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Correlation between Stress and Eating Behaviour in College Students: A Longitudinal Study

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ABSTRACT

Stress is a process that involves the perception of and response to pressure and is often related to eating behaviour. For college students, academic stress could be one factor that affects eating behaviour. So far, no longitudinal study has directly compared the same respondents' stress levels and eating behaviours in different years of study. Thus, this study aimed to examine changes in stress levels and eating behaviour during college students' third and final years and determine the correlation between stress levels and eating behaviour. We asked 89 undergraduate students (27 males and 62 females) to complete a questionnaire on their stress levels using the Perceived Stress Scale (PSS-10) and their eating behaviour. Our results showed that students had significantly higher stress levels during the final year than in their third year. Our results also showed that during the student's final year, there was a significant increase in eating when feeling stressed, overeating, eating fast food, and skipping meals compared to their third year. There was also a significant decrease in healthy food consumption during the final year compared to the third year. During the third year of study, stress levels were increased by academic workload pressure; meanwhile, during the final year of study, they were affected by sex and undergraduate thesis pressure. These results indicate that differences in academic pressure in different years of study can influence stress levels and eating behaviour in college students.

1. Introduction

Stress refers to a process that involves the perception, assessment, and response to pressure from internal or external stressors that can cause anxiety, discomfort, fear, and difficulty adjusting to the environment (Fink 2016). Several factors can influence stress levels, such as thoughts and feelings that cause anxiety, unrealistic expectations, the uncertainty of a condition, financial problems, pressure from family, or even academic conditions, such as a sense of competition, pressure to get good grades, inability to understand learning topics, and examination stress (Ang and Huan 2006; Rana *et al.* 2019; Wilburn and Smith 2005).

Students who enrol in institutions of higher education—for example, college students—must adapt to rapid physical, social, and mental changes that come from independent living, developing new relationships and peer groups, conflicting teacher-student interactions, and increased academic demands that may lead to higher stress (Hicks and Heastie 2008; Yikealo *et al.* 2018). Previous research has also shown that the academic year of study in college life has a significant influence on stress among undergraduate students. Studies have shown that middle-year students have higher stress levels than first-year students (Elias *et al.* 2011). Meanwhile, students in the final year showed the highest stress levels compared to those in the first and middle years (Fan and Wang 2001). The differences in each year of study may occur due to the increase in difficulty in each year of study, academic overload, inadequate time to study, having a workload every semester, and exams (Bataineh 2013; Fan and Wang 2001; Syahril *et al.* 2021). Furthermore, final-year students had to work on an undergraduate thesis (Syahril *et al.* 2021).

Increased academic stressors and stress levels in college students can impact health-related

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behaviours, such as eating (Caso *et al.* 2020). Several previous studies have shown that high levels of stress in college students are associated with increases in unhealthy food consumption, especially snacks and fast food (Errisuriz *et al.* 2016; Liu *et al.* 2007; Mikolajczyk *et al.* 2009; Penaforte *et al.* 2016; Zellner *et al.* 2006). In other cases, a high-stress level among college students is associated with lower healthy food consumption (Hill *et al.* 2021). These differences in the eating behaviours shown by college students depend on the severity of the perceived stress and individual characteristics, for example, economic conditions, the influence of others, and palatability of foods (Pliner and Mann 2004; Popkin *et al.* 2005; Torres and Nowson 2007).

Although many studies have discussed stress levels and eating behaviour in college students, no longitudinal study directly compares stress levels and eating behaviour with the same respondents but in different years of study (third and final years). Longitudinal studies can provide information about changes in stress levels and eating behaviour in students' third and final years. Furthermore, there is also no information about the correlation between stress levels and eating behaviour in college students in Indonesia. Thus, our study aimed to examine changes in stress levels and eating behaviour during the third and final years, as well as determine what variables can affect stress levels during the third and final years of college students. Our study also aimed to determine the correlation between stress levels and eating behaviour during college students' third and final years.

2. Materials and Methods

2.1. Respondents

The total number of respondents used in this study was 89 undergraduate students from the Department of Biology at IPB University. The respondents consisted of 27 males and 62 females with ages ranging from 20 to 23 years old, with an average age of 21 years old+0.61 years old.

2.2. Informed Consent

Before conducting the study, the researcher explained information related to the study and informed consent, such as details about the respondent's rights, the purpose of the study, procedures to be undertaken, potential risks and benefits of participation, and duration of the study, and provided the researcher's contact address. Respondents then decided whether to participate in the study. If the respondent was willing to participate, the respondent would give their informed consent and could start filling out the questions in the study.

