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# Effect of Food Intake on Mood in Higher Education Institute Students in Malaysia

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**Abstract**
The rise in mental health issues among Higher Education Institute (HEI) students calls for intervention. Studies indicate that mood influences mental health, and food influences mood. This study explored the effect of food on mood in HEI students. Twenty-four students from various HEIs in Malaysia were recruited in this study using a grounded theory approach. In-depth interviews were conducted, and data was arranged into themes and codes using a thematic approach. Food (themes) that were identified to have influenced the mood can be grouped into 4 major groups according to their flavour and effect: sweet, salty, spicy, and caffeinated food.

Keywords: Eating behaviours, Food Choices, Mood, Mental health, Higher Education Institute Students

## 1.0 Introduction
Higher education is the third level after high school (TAPSIR, 2019). In 2022, a net of 1.2 million students were enrolled in higher education institutions (HEI) in Malaysia, with 49.5% attending public universities, 42.7% in private HEI, and 7.7% in polytechnics and community colleges (MOHE 2022). Higher education opens the gate to new opportunities and presents students with various challenges, such as transitioning to a new environment, separation from family, and dealing with greater academic responsibility (Morshed et al., 2022).

*Academic emotions* are feelings that happen in various educational environments and can be positive or negative. This includes happiness (positive) when they learn something new or have accomplished an excellent job and despair (harmful) when they have too many tasks or fail (Barbayannis et al., 2022). These situations frequently lead college students to develop unhealthy eating behaviours such as irregular eating and unhealthy food choices (FC) (Sogari et al., 2018). This study was designed to understand the relationship between food intake and mood in HEI students who reported being depressed, anxious, or stressed.

## 2.0 Literature Review

## 2.1 Mental Wellness among Higher Education Institute (HEI) Students

Mental health is a significant concern in Malaysia, as the 2015 National Health and Morbidity Survey (NHMS) in this country indicated that 20% of Malaysians suffer from depression, followed by anxiety (40%) and stress (10%) (Institute for Public Health (IPH), 2015). As of 2019, NHMS reported that half of a million Malaysians were presented with depression (National Health and Morbidity Survey, 2019). The literature suggests that mental health depends on emotion, stress response, impulses, and mood, while those with mental health issues such as depression, anxiety, and stress are more vulnerable to mood changes.

## 2.2 The Effect of Food Intake on Mood

The mood is defined as a person's reactions to their life circumstance, lasting for hours or days and influencing behaviour and thought processes (Desmet et al., 2016; Marszał-Wiśniewska & Nowicka, 2018). Studies show that particular food affects mood, leading to people overconsuming their comfort food to have a positive feeling or to feel relaxed (AlAmmar et al., 2020; Leeds et al., 2020; van Strien et al., 2019) A recent study showed that individuals with mental health issues often seek their favourite comfort foods i.e., ice cream, pastries, and pizza. Although this food brings comfort, they are high in fat, and overconsumption may lead to obesity and cardiovascular diseases. The intake of certain foods, especially highly refined carbohydrates, may result in a person feeling more sad, anxious, or depressed in the long run when consumed. Since the mood of those with mental health issues is easily disturbed, these groups of people need to be more cautious of their food intake.

## 3.0 Methodology

### 3.1 Research design, location, and time.

The data of this study was obtained from a more extensive study, which employed a mixed methods design consisting of quantitative and qualitative methods. The objective of the original study was to determine the relationship between eating behaviour and mental health status among HEI students. In the quantitative section, cross-sectional data on mental health status was obtained using the Depression, Anxiety, and Stress Scale (DASS). At the same time, eating behavior was identified using Eating Behavior Pattern Scores (EBPQ). Selected participants who scored "severe" or "extremely severe" in any of the DASS items (depression, anxiety or stress) and participants who scored "presence" in their EBPQ scores were approached using the grounded theory approach. Those who consented to be interviewed were interviewed using the in-depth interview method, which explored the factors that influenced the Food choices of these participants. This study further analyzed how food affected the mood of the selected participants who reported being stressed, anxious or depressed.

