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THE RELATIONS BETWEEN ANXIOUS MOOD, EMOTIONAL EATING, AND EXTERNAL EATING AND ITS RELATIONSHIP WITH OBESITY IN ADULTS

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ABSTRACT

The increase in adult obesity is a serious health issue. Obesity is caused by calorie consumption exceeding an individual's daily caloric needs. Changes in eating behavior, such as emotional eating and external eating, are related to obesity and negative moods, specifically anxious mood. This study aims to determine the relationship between anxious mood and both emotional and external eating, as well as their relationship to obesity in adults. An observational cross-sectional analytical approach was used on 101 questionnaire respondents. The correlation between anxious mood and eating behaviors was analyzed using the Pearson Product-Moment Correlation test. The relationship between anxious mood and emotional eating and/or external eating with obesity was tested using multivariate Path Analysis. The majority of respondents were female (56,5%). Among respondents, 50,5% experienced anxious mood, 24,8% experienced emotional eating, and 54,5% experienced external eating. Pearson Product-Moment Correlation showed an r value of 0,136 (p-value = 0,175) for anxious mood and emotional eating, and an r value of 0,166 (p-value = 0,097) for anxious mood and external eating. No significant relationship was found between anxious mood and emotional or external eating. Additionally, The Path Analysis test demonstrated that the relationship between anxious mood and emotional eating and/or external eating in relation to obesity in this study showed an R^2 value, or the total effect of independent variables on the dependent variable, of 2%.

Keywords : anxious mood., eating behavior., obesity

INTRODUCTION

Eating behavior is a complex interaction between physiological, psychological, social, and genetic aspects that regulate a person's diet [1]. This regulated diet can be in the form of frequency of consumption, portions, and food choices.[1,2] An unhealthy diet can be a major contributor to being overweight or obese.[3] Obesity cases have increased significantly around the world. This problem can be seen from the data obtained by the World Health Organization (WHO), it is estimated that by 2030 the prevalence of obesity globally can increase to 1.12 billion people. This figure is a significant increase when compared to the prevalence of obesity in 2016 which reached 650 million people.[4] Indonesia also experiences an incidence of obesity which is increasing every year and can be categorized as moderate in its adult population. In 2018, as many as 21.8% of the adult population in Indonesia, with an age range of more than 18 years, were obese.[5,6]

Disturbances in *a*n individual's eating behavior can be a major concern in cases of overweight and obesity, including emotional eating and external eating. The concept of emotional eating occurs due to a negative emotional response that causes an increase in the desire to eat beyond the body's physiological needs.[2,7] An emotional eater will prefer calorie-dense foods, such as sweet and fatty foods. Consumption of these calorie-dense foods can help reduce stress by limiting the activity of the limbic hypothalamic-pituitary-adrenal (LHPA) axis. This can occur due to the role of the LHPA axis as a glucose metabolism system in the cerebral. As a result, when glucose is given to someone who is experiencing stress, those glucose can suppress the activity of the LHPA axis to reduce the stress, similar to the function of glucocorticoid hormones (cortisol hormone). So, emotional eating can be a way to overcome the stress that a person feels.[8,9] On the other hand, emotional eating often occurs along with external eating. In contrast to emotional eating, which occurs due to cognitive deficits, external eating is regulated by overstimulation of cephalic phase responses (CPRs).[10] CPRs are an anticipatory response of the body to prepare itself to consume a food. This response can come from the mind, smell, or sight and can increase the secretion of saliva and endocrine hormones. Some of them include the hormones leptin, insulin, ghrelin, and pancreatic polypeptide (PP). Thus, with this, CPRs can be associated with increased cravings to eat and/or increased portions of food.[11] However, it should be kept in mind, external eating and the initiation of CRPs get a very significant influence from the surrounding food environment.[10]

