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FACTORS INFLUENCING THE QUALITY OF LIFE AND MENTAL HEALTH OF BRAZILIAN FEDERAL EDUCATION NETWORK EMPLOYEES: AN EPIDEMIOLOGICAL CROSS-SECTIONAL STUDY

CERES – GO

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Scientific article presented to the Bachelor of Information Systems course at the Federal Institute of Goiás - Ceres Campus, as a partial requirement for obtaining the degree of Bachelor of Information Systems, under the guidance of Prof. Dr. Matias Noll.

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Research article

Factors influencing the quality of life and mental health of Brazilian Federal Education Network Employees: An epidemiological cross-sectional study

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ABSTRACT

Understanding the aspects of quality of life (QoL) and mental health can offer valuable insights into the well-being of educational employees. Therefore, this study assessed the factors influencing the QoL and mental health of Brazilian Federal Network Employees. This cross-sectional epidemiological study was conducted in 2022, with 1563 participants. We used the WHOQOL-bref, DASS-21, BackPEI, *PeNSE*, and a self-developed sociodemographic questionnaire. The results showed that female participants had poorer mental health, showing higher symptoms of depression ($p = 0.010$) and anxiety and stress ($p < 0.001$), and lower QoL in the physical and psychological domains ($p < 0.001$) compared with male participants. The older age group (>53 years) indicated higher QoL in the psychological ($p < 0.001$) and environmental ($p < 0.015$) domains, with differences in mental health-related symptoms ($p < 0.001$), compared with the younger age group. Higher levels of education were related to higher QoL in the psychological and environmental domains ($p < 0.001$). The consumption of ultra-processed foods, sodas, and sweets was negatively associated with mental health ($p < 0.001$), as was the consumption of fried snacks, which indicated higher symptoms of depression ($p = 0.002$), anxiety ($p = 0.006$), and

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stress ($p < 0.001$). Conversely, the consumption of healthy foods (vegetables and fruits) was related to better QoL in all domains ($p < 0.001$). Regarding alcoholic beverages, the results showed symptoms of anxiety ($p = 0.003$) and stress ($p < 0.001$) in employees who consumed these for more than 3 days in a month. Furthermore, regular physical activity was related to fewer symptoms related to mental health and higher QoL ($p < 0.001$). Conversely, spending 5 h or more using a computer indicated lower QoL in the psychological ($p = 0.002$) and environmental ($p < 0.001$) domains. The current findings emphasize the need for intervention measures for Brazilian education employees to promote physical activity, healthy food consumption, reduced screen time, and awareness of the harm of risky behaviors, such as tobacco and alcohol, to enhance their QoL and mental health.

1. Introduction

Many studies have extensively investigated physical, mental, and emotional well-being and professional behavior, which are fundamental to corporate development and employee health [1–3]. In this context, quality of life (QoL) encompasses various meanings and interpretations that can be used to assess physical, mental, and emotional well-being [4]. QoL refers to an individual's self-perception of their life situation within the cultural context and value system in which they are immersed, considering their expectations, goals, standards, and concerns [4,5]. The fundamental determinants of QoL include health, personal fulfillment, access to essential services, interpersonal relationships, and balance between work and leisure [6]. Therefore, improving QoL is an individual pursuit that represents the social and political efforts of the community [7].

In recent years, the relationship between workers' QoL, mental health [8], and the factors associated with these perspectives has become a relevant research focus, especially in the context of education professionals [9,10]. As society evolves and faces new and increasingly complex challenges, a deeper understanding of the factors that influence QoL and their impact on workers' mental health is crucial to promoting a healthy work environment, enhancing employee productivity [9], and decreasing sick leave for medical treatment, leading to reduced medical expenditure [11]. Additionally, improving employees' health and well-being can enhance satisfaction, thereby affecting their daily habits beyond work, producing positive effects on QoL [3], enhancing a sense of belonging, and improving employee performance, thus generating positive impacts on the development of educational institutions.

The COVID-19 pandemic has created a new scenario, exposing the lack of preparedness and infrastructure in educational institutions in various countries in the face of a public emergency [12–16]. Implementing a remote working emergency system as one of the infection control measures for educational institutions has significantly impacted the health and QoL of education workers [17–20]. Home environments had to be quickly equipped and adapted to meet remote-work demands, and the entire educational process was adapted to the online system [21–23]. Consequently, mental health problems [24,25], such as depression, anxiety, and stress, worsened [26–28]. Even before the pandemic, these problems have affected millions of people worldwide [25]. Mental health symptoms can negatively impact emotional well-being and hinder adaptation to new work scenarios. As such, the perception and recognition of mental health can help facilitate timely intervention, promoting overall well-being [4,29].

Several studies have identified factors associated with QoL and mental health to understand the relationship between these aspects and their consequences in everyday life [7,30–33]. Factors such as excessive workload and long working hours [34,35]; sedentary lifestyle [36]; inadequate diet with excessive consumption of ultra-processed foods (UPF) [37], soda, sweets, and fried snacks [38,39]; lack of physical activity [40–42]; sleep disorders [43]; and other habits may be connected with levels of stress, anxiety, and depression, affecting both the mental and physical health of employees [40]. Understanding these factors is essential for formulating actions to guide employees in prioritizing healthy habits, diminishing the consequences of the post-COVID-19 scenario, and mitigating the absence of these education professionals for health treatment due to mental illness.

Professionals from the Brazilian Federal Network of Professional, Scientific, and Technological Education (i.e., known in Brazil by the acronym *RFEPCT*, referred to in this paper as Federal Network) play a crucial role in providing essential public educational services during the COVID-19 pandemic. The *RFEPCT* comprises 41 institutions and is contemplated in all federative units of Brazil, both in the capital and interior cities. Therefore, ensuring the safety of these workers' physical and mental health was pivotal [44] to overcoming the sanitary crisis. However, the nature of the responsibilities and demands that these professionals face can lead to challenges that directly affect their QoL and psychological well-being [45]. Additionally, it would not be acceptable to attribute the entire weight of change and the creation of new habits to workers' individuality. According to the World Health Organization (WHO), it is necessary to work on the awareness and sensitization of the entire community to increase the understanding of the population and significantly reduce stigma and discrimination against people with mental health problems [46].

Several studies assess the QoL and mental health of education workers. However, a gap exists in the literature regarding *RFEPCT* professionals. Previous research has analyzed the challenges professionals face in basic or higher education, but to the best of our knowledge, no study explores the mental health and QoL of professionals in basic and technological education. It is worth highlighting that the specificities of these education networks establish distinct and complex challenges [47], making it necessary to assess the responses in each scenario [48]. Furthermore, most studies were conducted before the COVID-19 pandemic. The present research stands out by targeting *RFEPCT* professionals in the context of COVID-19, allowing for a broader and more contextualized understanding of the factors associated with these workers' QoL and mental health.

The results of this research may support targeted educational and occupational health policies, benefiting *RFEPCT* employees and the entire Brazilian educational system. Considering the above, our primary research question was: How are the QoL and mental health

of Federal Education Network employees in Brazil? To answer this question, this study aimed to assess the factors influencing the Federal Education Network employees' QoL and mental health to promote well-being and a better understanding of healthy habits, thus addressing the problems related to their work context.