The entire study was performed through an online platform. An online questionnaire was used to gather information for the quantitative part of the study, while Google Meet was used to conduct in-depth interviews for the qualitative part. All HEI students nationwide were invited to participate in the study via multiple social media platforms, including Facebook, Instagram, Twitter, and TikTok. However, only those who consented were recruited for this study.

The ethical approval for this study was obtained from Universiti Teknologi Mara (UiTM), Faculty of Health Sciences, under the Research Committee (REC/09/2021 (MR/873)).

### 3.2 Sampling

HEIs that were included in this study were all public and private universities, polytechnics, and matriculations, of which a total of 463 HEI students took part in the study. The inclusion criteria were undergraduate and postgraduate students who could comprehend and speak English or Malay and were enrolled in one of the following programs: matriculation, foundation, diploma, bachelor's degree, master's degree, or Ph.D. Meanwhile, Students with medical issues that prevent them from eating particular foods or diagnosed with mental illness were excluded from this study.

Upon data saturation, 24 participants were virtually interviewed, and their characteristics are presented in Table 1. Consent was obtained for the interviews.

### 3.3 Data collection

The data was collected between October 2021 and May 2022. Online in-depth interviews were conducted with 24 participants who consented to participate in the qualitative part of the study. The interviews were based on a semi-structured interview guide to obtain information about the participants' food choices (FC)

Two versions of interview guidelines (English and Malay) were created. Interviews with participants were conducted in either English or Malay, subject to participants' preference. Every interview lasted between 30 and 45 minutes and was conducted by researchers with dietetics backgrounds. Each interview was recorded and conducted until no new related topics or codes emerged. Participants were contacted to obtain missing data.

### 3.4 Data Analysis

The recorded interviews were transcribed verbatim, and the audio recordings were manually transcribed into Microsoft Word. All the participants were anonymized. Another researcher evaluated and verified each transcription and compared the original voice recording to ensure it was accurate. Malay-language interview transcripts were translated into English and manually coded. Interviews were arranged into codes and themes using a thematic analysis technique (Braun & Clarke, 2006).

## 4.0 Findings

*4.1 Participants characteristics*
The sociodemographic and mental health of the participants is given in Table 1. Participants were all from various HEIs in Malaysia, consisting of 21 female students (87.5%) and three male students (12.5%). The results indicated that participants aged 18-22 were prone to highly severe depression (12.5%), anxiety (50%) and stress (37.5%) as compared to participants aged more than 23 years. The data shown in Table 1 also indicates that more female participants face mental health issues than male participants.

*4.2 Foods that affect mood.*
This study was executed to understand the relationship between food and mood in HEI students were reported being depressed, anxious, or stressed. The results of this study were arranged according to themes/groups of frequently consumed food that were reported to influence the mood of the participants, such as *sweet food, salty food, spicy food,* and *caffeinated drinks.* Examples of types of food according to the food groups that were frequently consumed by participants in this study were; *sweet food*; chocolates, ice cream, cakes, and sweetened drinks; salty *food*; fried breaded mushroom, chips, tempeh, nuggets, spicy food; tomyam and teokbokki, and *caffeinated drinks*; coffee and tea.

Table 1: Characteristics of participants (n=24)

