Stress Level, Restrained Eating Behaviour, and Nutritional Status of University Students During the Hybrid Learning Condition

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Abstract: Students will suffer from extreme stress due to unclear learning methods. A restrained eating to control food intake is related to impulsive eating behaviour under stress. Therefore, this study aimed to determine the stress level, restricted eating behaviour, and nutritional status of university students during the hybrid learning condition. This study used a cross-sectional survey of 78 active students from Universitas Negeri Medan in July 2023. Data were collected using a questionnaire with *KoboToolbox* software. Variables observed in this study were composed of students' characteristics stress score, restrained eating behaviour score, and BMI score. Data were analysed using the Pearson's test and linear regression. From the results, most students are in a moderate stress level (75.6%) and more than 30% of the students are in malnutrition condition (under and over nutritional intake). According to the restrained eating behaviour scores, the three behaviours related to restrained eating behavior are ensuring what to eat (2.86 ± 1.24), associating the body weight with the food consumed (2.50 ± 1.41), and consuming less food when the weight gains (2.36 ± 1.18). In the linear regression results, the BMI score is positively correlated with the restrained eating score ($p<0.05$). As the restrained eating score levels up to 1 point, the BMI score elevates by 2.51. So, the more students perform a restrained eating behavior to lose or maintain weight, the higher BMI score of the students can gain.

1 INTRODUCTION

The hybrid learning policy has ever been enforced in Indonesia due to the low effectiveness of online learning and practical sessions that should be conducted directly. These drawbacks emerge due to several problems, such as unaffordable internet quota, unevenly distributed internet access, and less conducive learning. Hybrid learning is a learning method that combines conventional learning methods through face-to-face meetings and asynchronous learning methods through electronic devices (Fauzan, 2017).

Every learning method has its advantages and disadvantages, including hybrid learning. Changes in the learning system that alternates asynchronous and synchronous learning can increase students' stress (Noviana & Khoirunnisa, 2020). Previously, Resubun (2021) reported that students who joined hybrid or blended learning courses experienced mild stress (8%), moderate stress (26%), and severe stress (66%). Stress is more at risk for university students because they have many activities to do, that can finally make the students feel pressured and stressed (Andiarna & Kusumawati, 2020).

Among the body's balances, the body's physiology can be disrupted by stress and is highly related to food intake (Miliandani & Meilita, 2021). When the body is stressed, the hypothalamus orders the adrenal glands to release adrenaline and cortisol hormones. The cortisol hormone influences food appetite regulation. Whereas, decreasing appetite is caused by the adrenal glands that release more epinephrine, which triggers the body's response to delay eating. (Rahmawati, 2020). The imbalance between the intake of nutritional needs and adequacy will lead to nutritional problems, both in overnutrition and undernutrition conditions.

Controlling food consumption following the eating behaviour to maintain weight and avoid

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nutritional problems is highly important in stress conditions. Eating behaviours that tend to limit food intake and prevent weight gain or weight loss are commonly called restrained eating (Adams et al., 2019). Surprisingly, some studies found that restrained eating behaviour was associated with impulsive eating behaviour on food or eating habits. Restrained eating is a good behaviour when applied to overweight individuals. However, restrained eating is commonly associated with the reverse regulation, when an individual consumes more frequent calories as palatable (non-satiated) foods in small amounts (Adams et al., 2019; Herman & Mack, 1975; Polivy et al., 2020).

Polivy et al., (2020) mentioned that individuals who refrained from eating are more likely to experience episodes of overeating under stress, compulsion, or exposure to tempting foods. Therefore, this study was conducted to determine the relationship between stress, restrained eating behaviour, and nutritional status of students who are studying through a hybrid-learning system.

2 SUBJECTS AND METHODS

This study used a cross-sectional design and was conducted in July, 2023 on 78 students who attended the hybrid lectures from Universitas Negeri Medan. Data were composed of students' characteristics, body mass index (BMI), stress score, and restrained eating score. Data on students' characteristics included gender (male and female), age, ethnicity (Sumatran and other ethnicities), and faculty affiliation (engineering, sciences, education, languages and arts, economy, social). The BMI data included body height and weight, while restrained eating data were part of the eating behaviour aspects.

Data on characteristics, stress levels and restrained eating were taken using a questionnaire through *KoboToolbox* software, that was filled independently by the students accompanied by trained enumerators. The body height data were collected with a mechanical measuring tape (*GEA SH-2A*) at 0.1 cm scale and the body weight data were collected with a digital scale (*Karada Scan OMRON HBF-375*).