2. Method

This was a cross-sectional epidemiological study with a quantitative approach, conducted from June 25 to November 25, 2022. The study originated from an umbrella research project titled "Quality of Life in Education in Brazil – QoLE-Bra." As this research directly involved the participants [49,50], the research project was approved by the Research Ethics Committee of the *Instituto Federal Goiano* (Protocol CAAE No. 52353621.3.0000.0036). Following ethical principles, the participants were informed about the study's objectives, confidentiality of the information provided, and necessary data collection procedures. After understanding the importance of the study, all participants signed an informed consent form.

2.1. Research context

The *RFEPCT* was established by Law No. 11,892 on December 29, 2008, and is affiliated with the Ministry of Education [51,52]. Widely recognized nationwide, *RFEPCT* was noted for the quality of education offered, diverse courses across various knowledge areas from initial and continuing education to the doctoral level, and integration with societal and local productive demands. These institutions together have 1,513,075 students enrolled in 2022 [53]. In 2023, according to the Brazilian Education Ministry [54], the Federal Education Network consisted of 38 Federal Institutes of Education, Science and Technology, two Federal Technological Education Centers, the Federal Technological University of Paraná, 22 Technical Schools linked to Federal Universities, and the Pedro II College. Regarding Federal Education Network campuses, there are a total of 661 units distributed across the country's 27 federative units.

The *RFEPCT* includes teaching and administrative professionals covering different functions within the educational system. In addition, *RFEPCT* workers deal with various courses and levels of education: high school, undergraduate, and postgraduate (specialization, master, and doctorate).

2.2. Population and sample

The study population comprised 83,517 Federal Education Network employees, according to the data for 2021 from the Nilo Peçanha Platform (available at: https://www.gov.br/mec/pt-br/pnp/) [53]. All educational employees (i.e., civil servants working in the field of education) were invited to participate, including teaching and administrative-technical staff. The exclusion criterion was non-completion of the questionnaire.

Given the wide geographic distribution of *RFEPCT* employees, we used a non-probabilistic convenience sample. The survey, via Google Forms, was sent to the e-mail addresses of teachers and technical-administrative staff found on the web pages of each institution.

Initially, 1566 individuals who constituted the target audience of our research responded to the invitation to participate in the survey. Three volunteers left this study during the data collection because they "disagreed" with the survey terms. As a result, the final sample consisted of 1563 participants (corresponding to ~1.9 % of total employees), comprising those who voluntarily participated. There were no incomplete responses.

It is important to note that the administrative-technical staff category comprises educational employees involved in technical and operational activities, including administrative, academic, and management support [55]. In contrast, teachers are engaged in basic, technical, and technological education (i.e., undergraduate level) [56]. This study included participants from five major regions of Brazil (Midwest, Northeast, North, Southeast, and South), specifically from Federal Education Network units.

2.3. Data collection procedure

The participants provided data through a self-administered electronic questionnaire comprising semi-structured questions. To address potential sources of bias and ensure the robustness of the results, researchers conducted a thorough review of the literature to identify possible sources of bias known in the field of study. This review process included critically analyzing tools and methods used in similar studies and, importantly, the careful assessment of potential conflicts of interest. A sociodemographic questionnaire was used to collect information on sex, age, marital status, education level, region, and institutional affiliation. Additionally, the following validated questionnaires were used: (1) World Health Organization Quality of Life Brief Version (WHOQOL-bref), (2) National School Health Survey (*Pesquisa Nacional de Saúde do Escolar – PeNSE*), (3) Back Pain and Body Posture Evaluation Instrument (BackPEI), and (4) Depression, Anxiety, and Stress Scale (DASS-21).

(1) The WHOQOL-bref assesses QoL via 26 questions related to the following domains [5]: i) physical (7 items), ii) psychological (6 items), iii) social (3 items), and iv) environmental (8 items). Each item is scored from 1 (not at all) to 5 (completely) on a 5-point Likert scale. The version of this instrument adapted and validated for the Portuguese language was used to assess various aspects of the participants in each domain [57]. Each domain assesses different aspects [5,57]. The physical domain addresses physical health, including pain, discomfort, energy, fatigue, sleep, rest, and mobility. Positive and negative feelings, self-esteem, QoL

perception, and spirituality are considered in the psychological domain. The social domain includes social relationships, family support, and social and emotional support. Finally, the environmental domain assesses physical safety, financial resources, access to health and social assistance, leisure, transportation, and so on. The scores were calculated following the WHO guidelines [46]. Negative items were recorded in questions 3, 4, and 26, inverting the scale (1 = 5, 2 = 4, 3 = 3, 4 = 2, 5 = 1). The mean for each domain was calculated separately. The scores were transformed into a scale from 0 to 100, with higher values reflecting better QoL. The formula used to calculate the domain score was as follows (Eq. (1)):

$$\text{Domain Score} = \frac{\text{Raw Score} - \min(\text{Possible Domain Score})}{\max(\text{Possible Domain Score}) - \min(\text{Possible Domain Score})} \times 100 \quad \text{(Eq. 1)}$$

(2) The *PeNSE* questionnaire identifies common risk factors for noncommunicable chronic diseases [58]. This study evaluated the following topics: a) Smoking: Have you ever smoked? In the last 30 days, how many days did you smoke?; b) Alcohol consumption: Have you consumed alcohol? In the last 30 days, how many days did you consume alcohol?; and c) Nutrition, considering the consumption of UPF, soda, sweets, fried snacks, and fast food, as well as vegetables and fruits in the last 7 days. The raw data were categorized for analysis. For eating habits, a period of 0–4 days was considered non-regular consumption and 5–7 days as regular consumption [59–63]. For tobacco and alcohol consumption, the categories were "None," "1–2 days," "3–9 days," and "10 days or more" [64,65]. This categorization allowed a structured assessment of risk behavior patterns among employees.

(3) The BackPEI, a validated and structured questionnaire, evaluates back pain and its associated risk factors by analyzing postural habits and lifestyle [66–68]. The following questions were extracted from this questionnaire: Do you regularly engage in physical activity? How many hours do you spend sitting while watching television per day? How many hours do you spend sitting using a computer per day? Physical activity was categorized as "1" for "Yes" and "2" for "No" without calculating a score. For the questions about time spent sitting watching television and using the computer, the answers were collected in hours per day and later categorized as "2 h or less," "3–4 h," "5 h or more," and "I don't know, it depends on the day."