| Sociodemographic Characteristic | n (%) | Depression (%) | | | | | Anxiety (%) | | | | Stress (%) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Normal | Mild | Moderate | Severe | Extremely Severe | Normal | Moderate | Severe | Extremely Severe | Normal | Mild | Moderate | Severe | Extremely Severe |
| **AGE** | | | | | | | | | | | | | | | |
| 18-22 | 15 (62.5%) | 12.5 | 4.2 | 4.2 | 4.2 | 12.5 | 8.3 | - | 4.2 | 50.0 | 4.2 | 4.2 | 8.3 | 8.3 | 37.5 |
| 23 and older | 9 (37.5%) | 8.3 | - | 8.3 | 4.2 | 4.2 | 4.2 | 12.5 | - | 20.8 | - | 4.2 | 8.3 | 8.3 | 16.7 |
| **Gender** | | | | | | | | | | | | | | | |
| Male | 3 (12.5%) | 8.3 | - | - | - | 4.2 | 4.2 | - | - | 8.3 | - | - | 4.2 | 4.2 | 4.2 |
| Female | 21 (87.5%) | 25.0 | 4.2 | 20.8 | 12.5 | 25.0 | 8.3 | 12.5 | 4.2 | 62.5 | 4.2 | 8.3 | 12.5 | 12.5 | 50.0 |
| **Ethnicity** | | | | | | | | | | | | | | | |
| Malay | 21 (87.5%) | 25.0 | 4.2 | 20.8 | 12.5 | 25.0 | 12.5 | 8.3 | 4.2 | 62.5 | 4.2 | 8.3 | 12.5 | 16.7 | 45.8 |
| Indian | 1 (4.2%) | 4.2 | - | - | - | - | - | 4.2 | - | - | - | - | 4.2 | - | - |
| Others | 2 (8.3%) | 4.2 | - | - | - | 4.2 | - | - | - | 8.3 | - | - | - | - | 8.3 |
| **Educational Level** | | | | | | | | | | | | | | | |
| Diploma | 4 (16.7%) | 4.2 | 4.2 | - | - | 4.2 | 4.2 | - | - | 12.5 | - | - | - | 4.2 | 12.5 |
| Bachelor's Degree | 20 (83.3%) | 29.2 | - | 20.8 | 12.5 | 25.0 | 8.3 | 12.5 | 4.2 | 58.3 | 4.2 | 8.3 | 16.7 | 12.5 | 41.7 |
| **Institution** | | | | | | | | | | | | | | | |
| Public University | 23 (95.8%) | 33.3 | - | 20.8 | 12.5 | 29.2 | 8.3 | 12.5 | 4.2 | 70.8 | 4.2 | 8.3 | 16.7 | 12.5 | 54.2 |
| Polytechnics | 1 (4.2%) | 0.0 | 4.2 | - | - | - | 4.2 | - | - | - | - | - | - | 4.2 | - |
| **Residence** | | | | | | | | | | | | | | | |
| Home | 13 (54.2%) | 12.5 | 4.2 | 8.3 | 12.5 | 20.8 | 4.2 | 12.5 | - | 37.5 | - | 4.2 | 8.3 | 12.5 | 29.2 |
| College | 11 (45.8%) | 20.8 | - | 12.5 | - | 8.3 | 8.3 | - | 4.2 | 33.3 | 4.2 | 4.2 | 8.3 | 4.2 | 25.0 |
| **BMI** | | | | | | | | | | | | | | | |
| Underweight | 7 (29.2%) | 4.2 | - | - | 8.3 | 8.3 | 4.2 | 8.3 | - | 16.7 | - | 4.2 | 4.2 | 4.2 | 16.7 |
| Normal | 11 (45.8%) | 16.7 | 4.2 | 16.7 | 4.2 | 12.5 | 4.2 | - | 4.2 | 37.5 | 4.2 | 4.2 | 4.2 | 8.3 | 25.0 |
| Overweight | 5 (20.8%) | 8.3 | - | 4.2 | - | 8.3 | 4.2 | - | - | 16.7 | - | - | 4.2 | 4.2 | 12.5 |
| Obese | 1 (4.2%) | 4.2 | - | - | - | - | - | 4.2 | - | - | - | - | 4.2 | - | - |

*4.2.1 Sweet foods*
One group of foods that was frequently linked with influencing the mood was "sweet food". The interviews indicated that participants felt happy after consuming sweet food. Some even claimed that having sweet food like chocolates helps them feel relieved (calm). A few examples of "sweet foods" consumed by the participants were chocolate, ice cream (vanilla flavoured), cakes, and sweetened beverages.

Many participants claimed that eating chocolate made them feel happy; hence, many would consume chocolate or food containing chocolate to feel happy.

"*When I am sad, I would seek sweets foods like chocolates. I felt happier after eating chocolates.*"
(Participant 3, female)

"*When I am sad, I will seek something chocolatey. I could finish one whole bar... I feel satisfied after eating it.*"
(Participant 15, female)

Participants also reported that consuming ice cream made them feel happy. One participant explained that she took ice cream whenever she felt upset. When further probed about the flavour that she consumed, she replied that she usually chooses vanilla-flavoured ice cream.

