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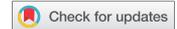
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## Food Craving Intensity and Gender Differences

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### ABSTRACT

**Background:** Food cravings typically influence individuals' diets and ultimately their health. However, the differences in food cravings between genders with normal BMI values are unclear. **Purpose:** The purpose of this study was to investigate differences in food craving intensity between genders with normal BMI values. **Methods:** The research group consisted of 1,394 participants (67% females, 33% males) between 15 and 92 years of age with normal BMI values. The self-reported General Food-Craving Questionnaire-Trait (G-FCQ-T) was used to determine individuals' food craving intensity on four subscales: preoccupation with food, loss of self-control-once eating, positive outcome expectations, and emotional craving. **Results:** The result suggested that there is no difference between males and females in the intensity of food cravings evaluated by the G-FCQ-T total score; however, gender differences were confirmed in two subscale scores. Positive outcome expectations subscale score was higher for males than for females, and an emotional craving subscale score was higher for females than for males. **Discussion:** Data indicated that the males' and females' food cravings are affected by different mechanisms. **Translation to Health Education Practice:** Findings confirmed the importance of creating gender-specific norms in dietary interventions.

### ARTICLE HISTORY

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## Background

Food craving is often defined as “the intense desire to eat a specific food.”<sup>1</sup> Typically, people eat when they are hungry. However, the desire to eat could be influenced by many different factors and stimuli. The smell of fresh bread could influence a food craving for bread, and the sight of the bakery could influence a food craving for anything sweet. Also, food cravings were found to be focused on foods which people consider tasting good, with a high content of sugar and low nutrition values, rather than those consisting of high-quality nutrition.<sup>2–5</sup>

In the past, researchers studied the reasons for and consequences of food cravings. The amount of stimulus or reward sensitivity that people get through consuming food is a great predictor of food craving intensity. Pavlov used dogs in his research to study psychological responses to a stimulus and found out that the sound of a bell ringing when giving food caused the dogs to salivate when only the sound of the bell was present.<sup>6</sup> Franken and Muris used Gray's Reinforcement Sensitivity Theory<sup>7</sup> in an attempt to explain how different stimuli or reward sensitivity may determine what causes an individual's cravings. They confirmed Pavlov's finding that the relationship between a stimulus or reward sensitivity and food cravings was positively correlated. They also stated

that “Food craving is driven by the presence of a stimulus that predicts the rewarding effect of food.”<sup>8</sup> Later research, however, focused more on a combination of impulsivity/reward sensitivity. Giel et al., after his review of 20 studies since 2012 on obesity/binge eating disorder concluded that stimulus or reward sensitivity plays a role in earlier stages of overeating, while rash impulsivity plays a greater role in the progression to more additive food consumption.<sup>9</sup>

Food cravings have the potential to lead to serious, negative health consequences. Many studies suggest that there is a relationship between food cravings, obesity, and other chronic diseases<sup>10–12</sup> and that obesity is a single independent factor for many chronic diseases.<sup>13</sup> Chao et al. found that participants with higher body mass index (BMI) are more likely to report higher frequencies of food cravings.<sup>14</sup> Higher habitual consumption of the types of foods that were craved is related to higher food cravings. The habitual consumption is a pattern regulated by the food cravings that can lead to obesity through craving the food and indulging in the intake of the types of food craved.<sup>14</sup> Furthermore, he found a negative relationship between the intake of unhealthy food and cravings for things such as starches and carbohydrates and at the same time a strong positive correlation between the intake of fast food-related fats, sweets, and food with

high-fat content and intense food cravings.<sup>14</sup> Burton et al., also found that BMI has a moderate positive correlation with food craving in a general sense and linked the food cravings for foods with high-fat content to higher intensity food cravings.<sup>2</sup>