(4) The DASS-21, developed by the University of New South Wales in 1995, assesses depression, anxiety, and stress levels, aiming to evaluate the overall mood of the participants [66]. The instrument consists of 21 questions regarding situations that indicate the possibility of mood disorders or imbalances. Each question is rated on a four-point Likert scale, ranging from "0" (did not apply to me at all) to "3" (applied to me most of the time), indicating the severity of the symptoms experienced over the past week. The questionnaire has three subscales, with seven questions each, and the individual sum is then performed, namely, depression, anxiety, and stress. It does not constitute a medical or psychological diagnosis; therefore, it cannot replace assessment or

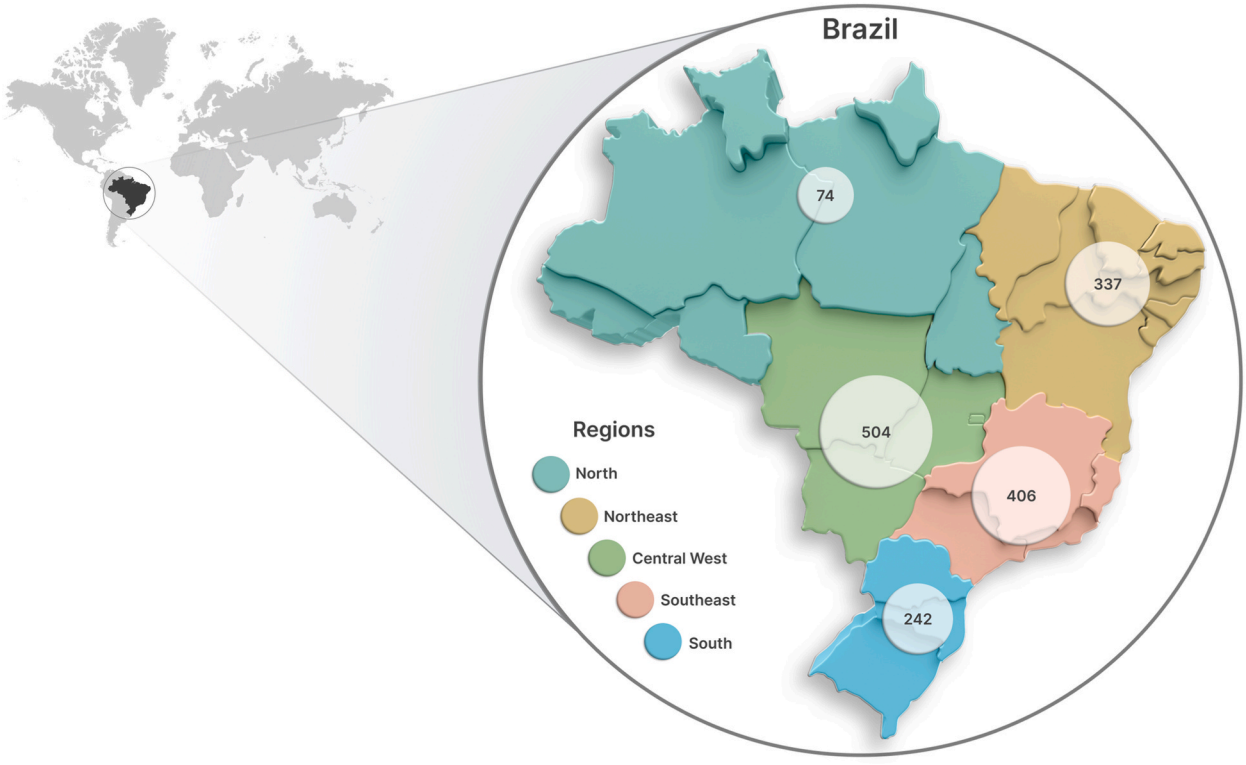

Fig. 1. Map of the sample distribution across regions, built using Figma software.

monitoring by specialized healthcare professionals. The Portuguese version of the questionnaire adapted and validated for idiomatic phrases was used in this study [67].

2.4. Data analysis procedure

To address confounding bias, statistical analyses were performed using SigmaPlot® version 14.0 (Systat Software, Inc., San Jose, CA, USA). First, data normality was assessed using the Kolmogorov–Smirnov test [68]. Subsequently, Student's *t*-test was used to compare pairs, whereas two-way analysis of variance (ANOVA) followed by Tukey's post-hoc analysis was used for three or more factors [69,70]. The Mann–Whitney and Kruskal–Wallis tests were used for data sets that presented non-parametric distribution. To minimize the confounding bias, we stratified our analysis into homogeneous subgroups based on confounding variables (e.g., sex, age, educational level, and region of residence, among others). A significance level of 5 % ($\alpha = 0.05$) was adopted for all tests.

3. Results

The analysis of sociodemographic data revealed that most survey participants were female (57.5 %), and the predominant educational level was a master's degree (40.7 %). People from all regions of Brazil participated in the study (Fig. 1).

The results showed that female participants had poorer mental health, with differences in depression, anxiety, and stress ($p < 0.001$), as well as lower QoL in the physical and psychological ($p < 0.001$) domains, compared with male participants (Table 1). The DASS-21 scores indicated varying levels of depression, anxiety, and stress ($p < 0.001$) across different age groups, with younger individuals (≤33 years) showing higher averages than other age groups. Regarding the WHOQOL-bref instrument, relationships were found between the QoL domains and participants' sociodemographic profiles. The results indicated that older participants (>53 years) had better QoL than younger individuals in the psychological ($p < 0.001$) and environmental ($p < 0.015$) domains. There were no significant variations in mental health or QoL depending on marital status. In the psychological and environmental domains, the scores gradually increased with higher educational attainment, indicating that higher levels of education were related to higher QoL. Regarding mental health, the results were balanced across all regions of Brazil. However, from the QoL perspective, there was a difference ($p < 0.014$) in the physical domain among participants from the Southern region compared with those from the Northern, Northeastern, and Southeastern regions. Additionally, there was a difference ($p < 0.001$) in the environmental domain between participants from the Northern and Northeastern regions and those from the Central-Western, Southern, and Southeastern regions. Regarding professional position, the environmental domain showed a higher QoL for faculty members, which differed from administrative-technical staff ($p < 0.001$).

Regarding employees' dietary habits, the results revealed frequent consumption of fast food, fried snacks, sodas, UPF, and sweets (Table 2). Moreover, there were several related markers of unhealthy foods and higher average scores for depression, anxiety, and stress, whereas regular consumption of vegetables and fruits was related to lower average scores for these symptoms. These scores suggest that unhealthy eating habits negatively influence mental health. Similarly, relationships were identified between food markers and different domains of the WHOQOL-bref. In other words, the consumption of UPF was more likely to negatively affect the physical, psychological, social, and environmental domains, while the consumption of healthy foods showed an inverse relation (Fig. 2).

Regarding tobacco consumption, there were no statistically significant differences in the DASS-21 and WHOQOL-bref domains for the analyzed groups, suggesting no relationship between tobacco consumption, mental health, and QoL (Table 3). Regarding alcohol consumption, the scores indicated that those who consumed alcohol had a higher propensity for depression ($p = 0.012$) and stress ($p = 0.039$), with outcomes directly proportional to the frequency of consumption; however, it did not influence QoL. When comparing consumption patterns, more frequent intake indicated a higher propensity for anxiety ($p = 0.003$) and stress ($p < 0.001$), showing a difference ($p = 0.001$) in the environmental domain of QoL between those who consumed alcohol (>10 days) and those who had not consumed it in the last 30 days. From a sedentary perspective, more than half of the employees (55.6 %) engaged in regular physical activity, while 76.9 % spent 5 h or more per day using a computer.

