

KĘPCZYK, Martyna, KWAŚNIEWSKA, Oliwia, MISIAK, Jakub, URBAŚ, Michał, OJDANA, Miłosz, DEMIANENKO, Yehor, CZEKAJ, Oliwia, KOŚCIOŁEK, Aleksandra, KOŚCIOŁEK, Dawid and SUROWIECKA, Kaja. Chronic stress and its relationship with increased food consumption and the risk of obesity. *Journal of Education, Health and Sport*. 2024;54:116-128. eISSN 2391-8306. <https://dx.doi.org/10.12775/JEHS.2024.54.009>
<https://apcz.umk.pl/JEHS/article/view/47856>
<https://zenodo.org/records/10542498>

The journal has had 40 points in Ministry of Education and Science of Poland parametric evaluation. Annex to the announcement of the Minister of Education and Science of 05.01.2024 No. 32318. Has a Journal's Unique Identifier: 201159. Scientific disciplines assigned: Physical culture sciences (Field of medical and health sciences); Health Sciences (Field of medical and health sciences).

Punkty Ministerialne z 2019 - aktualny rok 40 punktów. Załącznik do komunikatu Ministra Edukacji i Nauki z dnia 05.01.2024 Lp. 32318. Posiada Unikatowy Identyfikator Czasopisma: 201159. Przynależność dyscypliny naukowej: Nauki o kulturze fizycznej (Dziedzina nauk medycznych i nauk o zdrowiu); Nauki o zdrowiu (Dziedzina nauk medycznych i nauk o zdrowiu).

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The authors declare that there is no conflict of interests regarding the publication of this paper.

Received: 06.01.2024. Revised: 17.01.2024. Accepted: 20.01.2024. Published: 20.01.2024.

Chronic stress and its relationship with increased food consumption and the risk of obesity

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ABSTRACT

INTRODUCTION AND AIM OF WORK

Stress often accompanies daily functioning. This mechanism is activated by the body in response to external factors to effectively cope with challenges. With prolonged exposure, stress significantly impairs physiological functions, including impacting body weight.

MATERIALS AND METHODS

The aim of the study is to understand the impact of chronic stress on changes in dietary habits and body weight. For this purpose, a custom survey was created to investigate the correlation between stress and other factors. It was distributed using social media (Telegram) in the first half of August 2023 among the population of Ukraine.

RESULTS

The survey was completed by 110 individuals, with the majority being males, accounting for 67 participants (61%). The participants had an average age of 28 years with a standard deviation of 7.12. Among the responses, the most common frequency of experiencing stress was once every two weeks, with 41 answers (37.27% of participants). A majority of the respondents declared having a normal body weight (55.45%).

In our study, we demonstrated a correlation between stress and unhealthy eating habits (rho-Spearman $p=0.0002$, $r=0.34$), as well as a lower frequency of stress among individuals taking antidepressant medication ($p=0.012$). However, we did not establish a connection with abnormal body weight ($p>0.05$), physical activity ($p>0.05$), or healthy eating ($p>0.05$).

CONCLUSIONS

The obtained results suggest that stress may trigger a response in the form of overeating. The reduction in the frequency of stress is also influenced by the use of

medications. The findings may indicate a strong association between diet and the experience of stress.

KEY WORDS: stress, chronic stress, cortisol, obesity, physical activity

Introduction

Stress is a common experience in our daily lives, activated by the body in response to external factors to help us effectively deal with challenges. However, prolonged exposure to stress can significantly disrupt physiological functions, including its impact on body weight [1]. Chronic stress can lead to a decrease in energy, insomnia, fatigue, and headaches. This is accompanied by an increase in the stress hormone cortisol, leading to excessive appetite, fat deposition in the abdominal, neck, and facial areas, and potential worsening of existing health conditions [1].

The Influence of Chronic Stress

Psychological stress adversely affects physiological functioning. In stressful situations, the body responds with a temporary increase in blood pressure, elevated heart rate, and increased respiratory rate [2]. Persistent stress can lead to prolonged strain, causing a cascade of reactions in various body systems. Excessive stress is associated with symptoms such as gastrointestinal disorders, muscle tension, fatigue, sleep disturbances, cognitive function impairment, menstrual cycle disturbances, and decreased libido. Chronic elevation of stress hormones is linked to the risk of visceral obesity and other metabolic syndromes [4]. Stress-

related dietary changes may include symptoms of indigestion, diarrhea, and constipation. Increased cortisol production can intensify hunger [6].