There is also a connection between low-nutrition diets, losing control of food intake, emotional eating, and food craving. Muele et al. determined that people on a diet, regardless of how much success they have with their diet, tend to experience cravings related to a preoccupation with food, and they also experience guilt when they crave food or either indulge on these cravings.<sup>15</sup> However, unsuccessful dieters also reported that their loss of control of food intake and expectations to consume food were the main reasons for having intense food cravings. The latest interventions in emotional eating/depression and weight loss have been using Emotional Freedom Techniques (EFT).<sup>16</sup> EFT is an exposure therapy that targets stress response and has been used for different types of psychological problems from phobias to Post-traumatic stress disorders. Using the EFT, Church and Brooks reported a reduction in cravings for many food substances, including alcohol and tobacco, while engaged in the one-day intervention.<sup>17</sup> Another study that implemented the EFT intervention found significant improvement in weight loss, BMI, psychological coping and craving restrains that lasted for more than a year.<sup>18</sup>

In the last 20 years, researchers have been similarly interested in finding out if there are any gender differences in food craving intensity. The research results and the conclusion on the topic have been inconsistent. Chao et al. concluded that food cravings are associated with eating disorders, including binge eating disorders and global eating disorder psychopathology in general.<sup>19</sup> The association between food cravings and global eating disorder psychopathology seems to be stronger in females than in males. Still, there were no gender differences when looking at the relationship of food cravings to binge eating disorder. On the other hand, Cepeda-Benito et al. found that the cravings are associated with eating disorders but may not be entirely psychopathological and that men do not seem to have the same levels of cravings as women; the craving levels for men was significantly lower.<sup>20</sup> Weingarten and Elston, studied over 1000 male and female college students and found that women in his study reported more cravings overall even though women felt guiltier on giving in to their cravings than men did.<sup>21</sup> However, it did not stop them from indulging. Also, females reported more than twice as much a desire for chocolate than men did, but there were no differences in craving frequency. Chao's et al. study confirmed the previous study and found that males' desires are typically

for foods with a high content of fat. In contrast, females desire sweets and chocolate.<sup>19</sup> Females had a high correlation between cravings on a general scale, cravings for sweets and chocolate, and eating disorder psychopathology.<sup>19</sup> Burton et al. found that females tend to have stronger cravings for sweets and chocolate than males do, but they did not find any other differences related to different food cravings.<sup>2</sup> According to Pelchat's research, the intensity of craving decreases as females age.<sup>22</sup> This has been ascertained based on the view that cravings tend to be influenced heavily by the ovarian hormones in the female reproductive system. However, as females age, these hormonal effects on the body begin to decline rapidly, and a change in their diet is inevitable.

Though past research has confirmed some specific distinction in gender differences in most instances, the precise explanation of these differences has yet to be determined. This study will investigate food craving intensity between genders and will use only participants with a healthy value of BMI.

## Purpose

The purpose of this study was to investigate whether there are gender differences in food cravings between males and females with healthy BMI. Because some previous studies suggested the influence of BMI on food cravings,<sup>8,14</sup> we chose only participants with healthy values of BMI to identify differences between male and female cravings.

## Methods

This cross-sectional research study used a survey method to collect data on food craving among participants with healthy BMI. The questionnaire was collected from 2,042 participants (1,251 females, 791 males), between 15–92 years of age (average age  $30.4 \pm 19.8$ ). According to BMI classification, 66 individuals were classified as underweight (3.2%), 1,394 individuals with a healthy weight (68.3%), 431 individuals classified as overweight (21.1%), and 151 individuals classified as obese (7.4%). To gratify the purpose of the study, we removed the influence of abnormal values, and we chose only 1,394 participants with healthy BMI between 20–25 (929 females, 465 males; 15–92 years old – average age  $26.12 \pm 14.93$ ; average BMI value  $21.56 \pm 1.79 \text{ kg/m}^2$ ).

The study was approved by the Ethical Committee of the Faculty of Physical Culture Palacký University Olomouc (Czech Republic).

## Participants

From the 1,394 participants, 877 participants were from educational institutions in the Olomouc region (436 basic school students, 391 college students, and 50 students of retirement age). Another 517 participants (30–60 years of age) were asked to fill in the questionnaire individually at libraries, parishes, and senior clubs. Participants didn't get any compensation for completing the questionnaire. Qualifications for being part of the research included: must be older than 15 years of age, no addiction to addictive substances except nicotine and good mental health.