Education employees who reported spending more than 5 h per day watching television had higher mental health scores and lower QoL. Thus, there was a difference between the group that spent more time (>5 h) watching television in the depression ($p = 0.002$) and anxiety ($p < 0.001$) domains compared with those who spent less time (≤4 h), resulting in lower QoL in the physical ($p < 0.001$) and psychological ($p = 0.015$) domains compared with those who spent less than 2 h per day. Although data related to computer usage time did not show a significant difference in mental health scores, those who spent more than 5 h per day using a computer had lower QoL in the psychological ($p = 0.002$) and environmental ($p < 0.001$) domains compared with those who used a computer for less than 2 h per day. Participants who engaged in regular physical activity had lower scores on the DASS-21, suggesting a positive effect on mental health ($p < 0.001$) and higher QoL on all domains of the WHOQOL-brief ($p < 0.001$). This result indicates that regular physical activity leads to fewer symptoms of depression, anxiety, and stress and improves the perception of QoL.

4. Discussion

The results of this study contribute to the understanding of self-perceptions among Federal Education Network employees regarding QoL and mental health. This is the first study with educational servants to assess self-reported QoL, mental health, and factors influencing Latin America. Our findings indicate that a lower QoL and a higher prevalence of depression, anxiety, and stress symptoms were related to increased consumption of unhealthy foods and a lack of regular physical activity. Furthermore, pronounced symptoms of anxiety and stress were also associated with alcohol consumption for three or more days in the last 30 days. Additionally,

Table 1
Sociodemographic profile of research participants and the DASS-21 and WHOQOL-bref scores ($N = 1563$).

Sociodemographic variables	*n*	%	Scales of the DASS-21 instrument (*M*±*SD*)			Domains of the WHOQOL-bref instrument (*M*±*SD*)				
			Depression	Anxiety	Stress	Physical	Psychological	Social	Environmental	Total Score
Sex:			$\mathbf{p = 0.010}$	$\mathbf{p < 0.001}$	$\mathbf{p < 0.001}$	$\mathbf{p < 0.001}$	$\mathbf{p < 0.001}$	$p = 0.518$	$p = 0.901$	$\mathbf{p = 0.022}$
Female	895	57.3	5.7 ± 5.2	4.9 ± 5.0	8.3 ± 5.1	61.7 ± 16.5	62.6 ± 16.3	61.4 ± 21.1	64.0 ± 15.7	62.4 ± 14.2
Male	668	42.7	5.2 ± 5.1	3.7 ± 4.4	6.7 ± 5.0	66.4 ± 15.9	65.3 ± 17.5	60.7 ± 20.7	63.8 ± 16.1	64.0 ± 14.5
Age group:			$\mathbf{p < 0.001}$	$\mathbf{p < 0.001}$	$\mathbf{p < 0.001}$	$\mathbf{p = 0.004}$	$\mathbf{p < 0.001}$	$p = 0.413$	$\mathbf{p = 0.015}$	$\mathbf{p = 0.035}$
≤33[a]	181	11.6	6.6 ± 5.9[e,f]	5.1 ± 5.0[f]	8.3 ± 5.2[e,f]	65.7 ± 16.7[c]	61.2 ± 18.8[f]	62.0 ± 21.6	64.6 ± 16.7	63.4 ± 15.0
33–37[b]	374	23.9	5.8 ± 5.0[e,f]	4.5 ± 4.6[f]	8.2 ± 4.9[e,f]	63.1 ± 15.0	61.2 ± 17.1[e,f]	62.5 ± 20.5	63.1 ± 15.3[f]	62.5 ± 14.0
38–42[c]	356	22.8	5.8 ± 5.2[e,f]	4.9 ± 5.0[f]	8.2 ± 5.5[e,f]	62.8 ± 16.6[af]	63.2 ± 16.5[f]	60.2 ± 21.1	63.5 ± 15.6	62.4 ± 14.5
43–47 [d]	250	16.0	5.2 ± 4.9	4.5 ± 4.9[f]	7.8 ± 5.1	62.9 ± 16.4	63.3 ± 16.0[f]	59.6 ± 21.0	62.0 ± 16.6[f]	62.0 ± 14.2[f]
48–52[e]	163	10.4	4.6 ± 5.3[a,b,c]	4.1 ± 5.0	6.7 ± 5.3[a,b,c]	61.8 ± 18.3	66.6 ± 16.6 [b]	59.5 ± 22.1	64.0 ± 16.1	63.0 ± 15.4
≥53[f]	239	15.3	4.4 ± 4.7[a,b,c]	3.2 ± 3.9[a,b,c,d]	5.8 ± 4.5[a,b,c]	66.4 ± 16.5[c]	69.1 ± 15.1[a,b,c,d]	62.0 ± 20.0	67.3 ± 15.1 [b,d]	66.2 ± 13.3 [d]
Marital status:			$p = 0.327$	$\mathbf{p = 0.008}$	$p = 0.411$	$p = 0.117$	$p = 0.446$	$p = 0.069$	$p = 0.058$	$p = 0.079$
Married[a]	1019	65.2	5.3 ± 5.1	4.2 ± 4.7[c]	7.5 ± 5.2	64.1 ± 16.4	64.2 ± 16.8	62.0 ± 20.9	64.5 ± 15.8	63.7 ± 14.4
Divorced/Widowed[b]	167	10.7	5.5 ± 5.1	4.8 ± 4.6	7.6 ± 4.9	61.5 ± 16.6	63.3 ± 16.8	58.7 ± 20.1	61.7 ± 15.5	61.2 ± 13.7
Single[c]	377	24.1	5.9 ± 5.4	4.9 ± 5.0[a]	7.9 ± 5.2	63.5 ± 16.3	62.8 ± 17.1	59.6 ± 21.2	63.3 ± 16.1	62.3 ± 14.4
Education level:			$p = 0.411$	$p = 0.131$	$p = 0.823$	$p = 0.625$	$\mathbf{p < 0.001}$	$p = 0.219$	$\mathbf{p < 0.001}$	$\mathbf{p < 0.001}$
HS/HE/TPE[a]	111	7.1	6.7 ± 6.3	5.3 ± 5.4	7.5 ± 5.3	63.4 ± 16.7	60.9 ± 19.8 [d]	60.4 ± 23.3	57.7 ± 16.1[c,d]	60.6 ± 15.9 [d]
Specialization/MBA[b]	484	31.0	5.4 ± 4.9	4.1 ± 4.6	7.5 ± 5.0	62.9 ± 15.8	62.6 ± 16.1 [d]	60.0 ± 19.7	60.3 ± 15.7[c,d]	61.4 ± 13.5 [d]
Master's degree[c]	636	40.7	5.5 ± 5.2	4.5 ± 4.8	7.7 ± 5.2	64.1 ± 16.7	63.5 ± 16.9 [d]	61.3 ± 21.2	65.1 ± 15.1[a,b,d]	63.5 ± 14.5
Doctorate/Postdoctoral[d]	332	21.2	5.2 ± 4.9	4.3 ± 4.7	7.7 ± 5.3	64.1 ± 16.7	66.9 ± 16.5[a,b,c]	62.3 ± 21.4	68.9 ± 15.7[a,b,c]	65.6 ± 14.4[a,b]
Region:			$p = 0.119$	$p = 0.680$	$p = 0.315$	$\mathbf{p = 0.014}$	$p = 0.117$	$p = 0.593$	$\mathbf{p < 0.001}$	$\mathbf{p = 0.020}$
Midwest[a]	504	32.2	5.7 ± 5.3	4.5 ± 4.9	7.8 ± 5.4	63.9 ± 16.6	64.5 ± 17.2	62.1 ± 20.7	65.7 ± 16.2 [b]	64.0 ± 14.6[b]
North and Northeast[b]	411	26.3	5.4 ± 5.3	4.6 ± 4.9	7.6 ± 5.2	62.7 ± 16.1 [d]	63.1 ± 16.9	60.5 ± 20.6	60.8 ± 16.2[a,c,d]	61.7 ± 14.2[a]
Southeast[c]	406	26.0	5.7 ± 5.1	4.5 ± 4.8	7.8 ± 5.0	62.9 ± 16.4 [d]	62.7 ± 16.8	60.2 ± 21.3	64.2 ± 15.6 [b]	62.5 ± 14.2
South[d]	242	15.5	4.8 ± 4.7	3.8 ± 4.0	7.0 ± 4.8	66.3 ± 16.4 [b,c]	65.2 ± 15.9	61.3 ± 21.3	65.1 ± 14.3 [b]	64.5 ± 14.0
Position:			$p = 0.473$	$p = 0.343$	$p = 0.097$	$p = 0.439$	$p = 0.126$	$p = 0.989$	$\mathbf{p < 0.001}$	$p = 0.076$
Teacher	685	43.8	5.6 ± 5.2	4.5 ± 4.8	7.9 ± 5.4	63.3 ± 17.4	64.6 ± 17.2	61.0 ± 21.6	66.8 ± 16.2	63.9 ± 14.8
Administrative-technical staff	878	56.2	5.4 ± 5.2	4.3 ± 4.7	7.4 ± 5.0	64.0 ± 15.7	63.1 ± 16.6	61.1 ± 20.5	61.6 ± 15.3	62.5 ± 14.0

