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Emotional Eating Behaviour With Physical Activity, Stress, and Depression in Women: A Cross-Sectional Study

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Abstract

Background. Emotional eating, defined as consuming food in response to negative emotions such as sadness, stress, or depression, affects over half of the population and is more prevalent among women, posing risks to both physical and mental health.

Aim. This study aimed to characterise emotional eating behaviour in women and examine its associations with sadness, stress, depression, and physical activity across different age groups.

Methods. Cross-sectional quantitative study was conducted with 250 women ranging from adolescence to older adulthood. Emotional eating was assessed using the Dutch Eating Behaviour Questionnaire, physical activity was measured using the International Physical Activity Questionnaire, perceived stress was evaluated with the Perceived Stress Scale, and depression was assessed using the Beck Depression Inventory.

Results. The majority of participants were aged 17–25 years (83.2%), students (75.6%), and had a normal body mass index (41.6%). Overall, 66% of participants exhibited moderate emotional eating, 42.4% reported moderate physical activity, 74.4% experienced moderate stress, and 38.8% were classified as non-depressed. Significant differences across age groups were observed for stress and depression ($p < 0.05$), while no significant differences were found for emotional eating and physical activity ($p > 0.05$). Correlation analyses indicated that emotional eating was not significantly associated with physical activity, but it was significantly associated with stress and depression ($p < 0.05$).

Conclusions. Emotional eating and physical activity do not vary significantly across female age groups, whereas stress and depression do. Emotional eating behaviour is significantly related to stress and depression but not to physical activity. These findings highlight the importance of addressing emotional and psychological factors when considering eating behaviours in women.

Keywords: emotional eating; physical activity; stress; depression; women

1. INTRODUCTION

Emotional eating is defined as the consumption of food in response to emotional cues rather than physiological hunger. This behaviour has been associated with various negative emotional states, including stress, anxiety, depression, and low mood (Konttinen, 2020). Emotional eating often manifests as the consumption of high-calorie, high-fat, sugary, or salty foods, which can negatively impact both physical and mental health (Godet et al., 2022). It functions as a coping mechanism to regulate and mitigate negative emotions (Sambal et al., 2021) and is frequently linked to psychological factors such as stress (Dakanalis et al., 2017). Prior studies have identified stress as a precipitating factor for emotional eating among female college students (Bennett et al., 2013) and have demonstrated that elevated stress levels are associated with increased food intake (Torres & Nowson, 2007). This pattern can result in adverse outcomes, including weight gain and postprandial guilt.

Evidence regarding the relationship between emotional eating and physical activity is mixed. Some studies suggest that negative emotional eating is associated with lower physical activity levels in young adults (Calderón-Asenjo et al., 2022), while others report no significant association in specific populations, such as obese female students (Nuraini et al., 2024). Conversely, research has shown that regular physical activity can significantly reduce emotional eating, particularly when driven by depressive symptoms (Wang et al., 2023; Zhou et al., 2024). Depression itself is a strong predictor of emotional eating, with studies demonstrating a positive correlation between depressive symptoms and emotional eating behaviours (Braden et al., 2018). This association may reflect individuals' attempts to alleviate emotional distress or fill emotional voids through food consumption.

The beneficial effects of physical activity on physical and mental health, particularly regarding stress and depression, are well established (Pedersen & Saltin, 2015). Exercise has been shown to increase the production of endorphins, noradrenaline, and other neurotransmitters that enhance wellbeing, reduce stress, and improve mood (Kaur et al., 2020). Hormonal changes induced by exercise further contribute to mood enhancement and reduction of stress indicators (Pedersen & Saltin, 2015). Large-scale cross-sectional analyses have also shown that women experiencing depression are more likely to engage in emotional eating (Camilleri et al., 2014). Emotional eating affects over half of the population and is more prevalent among women, potentially due to hormonal factors, societal roles, and complex emotional stressors (Bemanian et al., 2021). Biologically, sex differences in sympathetic nervous system activity and hypothalamic-pituitary-adrenal axis responses influence stress regulation. Hormones such as oxytocin and oestrogen, which are higher in women, may increase susceptibility to stress and, consequently, emotional eating behaviours (Kajantie & Phillips, 2006).