"*I think because of the taste. I have been a vanilla fan, so the taste always makes me feel happier.*"
(Participant 20, female)

### 4.2.2 Salty foods
The study revealed that consuming salty foods helped the participants feel calm (reduced anxiety) and increased their focus. Participants said they feel more awake and can focus more on their work after snacking on salty foods. Hence, this group of participants binged on salty food (mainly chips and crackers) when they wanted to focus on finishing up a given assignment or preparing for an assessment.
One of the participants stated that salty food helped him to reduce anxiety.

"*If I felt agitated, I would search for salty food such as salted buttermilk cornflakes and eat until finished... That feeling will slowly fade after I eat.*"
(Participant 11, male)

### 4.2.3 Spicy foods
Spicy food has a distinct 'sharp' taste, which people tend to consume to evoke a mood. Based on the findings of this study, participants explained that they felt released from stress (calm) when they consumed spicy foods (e.g., tomyam and tteokbokki).
This was evident in a conversation with one of the participants;

"*I will order spicy Thai or Korean food like tomyam or tteokbokki. It feels like an escape of my mind from stressing out by the assignments.*"
(Participant 5, female)

### 4.2.4 Caffeinated drinks
Coffee is a common beverage consumed to increase focus or as an energy booster. Dietary coffee can be obtained from coffee, tea and cola drinks. Many participants in our study explained that they consumed coffee to improve their focus.
However, one of the participants who loved to consume tea narrated that the focus she felt was only temporary after consuming it. The focus declined after some time.

"*.... tea…In the beginning, it will be effective in helping me to focus, but eventually, I will lose focus.*"
(Participant 9, female)

The findings of this study are represented in Figure 1, in which participants felt happy and calm after eating sweet food. In addition, participants also consumed spicy and salty foods to feel calm. Lastly, participants love to drink coffee to increase their focus.
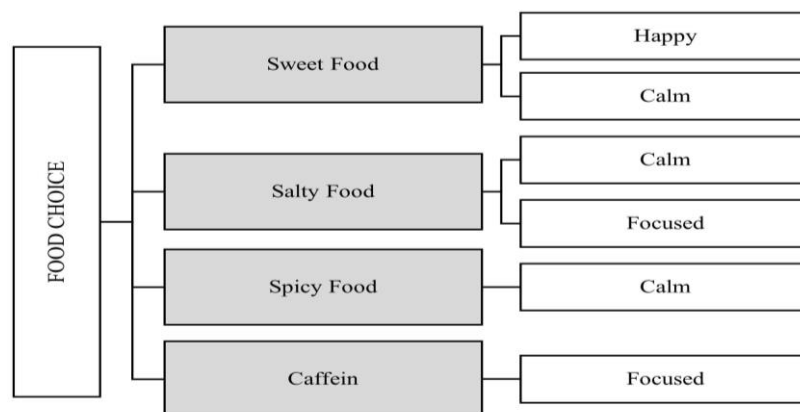


Figure 1: Framework of the relationship between food intake and mood among HEI students in this study

## 5.0 Discussion

Participants aged 18 to 22 had a higher prevalence of severely depressed, anxious and stressed compared to participants who were 23 years old. They struggle to adapt to university life, which involves independent decision-making and time management (Quehl et al. 2017). The results also indicated that females had a higher prevalence of mental health issues compared to males. This result is similar to a previous study, which explained that female participants were more prone to mental illness due to low self-compassion (Kotera et al. 2021).

The findings of this study suggest that participants felt happy after consuming sweet food such as chocolates, ice cream, cakes, etc. This is because sugar or simple carbohydrates are associated with tryptophane synthesis. The high level of CHO will increase the level of tryptophane, which will increase the level of serotonin (Jenkins et al., 2016). Serotonin is a neurotransmitter that is associated with feel-good feelings (feeling happy)(Farhud et al., 2014; Salehi et al., 2023). This sequence of events explains the reason for "feeling happy" after ingesting sweet/ simple CHO food.

The literature suggests that ingesting palatable food, especially sugar, increases dopamine release, overriding satiety.. This will lead to the overconsumption of sugary food and energy intake (Gillespie et al., 2023). In addition, sugar intake may promote the feeling of being happy in the short term; however, studies show that sugar intake results in reduced alertness in 60 minutes and an increase in fatigue within 3 minutes post consumption (Mantantzis et al., 2019).