Note: The "*n*" column represents absolute frequencies, whereas the "*%*" column represents relative frequencies. "*N*" represents the sample size. "*M*" and "*SD*" represent the mean and standard deviation, respectively. Higher scores on the WHOQOL-bref indicated a better quality of life. Student's *t*-test was employed for pairwise comparisons, while two-way ANOVA was followed by Tukey's post-hoc test to analyze three or more factors ($\alpha = 0.05$). For non-binary questions, each subgroup is identified with a superscript letter. Subgroups with one or more letters superscripted to the right of the standard deviation value indicate a statistical difference from the subgroup represented by the letter. "HS" is an abbreviation for high school, "HE" for higher education, "TPE" for technical professional education, and "MBA" for Master of Business Administration. Bold data means $p < 0.05$.

Table 2
Food markers of the participants' consumption pattern and the DASS-21 and WHOQOL-bref ($N = 1563$).

Food markers (consumption in the last 7 days)	*n*	%	Scales of the DASS-21 instrument (*M*±*SD*)			Domains of the WHOQOL-bref instrument (*M*±*SD*)				
			Depression	Anxiety	Stress	Physical	Psychological	Social	Environmental	Total Score
● Unhealthy foods										
UPF:			**$p < 0.001$**	**$p < 0.001$**	**$p < 0.001$**	**$p < 0.001$**	**$p < 0.001$**	**$p = 0.002$**	**$p < 0.001$**	**$p < 0.001$**
0–4 days	1336	85.5	5.1 ± 4.9	4.2 ± 4.6	7.3 ± 5.0	64.3 ± 16.1	65.0 ± 16.2	61.9 ± 20.4	64.6 ± 15.4	63.9 ± 13.8
5–7 days	227	14.5	7.7 ± 6.0	5.8 ± 5.5	9.4 ± 5.6	59.7 ± 17.6	56.7 ± 18.6	56.2 ± 23.6	59.8 ± 18.2	58.1 ± 16.5
Soda:			**$p < 0.001$**	**$p < 0.001$**	**$p < 0.001$**	**$p = 0.003$**	**$p < 0.001$**	**$p = 0.005$**	$p = 0.331$	**$p < 0.001$**
0–4 days	1432	91.6	5.3 ± 5.1	4.3 ± 4.7	7.4 ± 5.1	64.1 ± 16.3	64.2 ± 16.6	61.5 ± 20.8	64.1 ± 15.8	63.5 ± 14.2
5–7 days	131	8.4	7.2 ± 5.8	6.0 ± 5.6	9.4 ± 5.9	59.4 ± 17.6	58.6 ± 18.7	56.2 ± 22.0	62.2 ± 17.2	59.1 ± 15.1
Sweets:			**$p < 0.001$**	**$p < 0.001$**	**$p < 0.001$**	**$p = 0.007$**	**$p < 0.001$**	$p = 0.980$	$p = 0.446$	**$p = 0.038$**
0–4 days	1168	74.7	5.2 ± 5.0	4.2 ± 4.6	7.3 ± 5.1	64.3 ± 16.2	65.0 ± 16.5	61.2 ± 20.6	63.8 ± 15.8	63.6 ± 14.3
5–7 days	395	25.3	6.3 ± 5.4	5.1 ± 5.1	8.6 ± 5.2	61.9 ± 16.9	60.0 ± 17.4	60.7 ± 21.9	64.2 ± 16.2	61.7 ± 14.5
Fried snacks:			**$p = 0.002$**	**$p = 0.006$**	**$p < 0.001$**	**$p = 0.011$**	**$p = 0.008$**	**$p = 0.049$**	**$p = 0.047$**	**$p = 0.005$**
0–4 days	1512	96.7	5.4 ± 5.1	4.3 ± 4.7	7.5 ± 5.1	63.9 ± 16.3	64.0 ± 16.6	61.3 ± 20.7	64.1 ± 15.7	63.3 ± 14.2
5–7 days	51	3.3	7.9 ± 6.0	6.6 ± 5.7	10.2 ± 5.8	57.5 ± 18.8	56.4 ± 21.6	54.1 ± 26.0	59.1 ± 19.2	56.8 ± 18.1
Fast food:			$p = 0.601$	$p = 0.395$	$p = 0.451$	$p = 0.170$	$p = 0.898$	$p = 0.694$	$p = 0.496$	$p = 0.404$
0–4 days	1523	97.4	5.5 ± 5.1	4.4 ± 4.8	7.6 ± 5.1	63.8 ± 16.4	63.7 ± 16.8	61.1 ± 20.9	64.0 ± 15.8	63.1 ± 14.3
5–7 days	40	2.6	6.4 ± 6.1	5.5 ± 5.5	8.3 ± 5.9	60.5 ± 18.2	64.4 ± 18.2	59.2 ± 24.2	62.0 ± 17.8	61.5 ± 16.2
● Healthy foods										
Vegetables:			**$p < 0.001$**	**$p < 0.001$**	**$p < 0.001$**	**$p < 0.001$**	**$p < 0.001$**	**$p < 0.001$**	**$p < 0.001$**	**$p < 0.001$**
0–4 days	503	32.2	6.4 ± 5.5	5.1 ± 4.9	8.2 ± 5.3	60.1 ± 16.4	59.2 ± 17.5	56.8 ± 20.8	59.7 ± 15.8	58.9 ± 14.3
5–7 days	1060	67.8	5.1 ± 4.9	4.1 ± 4.7	7.3 ± 5.1	65.4 ± 16.2	65.9 ± 16.1	63.1 ± 20.7	65.9 ± 15.6	65.1 ± 13.9
Fruits:			**$p < 0.001$**	**$p < 0.001$**	**$p < 0.001$**	**$p < 0.001$**	**$p < 0.001$**	**$p < 0.001$**	**$p < 0.001$**	**$p < 0.001$**
0–4 days	769	49.2	6.2 ± 5.5	4.9 ± 5.1	8.2 ± 5.3	61.8 ± 16.6	60.6 ± 17.6	57.9 ± 20.8	61.8 ± 15.9	60.5 ± 14.5
5–7 days	794	50.8	4.7 ± 4.6	3.9 ± 4.4	7.0 ± 4.9	65.5 ± 16.1	66.8 ± 15.5	64.1 ± 20.6	66.0 ± 15.6	65.6 ± 13.7