Stress levels were measured using the Perceived Stress Scale (PSS-10) questionnaire, which categorized stress level into three conditions, i.e. mild stress (0 to 13 score), moderate stress (14 to 26 score), and severe stress (27 to 40 score) (Cohen et al., 1983). Restrained eating aspect variable was constructed following the Dutch Eating Behaviour Questionnaire,

which consists of 10 questions answered using a Likert scale of never (1), seldom (2), sometimes (3), often (4), and very often (5). Then, the assessment was carried out by summing the score divided by the number of questions on the restrained eating aspects (Snoek et al., 2013). Furthermore, the body mass index (BMI) was generated using formula, whereas the body weight (kg) was divided with the square of body height (m). From these data, the individuals were then classified as mildly thin (BMI <17.0), severely thin (BMI 17.0 to <18.5), normal (BMI 18.5 to <25.0), mildly overweight (BMI >25 to 27.0), and severely overweight (BMI >27.0) (Kemenkes, 2014).

The univariate analysis was conducted to determine the characteristics of students based on the sociodemographic, stress level, mean score of restrained eating and nutritional status. Meanwhile, the bivariate analysis was carried out by the Pearson's correlation test which used the data ratio from stress score, restrained eating score, and BMI score variables. This study has been ethically approved by the Commission of Research Ethics, Faculty of Medicine, Maranatha Christian University with approval number: 127/KEP/V/2023.

3 RESULTS

The univariate analysis results present that most students were female (61.5%) with an average of 20 years old. Most students participate in this study are originated from Sumatran ethnic groups (64.1%), such as Toba, Nias, Mandailing, Simalungun, Karo, Pakpak, and Minang, while the rest are originated from Javanese, Malay, and Banjar ethnic groups. The students involved are mostly studying at the Faculty of Engineering (51.3%) (Table 1).

The present study research involving students from Universitas Negeri Medan showed the number of students from Sumatran ethnic groups to be higher. In addition, with an average age of 20 years old, most students are currently entering their 3rd year or equal to the 6th semester this year.

Table 1. Students' Characteristics.

Characteristics	n	%
Sex		
Women	48	61.5
Men	30	38.5
Age (years old)		
18 – 20	39	50
20 – 23	39	50
Mean ± SD	20.4 ± 1.2	
Ethnicity		

Characteristics	n	%
Sumatran	50	64.1
Others	28	36.9
Faculty		
Engineering	40	51.3
Science	11	14.1
Language and Arts	10	12.8
Economy	8	10.3
Education	7	9
Social	2	2.6

The nutritional status of the students was dominantly categorized by normal nutritional status (62.8%), but the number of students with severe overweight status was higher than mild overweight status, whereas 12.8% to 6.4% (Table 2). The mean of BMI score was 22.3 ± 4.1 kg/m^2 with the minimum and maximum BMI score of 16.2 kg/m^2 and 33.7 kg/m^2, respectively. Table 2 also shows that most students are in a moderate stress level (75.6%), although there are 9% of the students who perceive a severe stress level.

Table 2. Students' distribution on nutritional status and stress level.

Category	n	%
Nutritional Status		
Severely thin	2	2.6
Mildly thin	12	15.4
Normal	49	62.8
Mildly overweight	5	6.4
Severely overweight	10	12.8
BMI score		
Mean ± SD	22.1 ± 3.8	
Minimum	15.7	
Maximum	33.7	
Stress Level		
Mild	12	15.4
Moderate	59	75.6
Severe	7	9

Table 3 indicates the restrained eating behaviour aspect with the mean score. There are three most behaviour aspects regarding the restrained eating, namely always ensuring what to eat, (2.86 ± 1.24), associating the body weight with the food consumed (2.50 ± 1.41), and consuming less food when the weight gains (2.36 ± 1.18). The results of this study are similar to Nurdiani et al., (2023) which showed three behaviours from the same aspect, but with a higher mean score.

Table 3. Mean score of restrained eating aspect.

No.	Aspect	Mean	SD
1	Consuming less food, when the weight gains	2.36	1.18
2	Trying to eat less at mealtimes than intended	2.32	1.11
3	Frequently refusing food or drinks offered because of worrying about the weight	1.88	0.97
4	Ensuring what to eat	2.86	1.24
5	Consuming foods that can maintain the slim body	1.82	1.07
6	Eating less food than usual, when eating too much from the previous day	1.96	1.05
7	Deliberately eating less to not gain weight	1.99	1.12
8	Frequently trying not to eat between meals due to weight concerns	1.96	1.11
9	Frequently trying not to eat meals at night because of weight concerns	2.05	1.13
10	Associating the body weight with the food consumed	2.50	1.41

The Pearson's test results showed that no significant correlation occurs between the BMI score and stress score ($p>0.05$). Meanwhile, a significant positive correlation between the BMI score and the restrained eating behaviour score ($p<0.05$). This condition implies that the higher BMI score, the higher restrained eating score, the more frequent for students to maintain what to eat.