In addition, a study shows that eating behavior in the form of emotional eating can be influenced by cognitive deficits. However, this is still influenced by the presence or absence of a negative mood response.[12] Cognitive control, in eating behavior, is in charge of providing a response related to a stimulus, such as food, and will carry out decisions related to that stimulus.[13,14] Mood itself is defined as everything that is felt temporarily and can appear without a clear stimulus. A mood disorder, in the form of a negative mood, can be a risk factor in changing a person's eating behavior with its regulatory center located in the center of emotional regulation.[8] In its correlation with mood, eating behavior can also be influenced by anxiety or fear. This feeling in the form of anxious mood can be influenced by several factors, one of which comes from the dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis.[15] In controlling this anxiety, the HPA axis will regulate glucocorticoid responses that will mediate hunger and eating behavior. If the anxiety has been handled, the HPA axis will be tasked with doing a negative-feedback. However, in the case of chronic increased glucocorticoid responses, HPA axis dysregulation in the form of a failure from the hormone cortisol negative-feedback can occur and thus an increase in excess weight can be the impact.[16]

Disregulation of the HPA *Axis* in the hormone cortisol is one of the causes of chronic symptoms of anxiety (anxious mood). In addition, the hormone cortisol is also believed to have a relationship with food consumption. Where, cortisol can affect food choices by choosing foods that are high in fat and sugar levels or can be said to be calorie-dense foods.[16,17] Consumption of calorie-dense foods when there is chronic stress response can help suppress these stressful effects by suppressing LHPA axis activity.[8,9] So this can cause someone with a stress response to look for ways to suppress the stress, which is called a reactive coping strategy.[9,18] Reactive coping strategy can basically be emotion focused coping and problem focused coping.[19]

Cortisol is known to have a role in maintaining blood glucose and mobilizing glucose reserves that will be used for energy. This energy will be obtained from the breakdown of glucose through a catabolism reaction in the sympathetic nervous system called the response fight or flight.[20] Fight or flight response can be triggered by the slightest stress response, not necessarily from something life-threatening, but can also come from things like family problems or workplace stress.[21] So, by still triggering the fight or flight response, the hormone cortisol will still provide the energy needed by our body by consuming the necessary glucose. In addition, cortisol will also be in charge of suppressing stress responses. Together, these two things can cause a person to build a coping strategy in the form of emotion focused coping by choosing foods that are dense in calories or high in sugar content to suppress the stress response. However, when combined with stressors that do not require significant energy expenditure, this can be one of the risk factors of obesity and metabolic disorders of the body.[17,18,20]

METHODS

This study is an observational research with a cross-sectional analytical method approach. This research was carried out online through an electronic questionnaire in the form of a Google form, distributed at the Faculty of Medicine, Udayana University, taking place from January to September 2024, and has obtained a research permit with the number: B/814/UN14.2.2.V.1/PT.01.04/2024 and an ethical clearance letter with the number: 0552/UN14.2.2.VII.14/LT/2024. The population of this study is the adult group at the Faculty of Medicine, Udayana University. The research subjects amounted to 101 respondents from lecturers, education staff (employees), and students and were selected with the non-probability sampling method (purposive sampling). The inclusion criteria of this study are a group of adults whose age is in accordance with the adult age classification of the Ministry of Health of the Republic of Indonesia, namely 19-44 years old, in 2023-2024 and also agrees and is willing to be the subject of the study after *informed consent*. Meanwhile, the exclusion criteria of this study are the adult group who moved or did not become part of the Faculty of Medicine, Udayana University during the duration of the study. The independent variables in this study are anxious mood, emotional eating, and external eating, the dependent variables in this study are obesity, and the confounding variables in this study are factors that can affect the relationship between anxious mood and emotional eating and external eating, namely adulthood, gender, and physical activity.

RESULT

Based on the data from the study, the number of respondents who agreed (signed informed consent) and met the inclusion criteria was 101 people. Table 1 shows the characteristics of the research respondents and Table 2 shows the distribution of anxious mood respondents towards emoitonal eating and external eating. The respondents studied were an obese group with a body mass index (BMI) value of ≥25, and the age of the respondents in this study was aimed at the adult group with an age range of 19 years to 44 years.