Note: The "*n*" column represents absolute frequencies, whereas the "*%*" column represents relative frequencies. "*N*" represents the sample size. "*M*" and "*SD*" represent the mean and standard deviation, respectively. Higher scores on the WHOQOL-bref indicated a better quality of life. Student's *t*-test was employed for pairwise comparisons ($\alpha = 0.05$). "UPF" is an abbreviation for ultra-processed foods. Bold data means $p < 0.05$.

screen time exceeding 5 h per day resulted in lower QoL and a higher incidence of depression and anxiety symptoms, highlighting the relevance of interventions aimed at this audience, stimulating and disseminating information to introduce healthy habits.

Our results showed worse mental health symptoms and lower QoL among female *RFEPCT* employees. The results of research focused on gender differences are similar, reinforcing the need to understand the factors that may be associated, such as gender inequality, domestic violence, discrimination, among others [71]. Previous studies indicate that this association is attributable to the number of daily activities that women find stressful and often overload themselves with [26,31,32,72,73]. A stressful environment can influence the perception of QoL and lead to mental health symptoms, such as depression, anxiety, and stress [74,75]. Recent studies showed that the workload burden caused by the COVID-19 pandemic, along with domestic responsibilities and emotional stress, negatively affected physical and mental health, particularly among women [76,77]. Our data also indicates that single people have higher levels of anxiety than married people, which can be caused by specific stressors such as social commitments, loneliness and economic issues [78–80]. Some studies argue that marriage can act as a protective factor against anxiety [79–81], as individuals in

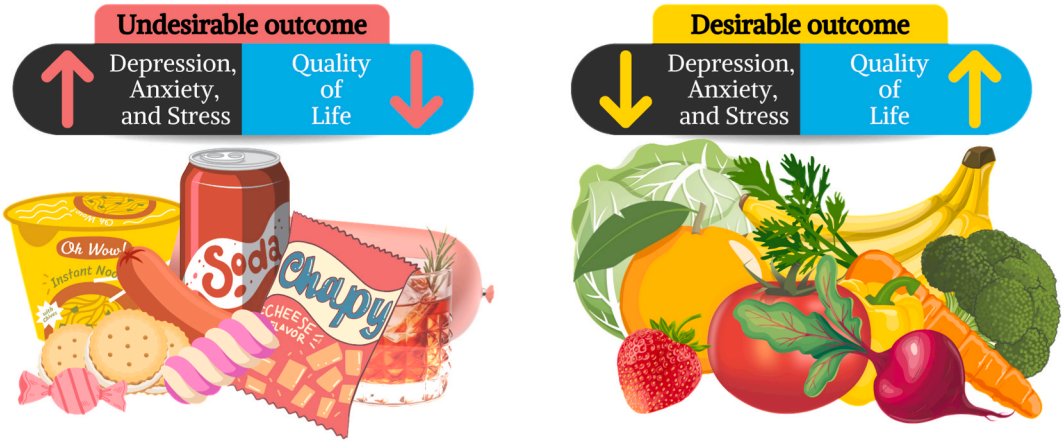

Fig. 2. Outcomes related to eating habits.
Note: The left-side illustration (a) indicates that consuming ultra-processed foods, soft drinks, sweets, and fried snacks increases symptoms of depression, anxiety, and stress and decreases the quality of life (QoL), while the right-side (b) indicates the opposite outcomes with the consumption of vegetables and fruit.

satisfactory marriages have lower levels of anxiety [82].

A longitudinal study in Portugal associated increasing age with a negative effect on QoL [83]. In contrast, our study indicates low QoL among younger workers and consequently high symptoms of depressive disorder, anxiety disorder and stress, referred to older workers. A possible explanation for these outcomes could be the prevalence of information and communication technology use among younger populations, which has gained momentum with the COVID-19 pandemic [84–87]. However, these technologies have been related to an increase in negative mental health symptoms, particularly depression. A systematic review and meta-analysis revealed that the association between age and poorer QoL was generally found in older adults and frail audiences, characterized by weakness, difficulty in mobility, and low physical activity [88].

Our data indicated that employees who regularly consumed unhealthy foods had a lower perception of QoL and more symptoms of depression, anxiety, and stress. In Brazil, a 4-year cohort study conducted by the Department of Nutrition and Health at the *Universidade Federal de Viçosa* highlighted the relationship between excessive UPF consumption in the last quartile and an 82.0 % increased risk for developing depression [89]. Additionally, two other cohort studies predominantly found depression as a consequence of UPF consumption [90,91]. A systematic review and meta-analysis of observational studies evaluated the link between UPF consumption and mental disorders, such as depression and anxiety, and investigated possible conditions for excessive consumption, such as dependence and eating disorders [92]. In contrast to consuming unhealthy foods, our results showed a higher QoL and fewer mental health symptoms related to consuming fruits, vegetables, and legumes [93,94].

Similar to other studies that associated alcohol consumption with better QoL perception regarding physical health but not mental health [95–97], our findings revealed higher self-reported QoL in the environmental domain; participants reported consuming alcoholic beverages for 10 or more days during a month and experiencing significantly worse mental suffering, including anxiety and stress. This discrepancy may be due to the instant sense of security induced by alcohol in recreational and leisure moments, specifically the facets evaluated in the environmental domain of the WHOQOL-bref [5,57]. Additionally, an investigation carried out in Brazil, in the state of Rio de Janeiro, emphasized the prevalence of high depression and anxiety in participants with alcohol dependence and observed higher QoL in the psychological domain in the same sample [98]. Our study showed that more frequent alcohol consumption can be associated with depression and anxiety, but the presence of QoL can complicate these results. In addition, irregular smokers, who smoke an average of 1–2 days a month, had a better QoL in the social domain than regular smokers, who smoke 10 days or more a month. Studies indicate that smokers have fewer relationships with social support, which can aggravate feelings of isolation and loneliness [99–101].