The Role of Diet

During stress, the consumption of food rich in salt, sugar, saturated fats, and trans-fatty acids may increase. The calorie intake may rise, but the proportion of recommended micro- and macronutrients for optimal body functioning may decrease. Consequently, this may lead to the development of overweight or obesity, coupled with a deficiency of essential nutrients. Stress-induced eating behaviors may include overeating, increased appetite for sweet and fried foods, non-alcoholic and alcoholic beverages [7].

Under stress, the body depletes stored B-vitamins and increases the demand for protein, vitamins, minerals, and unsaturated fatty acids. To prevent excessive weight gain, attention should be paid to overall energy intake and ensuring an adequate supply of nutrients. Including specific foods in the diet, such as legumes, whole grains, dairy products, meat, and fish, can address these nutritional needs. A diet rich in fruits, vegetables, and whole grains, as seen in the Mediterranean diet, has been linked to a reduced risk of chronic diseases [8-13].

The Significance of Physical Activity in Stress Management

Physical activity is essential for the proper functioning of the body and plays a crucial role in weight loss maintenance [14]. There is a correlation between physical activity and better health outcomes [15]. Furthermore, a reverse relationship exists between exercise and conditions such as diabetes and obesity [16]. This positive effect extends to mental well-being, reducing the effects of depression [17] and fatigue [18]. In athletes, older individuals, and veterans with post-traumatic stress disorder, exercise is associated with lower subjective stress [19].

Materials and Methods

To analyze the aforementioned issues, an 11-item questionnaire was prepared to assess both demographic data (age, gender) and other factors related to stress frequency. The questionnaire was created using Google Sheets and distributed via

Telegram groups between August 10 and 20, 2023. A total of 110 responses were obtained from participants.

All participants were informed about the study conditions and had the option to withdraw their consent at any time.

The survey consisted of 11 questions. The first two questions were about the age and gender of the respondents. In the subsequent questions, participants could indicate the frequency of specific phenomena mentioned in the survey. These nine questions aimed to collect information on the frequency of stress, meal regularity, current body weight (underweight, normal weight, overweight, obesity), subjective mood assessment, physical activity assessment, whether rest from work brings relief, antidepressant use (none, regular, irregular), frequency of consuming healthy foods like fruits and vegetables, and the frequency of consuming fast food and salty or sweet processed snacks.

Statistical Analysis

The data were analyzed using Excel, and statistical values were calculated using Statistica. Non-parametric tests were used due to the non-continuous nature of variables - specifically, the rho-Spearman test for correlation and the U-Mann Whitney test for comparing two groups. The correlation values obtained are recorded using the correlation coefficient 'r'. All tests used a two-tailed hypothesis, with a significance level set at $p < 0.05$.

Results

The average age of participants was 28 years (SD=7.12). The youngest participant was 19 years old, and the oldest was 41. The majority of respondents were male (61%).

Regarding BMI, 6 participants indicated underweight (5.45%), 61 participants had normal body weight (55.45%), 23 had overweight (20.91%), and 20 had obesity (18.18%). In total, 43 participants (39%) had elevated body weight.

In the mood-related question, 25 participants reported significantly lowered mood (22.73%), 18 reported lowered mood (16.36%), 47 considered their mood normal (42.73%), 14 slightly elevated (12.73%), and 6 significantly elevated (5.45%).

The experience of stress and the assessment of physical activity are presented in Figures 1 and 2.

