challenge of carrying out research during the pandemic and ensuring the safety of the participants.

Overall, our findings suggest that lifestyle behaviors changed during the COVID-19 pandemic, and some of these changes seem beneficial to the participants. We observed a food quality improvement combined with increased leisure-time PA and sleep duration. Despite this, a slight increase in body mass and BMI were self-reported. The increment in body mass can be a result of body fat gain, lean body mass gain, or both; but this remains to be investigated. Future studies should prospectively monitor changes in these behaviors and body mass as the pandemic policies change, as well as include information on the degree of processing of food. Our conclusions are drawn to contribute to the expanding literature pool concerning lifestyle behaviors in a middle-income country under unusual circumstances. Our findings may provide valuable and timely information in developing action plans involving the quality of life of young adults during the pandemic, such as improving food quality and cooking habits and the incentive to increase PA and sleep quality.

Authors' contributions

CRC: initial drafting and critical editing of manuscript; study concept and design; data collection; and interpretation of results. *TD and REF*: study concept and design; data collection; and interpretation of results. *BGGC:* data collection; statistical analysis and interpretation of results. *EAN:* study concept and design; interpretation of results; obtained funding.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

This study was approved by the Human Research Ethics Committee of the Federal University of Santa Catarina and all subjects provided written informed consent to participate in the study.

Availability of data and materials

Data are saved under CRC's responsibility, and available for further analyzes.

Consent for publication

All the authors consent the publication of the present paper.

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