Studies have indicated that regular physical activity has beneficial biological effects on the brain and mental health [9,36,87,102–104]. Furthermore, a systematic review showed that physical activity reduced depressive symptoms and increased self-esteem [105]. In another systematic review of studies with groups of various age ranges (adolescents, young adults, and older people), significant results showed that physical activity improved QoL, mental health, functional capacity, and mood states [106]. Similar to those obtained in the abovementioned study, our findings showed lower symptoms of depression, anxiety, and stress and a better perception of QoL among employees who participated in regular physical activity [42,71]. Studies suggest that physical activity can be an effective intervention to improve cognitive function in different age groups [107,108] and according to our data, regular physical activity is related to better scores in QoL domains such as physical function, bodily pain, vitality and social functioning.

Regarding sedentary behavior, our data indicated that 5 h or more of screen time, such as watching the television and using a computer, was related to lower QoL [26,102,109]. Thus, in Brazilian education, employees, especially in the physical, psychological, and environmental domains, have higher symptoms of depression and anxiety. A longitudinal study carried out in Brazil, in the state of São Paulo, highlighted that prolonged screen time generated consequences, including back pain [110]. According to our data, these

Table 3
Tobacco and alcohol consumption, sedentariness of the research participants, and the DASS-21 and WHOQOL-bref ($N = 1563$).

Tobacco and alcohol use and sedentary indicators	*n*	%	Scales of the DASS-21 instrument (*M*±*SD*)			Domains of the WHOQOL-bref instrument (*M*±*SD*)				
			Depression	Anxiety	Stress	Physical	Psychological	Social	Environmental	Total Score
● Tobacco and alcohol consumption										
Have you ever smoked?			$p = 0.143$	$p = 0.917$	$p = 0.574$	$p = 0.907$	$p = 0.933$	$p = 0.691$	$p = 0.982$	$p = 0.825$
Yes	588	37.6	5.7 ± 5.2	4.4 ± 4.8	7.7 ± 5.2	63.7 ± 16.3	63.7 ± 17.6	60.7 ± 21.1	64.0 ± 16.0	63.0 ± 14.5
No	975	62.4	5.3 ± 5.1	4.4 ± 4.8	7.5 ± 5.1	63.6 ± 16.5	63.8 ± 16.4	61.3 ± 20.8	63.9 ± 15.8	63.1 ± 14.3
Have you smoked recently?*			$p = 0.626$	$p = 0.224$	$p = 0.107$	$p = 0.519$	$p = 0.120$	**$p = 0.039$**	$p = 0.266$	$p = 0.097$
No day[a]	1457	93.2	5.4 ± 5.1	4.3 ± 4.7	7.5 ± 5.2	63.8 ± 16.3	63.8 ± 16.8	61.1 ± 20.8	63.9 ± 15.8	63.1 ± 14.3
1–2 days[b]	29	1.9	5.1 ± 4.3	4.4 ± 4.4	7.9 ± 4.0	65.9 ± 14.8	67.8 ± 11.8	69.8 ± 14.2[d]	68.0 ± 12.9	67.9 ± 10.1
3–9 days[c]	13	0.8	5.9 ± 6.2	6.2 ± 5.2	9.0 ± 5.1	63.7 ± 20.7	67.3 ± 23.6	58.3 ± 30.6	68.0 ± 18.5	64.4 ± 21.5
≥10 days[d]	64	4.1	6.9 ± 6.5	5.7 ± 6.0	9.2 ± 5.8	60.5 ± 18.1	59.7 ± 18.3	57.3 ± 23.5[a]	61.8 ± 17.5	59.8 ± 15.6
Have you consumed alcohol?			**$p = 0.012$**	$p = 0.430$	**$p = 0.039$**	$p = 0.631$	$p = 0.543$	$p = 0.861$	$p = 0.668$	$p = 0.995$
Yes	1420	90.9	5.5 ± 5.1	4.4 ± 4.8	7.7 ± 5.1	63.8 ± 16.4	63.7 ± 16.9	61.1 ± 20.9	64.0 ± 15.7	63.1 ± 14.3
No	143	9.1	4.8 ± 5.5	4.2 ± 4.8	6.8 ± 5.3	62.7 ± 16.6	64.5 ± 15.9	60.5 ± 22.0	62.8 ± 18.0	62.6 ± 15.2
Have you consumed alcohol recently?*			$p = 0.311$	**$p = 0.003$**	**$p < 0.001$**	$p = 0.190$	$p = 0.185$	$p = 0.054$	**$p = 0.001$**	**$p = 0.010$**
No day[a]	498	31.9	5.5 ± 5.3	4.4 ± 4.8[c,d]	7.3 ± 5.0[c,d]	62.3 ± 16.2	63.1 ± 16.7	59.3 ± 21.1	61.3 ± 16.8 [b,c,d]	61.5 ± 14.6[d]
1–2 days[b]	346	22.1	4.9 ± 4.8	3.7 ± 4.5	6.9 ± 5.1	64.5 ± 16.2	65.6 ± 16.1	61.5 ± 20.1	65.0 ± 15.0[a]	64.1 ± 13.6
3–9 days[c]	529	33.8	5.7 ± 5.0	4.6 ± 4.8[a]	8.1 ± 5.1[a]	64.4 ± 16.2	62.9 ± 16.8	61.7 ± 20.8	65.2 ± 15.2[a]	63.6 ± 13.9
≥10 days[d]	190	12.2	6.0 ± 5.7	5.1 ± 5.1[a]	8.4 ± 5.7[a]	63.5 ± 17.9	64.4 ± 18.5	63.2 ± 22.2	65.1 ± 16.1[a]	64.1 ± 16.0[a]
● Indicators of sedentary or non-sedentary activities										
Do you engage in physical activity?			**$p < 0.001$**	**$p < 0.001$**	**$p < 0.001$**	**$p < 0.001$**	**$p < 0.001$**	**$p < 0.001$**	**$p < 0.001$**	**$p < 0.001$**
Yes	869	55.6	4.7 ± 4.7	3.8 ± 4.4	7.0 ± 4.9	67.1 ± 15.5	67.2 ± 15.3	64.4 ± 19.8	67.1 ± 15.0	66.5 ± 13.0
No	694	44.4	6.4 ± 5.5	5.2 ± 5.1	8.4 ± 5.4	59.4 ± 16.6	59.4 ± 17.7	56.9 ± 21.6	59.9 ± 16.1	58.9 ± 14.8
Time spent watching television:**			**$p = 0.002$**	**$p = 0.016$**	$p = 0.053$	**$p < 0.001$**	**$p = 0.015$**	$p = 0.161$	$p = 0.312$	$p = 0.319$
≤2 h[a]	1139	72.9	5.2 ± 4.9[c]	4.3 ± 4.6[c]	7.5 ± 5.1	64.6 ± 16.0[c,d]	64.6 ± 16.4[c]	61.7 ± 20.3	64.3 ± 15.6	63.3 ± 14.4
3–4 h[b]	265	17.0	5.4 ± 5.2[c]	4.2 ± 4.7[c]	7.3 ± 5.3	63.5 ± 16.0	63.8 ± 15.9	60.8 ± 22.1	63.6 ± 15.8	62.1 ± 14.3
≥5 h[c]	77	4.9	8.1 ± 6.5[a,b]	6.5 ± 5.9[a,b]	9.2 ± 5.9	57.3 ± 19.0[a]	56.9 ± 22.4[a]	55.8 ± 23.6	62.3 ± 18.0	64.9 ± 13.0
It depends on the day[d]	82	5.2	6.4 ± 6.2	5.0 ± 5.7	8.1 ± 5.5	57.8 ± 19.3[a]	58.7 ± 17.7	57.8 ± 22.3	61.1 ± 17.1	61.3 ± 15.3
Time spent using a computer:**			$p = 0.492$	$p = 0.052$	$p = 0.055$	$p = 0.124$	**$p = 0.002$**	$p = 0.198$	**$p < 0.001$**	$p = 0.361$
≤2 h[a]	83	5.3	5.3 ± 5.1	4.1 ± 4.5	7.3 ± 5.3	65.8 ± 17.1	66.1 ± 17.5	60.3 ± 23.2	67.2 ± 17.9	65.1 ± 14.5
3–4 h[b]	228	14.6	5.1 ± 5.1	3.7 ± 4.5	6.9 ± 5.3	64.9 ± 17.6	67.0 ± 17.4[c]	63.5 ± 21.7	67.1 ± 16.9[c]	64.0 ± 13.3
≥5 h[c]	1202	76.9	5.5 ± 5.1	4.5 ± 4.8	7.7 ± 5.1	63.4 ± 16.0	63.1 ± 16.6 [b]	60.7 ± 20.6	63.1 ± 15.4 [b]	62.9 ± 14.5
It depends on the day[d]	50	3.2	5.7 ± 6.1	4.7 ± 5.5	8.3 ± 6.2	59.8 ± 18.5	61.4 ± 18.2	59.0 ± 21.2	64.0 ± 16.8	60.7 ± 13.9