Table 1. Characteristics of Respondents

Variable	Total n (%)
Age	
19-44	101 (100)
Institutional Origin	
Lecturer	9 (8,9)
Education Staff	12 (11,9)
PSSK	42 (41,6)
PSSKGPDG	8 (7,9)
PSSP	9 (8,9)
PSSFPF	4 (4,0)
PSSKM	8 (7,9)
PSSIK	9 (8,9)
Gender	
Man	44 (43,6)
Woman	57 (56,4)
Physical Activity	
Low	20 (19,8)
Moderate	55 (54,5)
High	26 (25,7)
Anxious Mood	
<45.5 (no)	50 (49,5)
≥45.5 (yes)	51 (50,5)
Emotional Eating	
<3.25 (no)	76 (75,2)
≥3.25 (yes)	25 (24,8)
External Eating	
<3.15 (no)	46 (45,5)
≥3.15 (yes)	55 (54,5)
Body Mass Index	
27,58 ± 3,16	

Table 2. Respondent Distribution Anxious Mood towards Emoitonal Eating and External Eating

Variable	Anxious Mood			
	<45.5		≥45.5	
	N	%	N	%
Emotional Eating				
<3.25 (no)	43	42,6	33	32,7
≥3.25 (yes)	7	6,9	18	17,8
External Eating				
<3.15 (no)	26	25,7	20	19,8
≥3.15 (yes)	24	23,8	31	30,7

The relationship between anxious mood variables on emotional eating and external eating was carried out by the Pearson Product-Moment Correlation test. The results of the analysis can be seen in Table 3.

Table 3. Relationship between Anxious Mood towards Emotional Eating and External Eating

	Mean	SD	Anxious Mood	
			r	p-value
Emotional Eating	2,5672	1,05126	0,136	0,175
External Eating	3,2356	0,66956	0,166	0,097

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Based on the table, the results of the Pearson test showed that there was no significant correlation between anxious mood and emotional eating with a correlation coefficient value of r = 0.136 (*p-value* = 0.175). Similar things were also obtained in the correspondence between anxious mood and external eating which showed that there was no significant correlation with a correlation coefficient value of r = 0.166 (*p-value* = 0.097).

Relationship anxious mood with emotional eating and/or external eating towards obesity was carried out using multivariate analysis through Path Analysis. Chart 1 represents the direct and indirect influence paths of independent variables anxious mood, emotional eatingand external eating towards obesity as the dependent variable and Table 4 shows the value of the correlation coefficient between these variables.

The results of the Path Analysis showed a value of R^2 = 0.02 (2%) which is the magnitude of the total direct and indirect relationship of the independent variables studied/involved in the study (anxious mood, emotional eating, and external eating) on the dependent variables (obesity).

The direct relationship of anxious mood on obesity was obtained by 0.3%. The direct relationship of emotional eating on obesity was obtained by 0.9%. And, the direct relationship of external eating on obesity was obtained by 0.25%.

The indirect relationship on the obesity variable are as follows: emotional eating through anxious mood has an effect of 0.008%, anxious mood through emotional eating has an effect of 0.008%, anxious mood through external eating has an effect of -0.05%, external eating through anxious mood has an effect of -0.05%, emotional eating through external eating has an effect of 0.3%, and external eating through emotional eating has an effect of 0.3%.

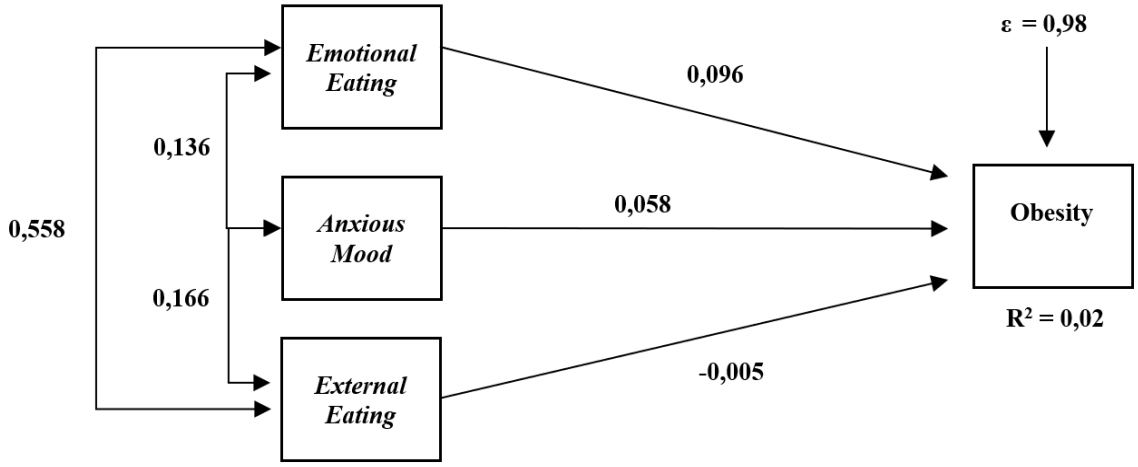

Chart 1. Structural model *Path Analysis* Relationship between *Anxious Mood*, *Emotional Eating*, *External Eating*, and obesity