2.3. Procedures

A quantitative longitudinal study was conducted with an online survey using Google Forms. Data were collected twice. The first data were collected during the third academic year in May 2021, and the subsequent data were collected during the final academic year in April 2022. The respondents who participated in this study 100% agreed to fill out the questionnaire, and we used the same person for both stages of data collection. The questionnaire consisted of four sections. The first section is the introductory page, informing respondents about the study's purpose, the researcher's contact address, and informed consent. The second section asked about personal information about sex, living places, BMI, and GPA. The third section asked about stress levels using the Perceived Stress Scale (PSS-10), and the last section asked about the respondent's eating behaviour using the eating behaviour questionnaire. Before each respondent answers the questions, our team will explain the purpose of the research, provide our team's contact address, and accompany the respondent while filling out the questionnaire. The respondent's answers to the questionnaire were confidential and only used for study purposes.

2.4. Perceived Stress Scale (PSS-10)

The Perceived Stress Scale (PSS-10) is a 10-item self-report questionnaire designed to evaluate stress levels based on individual perceptions of stress in the past month (Cohen *et al.* 1983; Cohen 1988). Each item in the PSS-10 is rated on a 5-point Likert scale ranging from never (0 points) to very often (4 points). The PSS-10 score is obtained by inverting the scores on questions 4, 5, 7, and 8, for example, 0 = 4, 1 = 3, 2 = 2, 3 = 1, and 4 = 0. The total score is obtained from the sum of the ten items. Individual scores on PSS-10 can range from 0 to 40, with higher scores indicating a higher stress level. The PSS-10 also allows for classification into low (0–13), moderate (14–26), and high (27–40) stress categories.

2.5. Eating Behaviour

Our study used a modified version of an eating behaviour questionnaire from previous studies (Choi 2020) to examine respondents' eating behaviours. This modified questionnaire asked about the frequency of performing several eating behaviours in a month, for example, "How often do you eat when you are stressed in a month?" This eating behaviour questionnaire consists of 6 categories: stress eating, healthy dietary habits, fast food, snacks, skip eating and overeating. In this modified version by the author, several questions in the original version were grouped into one category. Questions related to skipping meals (i.e., skipping breakfast, lunch, or dinner) were grouped into the "How often do you skip meals in a month?" category. Questions related to healthy dietary habits (consuming meat, fish, dairy products, and fruits) were grouped into the "How often do you consume healthy food such as meat, fish, dairy product, and fruits in a month?" category. Responses were rated on a 5-point Likert scale ranging from 0 (zero times in a month), 1 (1-7 days in a month), 2 (8-14 days in a month), 3 (15-21), to 4 (every day).

2.6. Statistical Analysis

The statistical analyses were conducted using the software RStudio version 1.4.1103 for descriptive statistics and correlation analysis (R Core Team 2021). We used the Kruskal-Wallis test to analyze the differences in eating behaviour between third-year and final-year students (Vargha and Delaney 1998). Spearman's rank correlation coefficients were used to determine the correlation between stress levels and emotional eating behaviour. The generalized linear model (GLM) was applied to determine which predictor variables could affect stress levels. This study used living place, sex, undergraduate thesis pressure, and academic workload pressure as the predictor variables. This study used backwards elimination stepwise model selection to obtain the most parsimonious model. The results presented here are based on the most parsimonious models.

3. Results

3.1. Stress Levels During the Third and Dinal Years of Study

Most respondents in each year of study were in the moderate stress category. However, there was an increase in the number of respondents in the high-stress category for final-year students (from 12 to 33%), as shown in Table 1. In addition, Respondent showed significantly higher stress levels during the final year compared to their third year (Mthird year = 20.42, s.d. = 3.42; Mfinal year = 25.11, s.d. = 3.86, Kruskal–Wallis, p-value = 4.7e-15), as shown in Figure 1.

3.2. Eating Behaviour During the Third and Final Years of Study

Our results from the Kruskal–Wallis test showed that during the final year, students tended to eat when stressed, overeat, eat fast food, and skip eating compared to their third year. Our study also found a significant decrease in healthy dietary habits among final-year students compared to their third year, as shown in Table 2.

3.3. Correlation between Stress Levels and Eating Behaviour

Our results showed that the higher the stress levels of college students, the higher their tendency

Table 1. Stress category of the respondent in each year of study

Stress category	Third-year student (N*)	Percentage (%)	Fourth-year student(N*)	Percentage (%)
Low	1	1	0	0
Moderate	77	87	60	67
High	11	12	29	33
Total	89	100	89	100