Note: The "*n*" column represents absolute frequencies, whereas the "*%*" column represents relative frequencies. "*N*" represents the sample size. "*M*" and "*SD*" represent the mean and standard deviation, respectively. Higher scores on the WHOQOL-bref indicated a better quality of life. Student's *t*-

test was employed for pairwise comparisons, while two-way ANOVA was followed by Tukey's post-hoc test to analyze three or more factors ($\alpha = 0.05$). For non-binary questions, each subgroup is identified with a superscript letter. Subgroups with one or more letters superscripted to the right of the standard deviation value indicate a statistical difference from the subgroup represented by the letter. * In the last 30 days. ** Time per day in hours. Bold data means $p < 0.05$.

consequences may be attributed to Federal Education Network employees, as 76.9 % of the respondents declared spending 5 h or more per day in front of a computer. However, this can be justified by the demand for daily activities and the increased use of technology resulting from the COVID-19 pandemic [25]. A systematic review targeting nurses found that a healthy work environment promoted greater empowerment, leading to better job performance [111]. Therefore, educational institutions need to promote a healthy work environment to encourage and contribute to the QoL of education employees [112] and balance demands and working hours.

Despite the importance of our results, with significant findings, especially regarding factors such as gender, age group, ultra-processed foods, physical activity and screen time, some limitations need to be addressed. Self-reported responses have certain limitations, including the possibility of memory bias and honesty in providing real answers. Another limitation of the study is related to the low number of responses from the Southern region of Brazil, which hinders and complicates the comparison of results by region. This was a cross-sectional study; therefore, it is impossible to infer causality. Caution should be exercised when generalizing these findings to the entire Brazilian population. Hence, a longitudinal study should be conducted to compare habits during the COVID-19 and post-pandemic periods to assess the impact of the pandemic and guide self-care reorientation. Despite these limitations, we believe that they do not limit the conclusions that can be drawn.

The strength of this study lies in the robust sample of 1563 participants from all regions of Brazil. These findings can assist in raising awareness among employees, encouraging them to adopt healthy habits that provide benefits for better QoL and mental health and contribute to advancing knowledge related to epidemiological data [113]. Finally, federal, state, and municipal governments may be guided by the current findings to create technical committees to develop programs, policies, and laws to promote and stimulate a healthy and productive environment among employees, based on studies like this one.

5. Conclusion

The consumption of healthy foods and regular physical activity positively contributed to the QoL and mental health of Federal Education Network employees. In contrast, risk factors such as alcohol consumption, tobacco use, and prolonged screen time had adverse effects on mental health, manifesting as symptoms of depression, anxiety, and stress, leading to a reduction in QoL. This mechanism negatively impacts overall well-being, resulting in decreased productivity and lower quality of public services provided by these educational institutions, as well as reduced public spending owing to employee absences and the related costs of treating employees' health issues. The high percentage of employees consuming less nutritious foods underscores the need for targeted interventions to raise awareness and provide healthier options in the workplace, emphasizing the adverse effects of poor dietary choices and the benefits of consuming healthy foods.

Future research directions

Longitudinal studies should be considered to better understand the significant long-term impacts of various factors on the health and well-being of *RFEPCT* employees. This approach may help establish sound cause-and-effect relationships. The current study's design offers valuable insights into workers' physical and mental health and possible long-term relationships between the COVID-19 pandemic and their general well-being. Hence, the study's results may support the development and implementation of occupational health policies and support strategies for this population.

CRediT authorship contribution statement

Isabela Fernanda Rodrigues de Oliveira: Writing – review & editing, Writing – original draft, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Nicolli Godoi Pereira:** Writing – review & editing, Writing – original draft, Project administration, Data curation, Conceptualization. **Luís Fernando Monteiro:** Writing – review & editing, Writing – original draft, Software, Investigation, Formal analysis. **Leonardo Mateus Teixeira de Rezende:** Writing – review & editing, Writing – original draft, Validation, Software, Methodology, Investigation, Formal analysis, Data curation. **Claudio Andre Barbosa de Lira:** Writing – review & editing, Writing – original draft, Validation, Methodology. **Manuel Monfort-Pañego:** Writing – review & editing, Writing – original draft, Validation, Methodology. **Woska Pires da Costa:** Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Resources, Data curation. **Priscilla Rayanne E. Silva Noll:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Conceptualization. **Matias Noll:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Resources, Methodology, Investigation, Formal analysis, Conceptualization.

Informed consent statement

Informed consent was obtained from all participants involved in the study through the respective informed consent forms (ICF), following the provisions of Resolution *CNS* No. 510/2016 and Resolution *CNS* No. 466/2012 from the Brazilian National Health

Council (*Conselho Nacional de Saúde – CNS*).

Ethical statement

This legislation applies to research involving direct participation [49,50]. The research design was approved by the Research Ethics Committee of *Instituto Federal Goiano* (Protocol *CAAE* No. 52353621.3.0000.0036; approved by Opinion No. 5.270.596), following the provisions of Resolution *CNS* No. 510/2016 and Resolution *CNS* No. 466/2012 from the Brazilian National Health Council.

Data availability statement

Data will be made available by request to the corresponding senior researcher (M.N.), provided that the applicant guarantees ethical restrictions following Brazilian legislation (Resolutions *CNS* No. 466/2012 and No. 510/2016).

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Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:Nicolli Godoi Pereira reports a relationship with FUNAPE-UFG that includes: funding grants. Isabela Fernanda Rodrigues de Oliveira reports a relationship with National Council for Scientific and Technological Research that includes: funding grants. If there are other authors, they 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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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2025.e42029.

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