Table 4. Result Path Analysis The Relationship between Anxious Mood, Emotional Eating, External Eating, and obesity

Dependent Variables		Independent Variables	Path Coefficient	*p-value*
Dire				
Obesity	←	Anxious mood	0,058	0,572
Obesity	←	Emotional eating	0,096	0,434
Obesity	←	External eating	-0,005	0,967
Indirect Influence				
Anxious mood	←	Emotional eating	0,136	0,175
Emotional eating	←	Anxious mood	0,136	0,175
External eating	←	Anxious mood	0,166	0,097
Anxious mood	←	External eating	0,166	0,097
External eating	←	Emotional eating	0,558	0,000
Emotional eating	←	External eating	0,558	0,000

Based on the analysis of the relationship between anxious mood variables on emotional eating and external eating, it is suspected that there is an influence of the third factor/confounding factor in the form of gender and physical activity, so a stratification test was carried out using the Cochran Mantel-Haenszel test method. The results of the stratification test can be seen in Table 5.

The results of the stratification test of the relationship between anxious mood and emotional eating by gender showed values (*p-value* = 0.027, OR_{MH} of 3.331, and 95%

CI: 1.253-8.962). Thus, it can be concluded that gender significantly affects the relationship between anxious mood and emotional eating. The results of the stratification test of the relationship between anxious mood and emotional eating based on physical activity showed values (*p-value* = 0.016, OR_{MH} of 4.1, and 95% CI: 1.253-8.962). Thus, it can be concluded that physical activity significantly affects the relationship between anxious mood and emotional eating.The results of the stratification test of the relationship between anxious mood and external eating based on gender showed values (*p-value* = 0.261, OR_{MH} of 1.7, and 95% CI: 0.762-3.699). Thus, it can be concluded that gender does not affect the relationship between anxious mood and external eating, but this result is not significant.

The results of the stratification test of the relationship between anxious mood and external eating based on physical activity showed values (*p-value* = 0.275, OR_{MH} of 1.7, and 95% CI: 0.762-3.699). Thus, it can be concluded that physical activity does not affect the relationship between anxious mood and external eating, but this result is not significant.

Table 5. Stratification Test Results *Cochran Mantel-Haenszel* Based on Confounding Factors, Gender, and Physical Activity

Variable	*Anxious Mood*				Total		*p-value*	OR_{MH}	CI
	<45,5		≥45,5						
	N	%	N	%	N	%			
***Anxious Mood* towards *Emotional Eating* and Gender**									
Man	23	22,77	21	20,8	44	43,56	0,027	3,331	1,253-8,962
Woman	27	26,73	30	29,7	57	56,44			
***Anxious Mood* towards *Emotional Eating* and Physical Activity**									
Low	6	5,94	14	13,86	20	19,8	0,016	4,123	1,253-8,962
Moderate	28	27,73	27	26,73	55	54,46			
High	16	15,84	10	9,9	26	25,74			
***Anxious Mood* Towards *External Eating* and Gender**									
Man	23	22,77	21	20,8	44	43,56	0,261	1,711	0,762-3,699
Woman	27	26,73	30	29,7	57	56,44			
***Anxious Mood* for *External Eating* and Physical Activity**									
Low	6	5,94	14	13,86	20	19,8	0,275	1,724	0,762-3,699
Moderate	28	27,73	27	26,73	55	54,46			
High	16	15,84	10	9,9	26	25,74			

DISCUSSION

The subjects in this study amounted to 101 people from lecturers. education staff, and students with details of 44 males (43.6%) and 57 females (56.5%). In this study, something similar was found to most previous studies, namely that there were more female research subjects than male ones.[22–26]