## Instrument and procedures

Data were collected through the electronic information system of Palacky University using an anonymous self-reported questionnaire – Czech version of the General Food-Craving Questionnaire – Trait (G-FCQ-T). The original Food-Craving Questionnaire (FCQ-T) was developed and validated by Cepeda-Benito et al.<sup>23</sup> and had 39 questions and nine subscales that measured craving as a multifactorial concept that expressed physiological and psychological processes. Then the original FCQ-T questionnaire was translated and validated in the Spanish language.<sup>20</sup> This version was later modified from 39 to 21 questions and four subscales (G-FCQ-T) by Dutch authors.<sup>24</sup> The authors reported internal consistency Cronbach's alphas .94 for the total score of the new G-FCQ-T and between .72 and .87 for the subscales. Test-retest reliability was .79 for the total scale, and between .62 and .78 for the subscales. Also, the questionnaire explained 53% of the variance.<sup>24</sup> This validated and reliable version was translated to Czech by Světlák and Černík.<sup>25</sup> The reliability of the Czech version questionnaire was tested by Klimešová and Elfmark. They used a sample of almost 400 participants and reported a .93 Cronbach's alpha for internal consistency and a .82 test-retest after three weeks.<sup>26</sup> Just like the Dutch version of the questionnaire<sup>24</sup> the Czech questionnaire (G-FCQ-T) consists of 21 questions arranged to four subscales: 1) Preoccupation with food (i.e., obsessively thinking about food and eating; questions 1– 6); 2) Loss of self-control-once eating (i.e., the tendency to demonstrate disinhibited eating behavior when exposed to food cues; questions 7 – 12); 3) Positive outcome expectations (i.e., believing eating to be positively or negatively reinforcing; questions 13– 17); and 4) Emotional craving (i.e., the tendency to crave food when experiencing negative emotions; questions 18–21). Answers were provided using Likert's six-point scale (1 point – never/not my concern; 2 points – rarely; 3 points – sometimes; 4

points – often; 5 points – almost always, 6 points – always). A high score/value indicated high food craving intensity; the minimal score being 21 points and the maximal score being 126 points.

Participants' weight and height data were collected by the same questionnaire. For calculating anthropometric index of body weight/Body Mass Index (BMI), we used the formula:  $BMI = (\text{body weight in kg})/(\text{body height in meters})^2$ . All respondents were classified by each of the following BMI categories: underweight, healthy weight, overweight, obesity. To place respondents to the above BMI categories, we used the standards of the World Health Organization (WHO) for adults<sup>27</sup>; and the standards of the WHO for the persons under 18.<sup>28</sup>

## Data analysis

For every parameter, basic statistical variables were calculated (arithmetic mean, standard deviation, median). The data normality test was verified by Kolmogorov-Smirnov's test. Differences between males and females were verified by t-tests for independent samples. To measure differences in education, we used a test for relative frequencies. The level of significance was set at level  $\alpha = 0.05$ . For statistical data processing, we used STATISTICA 12.0 by StatSoft CR s.r.o.

## Results

The overall sample comprised of 1394 participants aged 15–92 years (468 males and 929 females), with the mean age of 26.02 years (25.77 males and 26.27 females). The participants means for BMI = 21.8 kg/m<sup>2</sup> (22.05 males and 21.55 females) (Table 1).

From the maximum possible 126 points, the average total value of the raw score for the G-FCQ-T questionnaire was  $53.58 \pm 16.01$  points. The male average total value of the raw score was  $53.88 \pm 15.85$  points, and the female average total value of the raw score was  $53.44 \pm 16.09$  points. T-test values show that there are no significant differences in the total value of raw scores between males and females (Table 2).

**Table 1.** Descriptive statistics for males and females (N = 1,394).

	Males (N = 465)		Females (N = 929)	
	M or N	SD or %	M or N	SD or %
Age (years)	25.77	11.57	26.27	11.28
BMI (kg/m <sup>2</sup> )	22.05	1.76	21.55	1.74
Highest education				
Basic	116	25%	223	24%
High school	307	66%	604	65%
College	42	9%	102	11%

M – arithmetic mean, N – number of participants, SD – standard deviation

**Table 2.** Comparison of males and females.

	Total Males/ Females (N = 1394)		Males (N = 465)		Females (N = 929)		p
	M	SD	M	SD	M	SD	
Preoccupation with food	14.85	5.26	14.92	5.54	14.82	5.12	.74
Loss of self-control once eating	14.21	5.72	14.54	5.83	14.05	5.67	.14
Positive outcome expectations	15.70	5.04	16.41	5.23	15.34	4.91	<.001
Emotional craving	8.82	3.55	8.02	3.10	9.22	3.69	<.001
Total raw score	53.58	16.01	53.88	15.85	53.44	16.09	.63