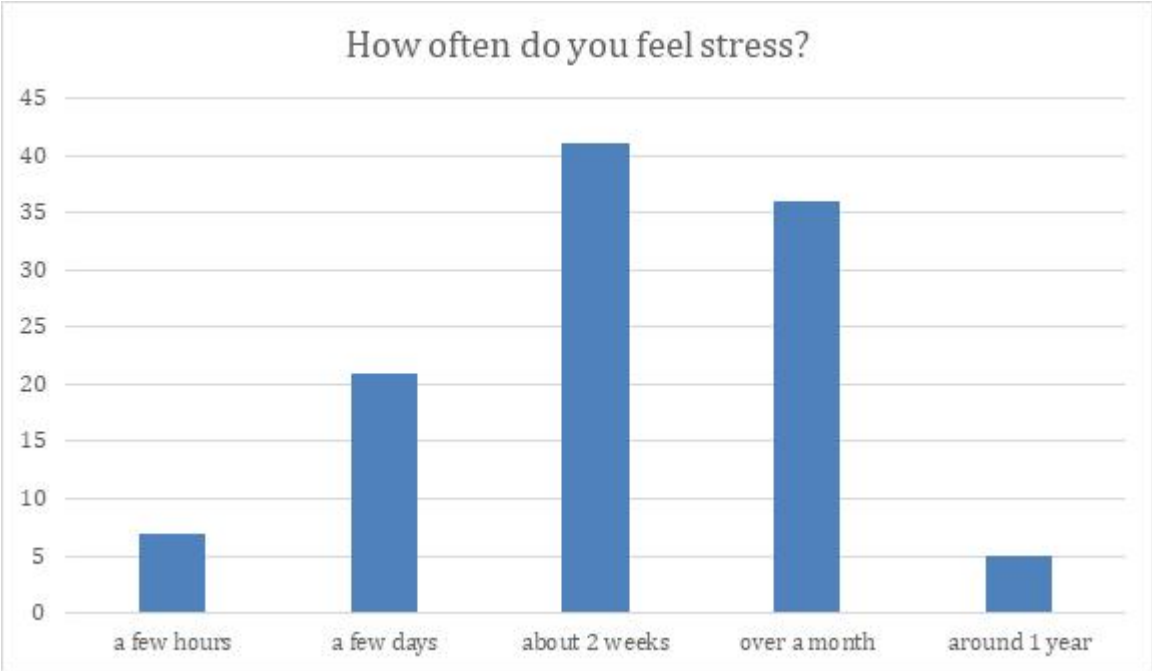


Figure 1.

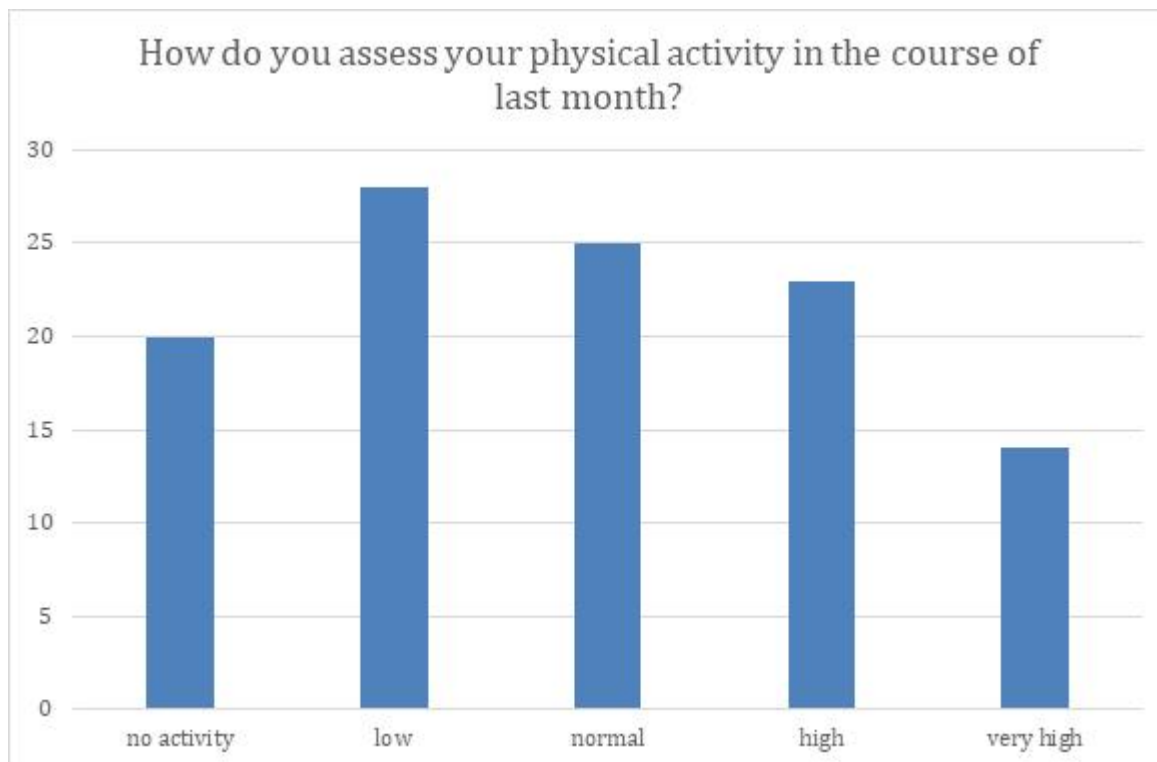


Figure 2.