*N: Number of individuals

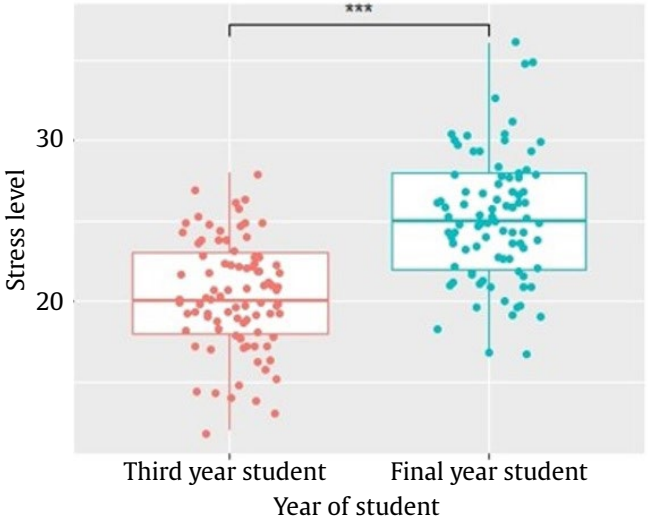

Figure 1. Comparison of stress levels during the third and final years of study

to eat when they feel stressed, skip eating, eat fast food, and overeat, as shown in Table 3.

3.4. Factors Affecting Stress Level During the Third Year of Study

Academic workload pressure significantly affected the increase in stress levels during the third year of study. Our study also found no difference in stress levels between the sexes. This result was obtained through the final model from GLM (generalized linear model) analysis, as can be seen in Table 4.

Table 2. Eating behaviour during the third and final years of study (Kruskal–Wallis test, p-value <0.05 = significant)

Items	Third-year student Mean (SD)	Final-year student Mean (SD)	p-value
Eat when stressed	1.74 (1.28)	2.88 (1.01)	5.794 x e-09***
Healthy dietary habits	10.77 (3.42)	9.22 (2.89)	2.812 x e-03**
Overeat	1.20 (1.08)	2.10 (1.11)	3.267 x e-07***
Eat fast food	3.26 (1.58)	4.75 (1.88)	2.205 x e-07***
Skip eating	2.65 (2.53)	5.55 (2.93)	3.7 x e-10***
Have snacks such as cakes, candies, soft drinks	1.93 (1.01)	1.92 (0.91)	9.332 x e-01

Table 3. Correlation between stress levels and eating behaviours (Spearman's correlation test, p-value <0.05 = significant)

Items	Rho	p-value
Eat when stressed	0.56	2.9 x e-16***
Healthy dietary habits	-0.0017	9.8 x e-01
Overeat	0.36	5.9 x e-07***
Eat fast food	0.35	1.9 x e06***
Skip eating	0.36	1.1 x e-06***
Have snacks, such as cakes, candies, soft drinks	0.11	1.4 x e-01

3.5. Factors Affecting Stress Level During the Final Year of Study

Sex and undergraduate thesis pressure significantly affected the stress levels of final-year students. Our results showed that female students had higher stress levels than males during the final year. Furthermore, stress levels increased along with increasing pressure from undergraduate theses. Our study showed no difference in stress levels in different living places. This result was obtained through the final model from GLM (generalized linear model) analysis, as can be seen in Table 5.

4. Discussion

Our study showed a significant increase in stress levels during the final year compared to their third year. We predicted that this might happen because, during collecting samples in April 2022, our respondents were in the middle of doing their research work or finishing their undergraduate thesis. Our result was in line with a previous study that explained higher stress levels in final-year students mainly due to increased workload, such as research work and writing for the undergraduate thesis (Syahril *et al.* 2021). Another previous study showed that in the final year, students tend to become worried and anxious about their final results (Aihie and Ohana 2019). They also have to

Table 4. Variables affecting stress level during the third year of study

	Estimate	Std. Error	t-value	p-value
Sex (Ref: female)	0.9975	0.6989	1.427	1.57 x e-01
Academic workload pressure	4.64939	1.58769	2.928	4.38 x e-03 **

Table 5. Variables affecting stress level during the final year of study

	Estimate	Std. Error	t-value	p-value
Sex (Ref: female)	2.7115	0.8203	3.305	1.39 x e-03 **
Living place (Ref: Living with parents)	-1.9323	0.9806	-1.970	5.205 x e-02
Undergraduate thesis pressure	4.6127	1.6263	2.836	5.7 x e-03 **

start considering what to do after graduating from college, such as getting a job or continuing to the following degree (Li and Lin 2003). This thought led to a higher stress level during the final year compared to their third year.

The present study also found a significant increase in the frequency of eating when feeling stressed and overeating during the final year compared to the third year. We also found that a higher frequency of stressed eating and overeating in college students was significantly correlated with a higher stress level. Parallel to this finding, previous studies (Caso *et al.* 2020; Kaplan and Kaplan 1957; Penaforte *et al.* 2016) showed that college students used food as a dysfunctional coping strategy to reduce stress. As a result, they tend to eat more when they feel stressed.