M – arithmetic mean, SD – standard deviation, *p* – statistical significance of difference t-test for independent samples

However, differences between genders were found in subscales labeled Positive outcome expectations ( $p = .042$ ) and Emotional craving ( $p < .001$ ). Males reached higher values in the subscale positive outcome expectations, which represents the function of food as a reward. On the contrary, females reached significantly higher values at subscale emotional craving. This is evident during experiences of unpleasant emotions that are wrongly considered feelings of hunger. Therefore, these unpleasant emotions represent the primary motive for food consumption. No differences between genders were found on the other subscales – preoccupation with food ( $p = .74$ ) and loss of self-control once eating ( $p = .14$ ).

## Discussion

The purpose of this study was to investigate whether there are gender differences in food cravings between males and females with healthy BMI. The sample was representative of 1,394 participants (67% females, 33% males) between 15 and 92 years of age with healthy BMI values.

Results from the analysis prove that according to the total raw score of the G-FCQ-T questionnaire, there is no gender difference in the total food craving intensity between males and females. Also, no gender differences were found in two monitored subscales – Interest for food (describes thoughts, intensity about food without feeling hunger) and Loss of control (testifies about the ability to control food consumption and about circumstances which lead to loss of control) from a total of four monitoring subscales. This result supports the conclusions of a study by Burton et al., which also did not find any food craving intensity differences between males and females.<sup>2</sup>

Although our study didn't support the higher total food cravings intensity between males and females, it did find a statistically significant difference between males and females in two subscales from a total of four subscales using the G-FCQ-T questionnaire.

Males reached a higher value on the subscale of Positive expectations, which is representative of satisfaction from food as a reward. Males often combine food and feelings of contentment. The mechanisms of reward are used as a behavior control through motivation and are based on personal experience with the results of previous behavior. This kind of motivation, connected with positive reward experience, can be perceived as very intensive and urgent. Females reached higher values than males in the Emotional craving subscale. Females choose food when they feel tense emotions; higher scores show a craving for food-related to emotionally tense situations. Automatic food consumption as a tool for tempering unpleasant feelings can cause an undesirable increase in weight, but also can prevent revealing the right reasons for negative emotions.<sup>29</sup>

Some other studies, however, confirmed that females have a higher intensity of food cravings than males.<sup>20,21,25,29</sup> A study conducted by Syetlak and Cernik, using the same questionnaire, (G-FCQ-T)<sup>25</sup> found that females have a higher total food cravings intensity than males; furthermore, Cepeda-Benito et al., as well as the studies conducted by Weingarten and Elston and Lafay et al. shared the same findings. However, it is critical to note that the participants from all three studies, the Svetlak and Cernik, Cepeda-Benito et al., and Weingarten and Elston were limited to university students.<sup>20,21,25</sup> On the contrary, more than a third of our participants included in the current study were recruited from the general population.

This has important implications. First, within the current study, the average age of the participants was higher (our study average age 26; Svetlak and Cernik average age 24; Cepeda-Benito et al. average age 19.1; and Weingarten and Elston recruited students in their first two years of undergraduate study).<sup>20,21,25</sup> Second, because of the age difference, this could result in a direct impact on the results. It is possible that because our participants were older, they were taking more responsibilities in life, and were more reflective in their nutrition choices. Third, it is fair to surmise that more responsibilities could contribute to more stress and, therefore, more cravings. Notably, the two subscales where males scored higher (Positive expectations) and females scored higher (Emotional craving) may reflect stressful situations more than the other two subscales. For example, questions from the Positive expectation scale which males scored higher are: when I eat food that I crave for I feel so much better; and when I am full I feel good, etc. Some questions from the Emotional craving scale which females scored higher are: I really crave food when I am agitated; my

emotions are often the reason that I want to eat; when I am stressed out I cannot resist my cravings, etc.

This can reflect a difference in gender preferences based on the social/emotional influences that impact each gender through the developmental years. While males may be taught to be more competitive and reward themselves with food and food cravings; females may resort to food for comfort when feeling depressed, defeated, or emotionally insecure. These differences might merit further investigation in a subsequent study.