89 individuals (80.91%) deny taking antidepressant medication, 8 people (7.27%) report taking them irregularly, while 13 individuals (11.82%) take them regularly. Regarding the frequency of meals, respondents provided the following answers: once a day 27 people (24.55%), twice a day 19 people (17.27%), three times a day 25 people (22.73%), four times a day 20 people (18.18%), and five or more times a day 19 people (17.27%). In terms of fruit consumption, 3 participants marked once a month (2.73%), 1 participant several times a month (0.91%), 10 participants once a week (9.09%), 27 participants several times a week (24.55%), and 69 participants every day (62.73%). Regarding the consumption of fast-food meals, 13 respondents indicated consuming them less than once a month (11.82%), 24 once a month (21.82%), 37 several times a month (33.64%), 27 several times a week (24.55%), and 9 every day (8.18%). We also examined the correlation between stress and the frequency of unhealthy eating (rho-Spearman $p=0.0002$, $r=0.34$) and compared the frequency of stress in individuals taking antidepressant medication. It was significantly lower in individuals taking these medications irregularly and regularly ($p=0.012$). However, no correlation was found with abnormal body weight

($p=0.781$), physical activity ($p=0.030$), healthy eating ($p>0.611$). The frequency of meals was also not correlated with stress perception ($p=0.931$).

Discussion

The conducted study has several limitations. It was distributed via social media, which means that a random selection of respondents cannot be ensured. Additionally, there is no way to verify the accuracy of the entered data. The survey was anonymous, allowing the same individuals to fill it out multiple times, relying on the honesty of the respondents. Participants could only choose from specified options regarding the frequency of certain phenomena (e.g., once a week, once a month), which has both advantages (more people completing the survey) and disadvantages (respondents must fit their situation into the provided response options). One of the study's strengths is the relatively large and homogeneous group of respondents, consisting of young individuals of Ukrainian nationality.

The results confirm the significance of stress in relation to diet and eating disorders. However, the survey does not answer whether an unhealthy diet is a result of stress or if the mechanism is reversed. As suggested by numerous studies [20, 21], chronic stress leads to excessive cortisol release, influencing the hunger and satiety center. This may lead to overeating unhealthy foods and snacks. While our results did not show a correlation between more frequent stress and fruit consumption or the frequency of meals, this is somewhat contradictory to the available literature. The obtained result may be due to statistical error.

We also did not find a correlation between stress and body composition, likely resulting from the lack of direct connections between these elements. The study demonstrated lower stress frequency in individuals taking antidepressant medication, as these drugs positively affect mood, alleviate anxiety, and reduce compulsive behaviors [22-25]. Their impact on stress perception has also been confirmed [26, 27, 28].

Conclusion

Our study conducted on a group of 110 individuals confirms the association between stress and excessive food consumption. In order to confirm this relationship further research is required.

Authors' contribution

Conceptualization, Martyna Kępczyk, methodology, Yehor Demianenko software, Michał Urbaś check, Miłosz Ojdana, Kaja Surowiecka; formal analysis, Oliwia Kwasniewska.; investigation, Dawid Kosciolek; resources, Aleksandra Kościotek; data curation, Oliwia Czekaj, writing - rough preparation, Aleksandra Kosciolek and Dawid Kościotek; writing - review and editing, Miłosz Ojdana and Jakub Misiak; visualization, Jakub Misiak; supervision, Oliwia Czekaj; project administration, Martyna Kępczyk; receiving funding - no specific funding.

All authors have read and agreed with the published version of the manuscript.

Financing statement

The study received no specific funding

Institutional Review Board Statement

Not applicable – Not required

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

Not applicable.

Conflict of interest

The authors deny any conflict of interest

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