In addition, according to Kaplan and Kaplan (1957), emotional arousal that occurs due to increased stress levels might cause a person to be less sensitive to hunger and satiety cues. Therefore, a person might mistake emotional arousal as a sign of hunger (Kaplan and Kaplan 1957; Tan and Chow 2014). This condition leads to greater hunger when individuals experience greater stress levels (Groesz *et al.* 2012; Wallis and Hetherington 2009). Moreover, we found an increase in body mass index (BMI) during the final year compared to their third year ($M_{third\ year}$ = 21.79, s.d. = 3.95; $M_{final\ year}$ = 22.14, s.d. = 3.95). The increase in body mass index (BMI) might result from increased eating during stress and overeating during the final year compared to their third year.

Our study found an increase in meal-skipping and fast-food consumption during the final year compared to the third year. We also found that a higher tendency to skip meals and consume fast food was significantly correlated with a higher stress level. We predicted that this might occur because there were increases in academic work students must complete in their final year. For example, they must do their research work and write for their undergraduate thesis, and in our study, some of the respondents were still taking course lessons. As a result, the final-year students might not have had enough time to cook for themselves and eat meals regularly. Our prediction was supported by a previous study that showed the influence of time or a perceived lack of time, including prioritizing tasks, being reported as the most significant influence on meal-skipping and ordering fast food among final-year students (Pendergast *et al.* 2016; Penaforte *et al.* 2016). As a result, there was a tendency to skip meals during the final year and an increase in fast food consumption during the final year compared to the third year.

Apart from an increase in the frequency of several eating behaviours, our study also found a decrease in the frequency of consuming healthy foods, such as meat, fish, dairy products, and fruits. This result might occur because, during the final year, most respondents (82%) in our study lived in boarding houses or rented houses compared to their third year. According to previous research, students who do not live with their families tend to experience a decrease in healthy food consumption (Papadaki *et al.* 2007). Students who previously lived with their families had to change their lifestyle, from having somebody to cook regular meals in the family to themselves (Kim *et al.* 2015). Under this circumstance, students might consider ordering fast food or tend to make something simple, such as ready-to-eat food, which is easy and fast to prepare (Kim and Kim 2005; Penaforte *et al.* 2016; Steptoe *et al.* 2002). This behaviour may have led to a decrease in healthy food consumption during the final year compared to the third year.

Our results showed that during the third year of study, an increase in stress levels was caused by academic workload pressure. We found that sex did not significantly affect stress during the third year. We predicted that this might happen because, during the third year of study, both female and male students had the same academic workload, consisting of the same total course and assignment. This result was in line with previous studies that showed that academic workload pressure increased stress levels due to the responsibility to finish excessive tasks in a short time, study continuously, and prepare for exams (Bedewy and Gabriel 2015; Omigbodun *et al.* 2006; Yang *et al.* 2021). Thus, it might increase the stress levels of third-year students.

Meanwhile, during the fourth year of study, stress levels were affected by sex and undergraduate thesis pressure. This study found that female students had higher stress levels than male students. Previous research also showed that female students had higher stress levels than male students (Graves *et al.* 2021; Ndoen *et al.* 2021; Sulaiman *et al.* 2009;

Yikealo *et al.* 2018). This might be because female students had higher perceived stress and were more susceptible to repeated stress exposure than male students (Deatherage *et al.* 2014; Schmaus *et al.* 2008).

Furthermore, this study found that the pressure caused by the undergraduate thesis could affect increases in stress levels. According to previous research, this might have happened because several students experienced difficulties during working on an undergraduate thesis, such as finding literature, limited research budget, unfamiliarity with systematically organized paper consultations, and the anxiety or fear that arises when facing the thesis supervisor (Wardi and Ifdil 2016). As a result, there was an increase in the stress levels of the final-year students.

In conclusion, there was a significant increase in the stress levels of final-year students compared to their third year. There was a significant increase in several eating behaviours (eating when feeling stressed, overeating, eating fast food, and meal-skipping) during the final year compared to the third year. There was also a significant decrease in healthy food consumption among final-year students compared to their third year. Stress levels are significantly correlated with eating when stressed, meal-skipping, fast food, and overeating. An increase in stress level during the third year was affected by academic workload pressure; meanwhile, during the final year, it was affected by sex and undergraduate thesis pressure. These results indicate that differences in academic pressure in different years of study can influence stress levels and eating behaviours in college students.

This study has several limitations. Our team did not examine the stress level between first-year and second-year students. Therefore, our study did not know the stress level of Biology students at IPB University from the first to the final year of study. Our study did not ask about the respondent's SES (Socio-economic status); hence we do not know how SES might affect stress level and eating behaviour in college students. It would be more interesting if a further study could conduct a longitudinal study related to stress levels and eating behaviour from the first year of study until the final year. A further study needs to consider adding questions about respondents' SES (Socio-economic status) and determine what SES may influence stress levels and eating behaviour in college students.

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