Table 4. Correlation test between BMI score, stress score, and restrained eating score.

Variable	Mean ± SD	Min - Max	BMI Score p-value
Stress Score	18.5 ± 5.5	0 - 33	0.332
Restrained Eating Score	2.2 ± 0.7	1 - 3.8	0.001*

To determine the effect between the restrained eating score and BMI score, multivariate analysis was applied. According to the linear regression test, the p value = 0.000 (p <0.05), which means that it has a significant effect on the BMI score. Meanwhile, the R^2 value of the analysis results is 22.7%, which means that the BMI score is explained by the Restrained eating score by 22.7%. The regression equation is Y = 16.64 + 2.51 X, which means that when the restrained eating score levels up to 1 point, the BMI score will elevate by 2.51.

4 DISCUSSIONS

The prevalence of malnutrition, both undernutrition and overnutrition, was lower than the national prevalence for nutritional status of adults over 18 years old, whereas 10.8% of whom are thin, overweight are 12.1%, and suffering obesity are 14.5% (Kemenkes RI, 2019). However, the one-third of the total students are issued with abnormal nutritional status. In addition, the maximum value of the BMI score is 33.7 kg/m^2, so this needs more attention from the institution that conducts the study.

The stress category experienced by the students is academic stress, as the students perceive academic demands as a disturbance that cannot be handled (Barseli et al., 2017) Different students' preferences for learning can also cause stress. Some students are comfortable with online learning due to more practical and flexible, while others choosing offline learning because they can focus more on their studies (Fitriansyah, 2022).

Previously, the various studies using the DEBQ mentioned that only restrained eating was used to examine the correlation between DEBQ and other variables, such as age, gender, socioeconomic status, nutritional status, psychology, and family socioeconomics (Ohara et al., 2014; Poínhos et al., 2015; Snoek et al., 2013; van Strien et al., 2020). Restrained eating indicates the person's condition who maintains the food consumed to deliberately limit the food intake and prevent the weight gain or lose weight (Meule, 2016; Polivy et al., 2020).

Wijayanti et al., (2019) stated that stress is related to emotional overeating, but not relating to BMI values. The results also show that the emotional overeating has no effect on the nutritional intake, so it has no effect on the nutritional status. The nutritional status is also caused by other factors, such as energy and macronutrient intake, physical activity, nutritional knowledge, peer and parental influence, etc (Deliens et al., 2014; Nawaz et al., 2016).

The results of this study indicate that no correlation is occurred between the restrained eating score and BMI score, which is in line with the restrained eating, as someone who skips meals can cause an irregular eating pattern. A counter regulation occurs when someone is no longer urged to restrain eating, which causes a weight gain due to eating as much as possible to compensate the restrained eating. (Nurdiani et al., 2023; Polivy et al., 2020).

Restrained eating is expected to lead weight gain rather than weight loss over time, although restrained eaters perceive that they are deprived of food, even if they do not eat less than the unrestrained eaters (Timmerman & Gregg, 2003). Indeed, perceived restrained eating is less likely to lead weight loss and is even associated with the weight gain over time in a number of prospective studies on diet populations (Konttinen et al., 2018; Lowe et al., 2013). The restrained eating practices are often easily disrupted, that lead to overeating. In the end, the people tend to be unsuccessful in losing or even maintaining their weight (Polivy et al., 2020).

5 CONCLUSIONS

Students as samples were mostly female with an average of 20 years old. Most of them are originated from Sumatra and study at the Faculty of Engineering. More than 30% of the students are having malnutrition problems (over and under nutrition). The minimum BMI value is at 15.7 kg/m^2 and the maximum value is at 33.7 kg/m^2. Stress level is dominated by moderate stress levels, although some students are in severe stress level. The correlation test results showed that no correlation is described between the BMI and stress scores, but a positive correlation occurs between the BMI and restrained eating behaviour scores, which means that the more participants perform the restrained eating behaviour to lose or maintain weight, the higher BMI score obtained. This condition should be a concern, when students are under the stressful conditions that can lead to overeating.

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