Precise differentiation of the motivation related to food craving is important, especially when researching the methods of craving management. If we know that stress, craving, and intense emotions are connected, then we can manage the individual's impulses by linking therapeutic procedures to control cravings.<sup>30</sup> In the best-case scenario, it would be possible to keep our emotions in check, and always control them before our body's healthy internal state is disturbed (homeostasis). If that were the case, then during the first stage of our response to a stressful situation (alarm reaction), we would be able to identify the emotion we were experiencing and then monitor our food cravings. This would result in the food cravings and all other addictive behaviors being easy to manage. However, because of the complexity of the brain and the connections between the brain and the nervous system, that is not possible. It is not humanly possible for anyone to control their emotions all the time. Therefore, the incorporation of traditional and dated therapeutic procedures are not sufficient. Rather, it is critical that a variety of new therapeutic procedures be developed. They are essential to finding new insights and techniques that will assist in influencing and controlling intense emotions that lead to cravings. Because cravings happen during stressful situations and last only for a few minutes, it is critical that the corrective procedures always be (a) simple to remember, (b) used frequently, and (c) provide many alternatives to choose from. Examples of some of the techniques are included in the section Translation to Health Education Practice.<sup>30</sup>

Although the results of this research show that males and females feel the same food craving intensity as expressed by the value of G-FCQ-T questionnaire's raw score which reached the average value of  $53.58 \pm 16.01$ , we consider food craving intensity as a gender-determined factor because we found gender differences in two of the four subscales. We did not prove that females feel higher food craving intensity but are inclined to the common affirmation that gender differences in food craving intensity exist. According to these results, we recommend that future clinical research of food craving intensity between genders should be conducted to find the best treatment for weight gain and other nutrition-related health problems.

## Study limitations

Some factors can influence these research conclusions.

- (1) Data were not collected by random sampling.
- (2) Uneven representation of males (33%) and females (67%).
- (3) There could be some distortion of BMI values, due to data collection of body height and weight through a questionnaire.
- (4) Although the G-FCQ-T questionnaire could be used for younger populations,<sup>31</sup> it is evident that self-evaluation of feelings about food craving is conditioned by critical thinking skills and can be influenced by age.
- (5) Self-reported questionnaires may have a problem with the truthfulness reporting and self-defense mechanism during self-evaluation.

However, on a positive note, the use of a large sample of participants with healthy weight and covering a broad age spectrum can be considered a strength for this research. Male and female groups were consistent in BMI value and age.

## Translation to Health Education Practice

Food craving associated with impaired eating behavior and obesity may prevent individuals from successfully engaging in weight loss attempts. Therefore, managing food cravings, in essence, becomes a key component in the management of obesity and other chronic diseases.<sup>10</sup> It is imperative that all health educators focus on working with their clients to provide them with information, so they better understand specific gender differences related to food cravings. Clients should be informed and gain a better understanding that males' and females' food cravings are affected by different mechanisms.

Also, our study suggests that even males and females with healthy BMI's crave food for different reasons. Males often have specific cravings, especially for a fat diet during stressful situations that are connected with emotions of rewards and happiness. In contrast, females are more likely to crave sweets during stressful situations connected with negative emotions. Our findings can be useful for creating educational intervention. The intervention should be specific and should use different techniques to reflect the various mechanisms that affect cravings. There are different interventions to help males and females to overcome or interrupt their cravings. Based on the client and situation, many techniques could be implemented. Some of these techniques include, but are not limited to, calling a professional or

friend, thinking and reflecting about the negative consequences of the behavior, avoiding stressful environments, being physically active, refraining from buying junk food for the house, using different relaxation techniques, drinking an extra glass of water, as well as other stress-relieving interventions.<sup>30</sup>

Finally, at the moment, the dietary guidelines are the same for males and females. They are published every five years by the U.S. Department of Health and Human Services.<sup>32</sup> The study should help health education professionals understand that food craving is strongly associated with emotions in a different way for males and females; therefore, there may be a reason for developing gender-specific dietary guidelines during dietary interventions.

### Disclosure statement

No potential conflict of interest was reported by the authors.

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