This study also considers the physical activity of the subject which is suspected to be one of the factors that affect the variables studied in this study. The subjects can be categorized into 3 groups, namely low physical activity of 20 people, moderate physical activity of 55 people, and high of 26 people who were assessed using the IPAQ questionnaire. However, there are limited studies about physical activity in regards to the relationship between anxious mood and emotional eating and external eating. In fact, several other studies, such as research by Glavin, et al supports the relationship between physical activity and a person's mood regulation, one of which is anxious mood.[27]

The relationship between anxious mood and emotional eating in this study gave insignificant correlation results. On the other hand, in the analysis of confounding variables, it was found that gender and physical activity affect the relationship between anxious mood and emotional eating. The relationship between anxious mood and emotional eating is similar to the results obtained by Trisnawati dan Wicaksono, which shows that anxiety and emotional eating have an insignificant relationship.[22] However, these results are contrary to research conducted by Braden, et al and Guerrini-Usubini, et al that show significant results between the relationship between anxiety and emotional eating.[24,26]

The relationship between anxious mood and external eating in this study gave insignificant correlation results. And in the analysis of confounding variables, it was found that gender and physical activity also did not affect the relationsip between anxious mood and external eating, but the result was not significant. However, these results are not similar to those obtained by Trisnawati dan Wicaksono those who showed that there was a significant relationship between anxiety and external eating.[22]

The results of the analysis between anxious mood and emotional eating and/or external eating towards obesity in this study showed that the total value of the relationship between independent variables on the dependent variable was 2%. Thus, the results of this study show that there are

still many other unexamined variables that can provide a relationship with the incidence of obesity. Meanwhile, in other studies, such as the study by Nurdiani, et al showing the results of a significant relationship between emotional eating and obesity, but the relationship between external eating and BMI is significantly negative which means that the higher a person's BMI (obesity), the value of external eating-will be lower.[23] Then, the study by Braden, et al and Guerrini-Usubini, et al each other showed similar results that there was a significant indirect relationship between anxiety and emotional eating and continued with a significant direct relationship with obesity.[24,26]

This is related to the role of the hormone cortisol as a hormone that affects chronic anxiety and also as a hormone that has a role in food selection in an effort to suppress the effects of stress on a person.[8,16,17] This will cause a person to apply a coping strategy in the form of choosing calorie-dense foods to reduce the effect of stress by suppressing LHPA axis activity.[8,9,18] So, when the occurrence of stress effects, such as anxiety, occurs in the long term, this will cause a person to apply a coping strategy in the form of changing eating behavior (emotional eating or external eating) and as a result be more susceptible to obesity.[9,16,18,19] In addition, the incidence of psychological stressors, such as problems in the family or stress at work, causes the risk of obesity to increase along with the fight or flight response that arises from psychological stressors that do not require significant energy expenditure.[9,18,20,21] So, coping strategies and the habit of not expending significant energy should be eliminated. Efforts to retrain our way of thinking in dealing with stress and adjusting between energy needs and consumption are needed to improve metabolic balance and maintain body health. Eating behavior disorders in response to chronic stress can lead to obesity. Therefore, it is important to develop a healthy coping strategy and improve behavior patterns to be more physically active. Thus, overall health can be better maintained and the risk of obesity can be minimized.[9]

1. CONCLUSIONS AND SUGGESTIONS

The relationship between anxious mood and emotional eating was found to be no significant relationship with the value of r = 0.136 (*p-value* = 0.175). The relationship between anxious mood and external eating was also found to be no significant relationship with a value of r = 0.166 (*p-value* = 0.097). The relationship between anxious mood on emotional eating and external eating, as well as its relationship to obesity, were found to have a total influence marked by an R^2 value of = 2%. This shows that there are still other unstudied variables that provide a more significant relationship.

For future researchers, it is hoped that further exploration of the relationship between anxious mood, emotional eating, and external eating, as well as their relationship on obesity by assessing confounding factors that can affect their relationship. The duration of experiencing anxious mood or emotional eating and/or external eating on the risk of obesity also needs to be researched. Leptin hormone levels in the incidence of anxious mood, emotional eating, or external eating also need to be studied. The assessment of factors that may be confounding variables can be included in the inclusion criteria, so as to minimize the influence of confounding factors on the relationship between variables.

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