The findings also suggest that some participants love to eat chocolate as they claim it makes them to feel good. Previous findings reported the strong effect of chocolate on evoking positive emotions and reducing feelings of discomfort. (Van Strien et al. 2019). Chocolate is a popular food choice that is consumed to provoke a positive feeling (antidepressant) because, in addition to theobromine and caffeine content, chocolate also contains tryptophan, an essential amino acid required by the brain to secrete serotonin (AlAmmar et al., 2020). Serotonin is a neurotransmitter that can mediate satisfaction, optimism, and happiness (Farhud et al., 2014; Salehi et al., 2023

Ice cream is a well-known dairy product that is rich in protein derived from milk. Ice cream elevates tyrosine (i.e., a neurotransmitter that increases the levels of dopamine and norepinephrine in the brain (Eknath, 2017). In addition, the vanilla aroma and flavour of ice cream elicit pleasant feelings, stimulating the brain and releasing endorphins (Eknath, 2017). As a result, individuals who consume it will experience a sense of relief and calm because endorphins are neurotransmitters known to reduce pain and emotional stress (Pilozzi et al., 2020).

The study identified that female participants liked to binge on salty food to increase focus. Being calm and relaxed will help to increase focus. A study conducted among healthy adults identified that a higher salt intake increased urinary cortisol excretion compared to a low salt diet. This also reduced circulatory Cortisol (Chen et al., 2020). A high level of Cortisol is often linked with many mental health disorders, such as depression, bipolar and psychosis. Hence, the participants may experience a slight relief from stress after consuming food high in salt, and this may increase their focus.

Spicy food usually contains capsaicin, usually found in jalapeño peppers, bell peppers, cayenne peppers, and other chilli peppers. When consumed, capsaicin causes the taste receptor cells in the taste buds to send signals to the brain to release the endorphin hormone (Noel & Dando, 2015). Endorphins are peptide opioids produced in the body that function as neurotransmitters, which are identical to that found in morphine, consumed by people to suppress pain signals. The release of endorphins calms the brain in stressful situations, thus resulting in a happy mood (Jain et al., 2019).

Coffee is a standard beverage consumed by people of all ages and continents. However, the ingestion of coffee has positive and negative effects. A previous study reported that students consumed coffee for its effects, including improved mood, increased alertness, and the capacity to stay awake even when exhausted (Beek et al., 2019). However, a study conducted among young adolescents reported that high intake of caffeine was associated with anxiety and depression (Richards & Smith, 2015).

Coffee is a famous beverage widely consumed to increase alertness and focus. The main ingredient in coffee that aids with this process is its caffeine. Caffeine will block the engagement of both adenosine and benzodiazepine receptor ligands (i.e., known to slow down brain activity) to brain membranes. Blockade of these neurotransmitters leads to increased brain activity. Other neurotransmitters such as noradrenaline, dopamine, serotonin, and acetylcholine are also affected by caffeine consumption (Boolani et al., 2020).

## 6.0    Conclusion & Recommendation

This study reveals that food intake affects mood among HEI students who have mental health issues. Studies indicate that individuals with poor mental health have frequent mood swings. Given the increasing prevalence of poor mental health among HEI students, this study sought to identify food that affected the mood of HEI students who were reported to have depression, anxiety and stress.

The study discovered that students frequently consumed high-sugar foods such as sweets, candy, ice cream, and chocolates to feel happy and calm, salty and spicy food also to feel calm, and caffeinated drinks, especially coffee, to increase focus. The literature shows that all these foods may positively affect mood, but the effects are short-term. High sugar, salt and caffeine are often linked with depression, anxiety and stress. Given the increasing prevalence of mental health issues among HEI students and older adults in the country and globally, it is vital to educate our young adults in HEI on healthy food choices to reduce these future health outcomes and improve their mental health.

The limitation of this study is it was conducted online, hence limiting the information that could have been obtained during in-depth interviews. Future studies may be conducted face-to-face using a focus group discussion approach. The groups should be divided according to age to be able to understand further if food affects mood according to age.

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## Declaration Of Conflict Of Interests
The authors have no conflict of interest.

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