Despite its prevalence, relatively few studies have examined the interrelationships between women's emotional eating behaviour, stress, depression, and physical activity. A better understanding of these relationships is essential for developing effective, targeted interventions for populations at risk. The present study aims to investigate the associations between emotional eating, stress, depression, and physical activity in women. By adopting a comprehensive approach that considers both psychological and physical factors, this research seeks to inform strategies to prevent and manage emotional eating effectively. Relatively few researches have examined the connection between women's emotional eating behaviour and stress, depression, and physical activity. A deeper understanding of these relationships is essential for designing effective, targeted interventions to address emotional eating in vulnerable groups of women. This study aims to ascertain the relationship between women's emotional eating, stress, depression, and physical activity. By taking a comprehensive strategy that considers both psychological and physical factors, this study should help avoid and manage emotional eating.

2. METHODS

Ethical approval for this study was obtained from the Ethics Commission of the State University of Surabaya (Approval No. 0020/UN38.III.1/DL.01.02/2024). Participants were selected based on the following inclusion criteria: female gender, age between 17 and 65 years, and willingness to participate. The sample size was calculated using the Lemeshow formula, resulting in a total of 250 participants.

Data collection was conducted via a structured questionnaire, which included demographic information (age, weight, height, body mass index, and occupation), followed by assessments of emotional eating, physical activity, stress, and depression. Participants first provided informed consent before completing the questionnaire, which was distributed via WhatsApp. Direct assistance was provided to elderly participants as needed to ensure accurate completion. Participants were instructed to answer all questions honestly according to their current state.

Emotional eating assessment

Emotional eating behaviour was measured using the Emotional Eating subscale of the Dutch Eating Behaviour Questionnaire (EE-DEBQ) developed by van Strien et al. (1986). This instrument evaluates food consumption in response to negative emotions, such as sadness, anger, boredom, or frustration. Responses are recorded on a 5-point Likert scale, with 1 = never, 2 = rarely, 3 = sometimes, 4 = often, and 5 = always. Higher scores indicate greater emotional eating behaviour. The overall score was obtained by summing all items, and categories were defined based on the mean and standard deviation: high emotional eating (score ≥47.15), moderate emotional eating (score 22.49–47.15), and low emotional eating (score <22.49). Cronbach's alpha for the scale was 0.94, indicating excellent internal consistency.

Physical activity assessment

Physical activity was assessed using the Indonesian version of the International Physical Activity Questionnaire-Short Form (IPAQ-SF) (Jarvig et al., 2012). This questionnaire captures the duration and intensity of physical activity over the previous seven days, including walking, moderate and vigorous activities. Physical activity data were converted to metabolic equivalent of task (MET) minutes per week, with 1 MET representing the basal oxygen consumption rate at rest (3.5 mL O_2/kg/min) (Pilipović-Spasojević et al., 2020). Vigorous activity was multiplied by 8 METs, moderate activity by 4 METs, and walking by 3.3 METs. Total MET-minutes per week were calculated for each participant and categorised as light (<600 MET-min/week), moderate (601–2,999 MET-min/week), or vigorous (>3,000 MET-min/week) physical activity (IPAQ, 2004).

Stress assessment

Perceived stress was measured using the Perceived Stress Scale (PSS-10) (Stewart, 2001), a 10-item questionnaire evaluating feelings and thoughts experienced over the preceding month. Each item is scored on a 5-point Likert scale ranging from 0 (never) to 4 (very often). Total scores range from 0 to 40, with higher scores indicating greater perceived stress. Stress levels were categorised as low (0–13), moderate (14–26), or high (27–40).

Depression assessment

Depression was assessed using the Beck Depression Inventory-II (BDI-II) (Beck et al., 1996), consisting of 21 items that evaluate the severity of depressive symptoms, including sadness, pessimism, guilt, suicidal ideation, fatigue, sleep and appetite changes, and diminished concentration. Each item is scored from 0 to 3, with total scores classified as follows: 0–9 = no depression, 10–16 = mild depression, 17–29 = moderate depression, and 30–63 = severe depression.

Data analysis

Data were analysed using IBM SPSS Statistics version 26.0. Descriptive statistics, including mean, standard deviation, and percentage, were calculated for all variables. The Kolmogorov–Smirnov

test was used to assess normality. Differences in variables across age groups were evaluated using one-way analysis of variance (ANOVA). Associations among emotional eating, physical activity, stress, and depression were analysed using Pearson correlation coefficients, followed by multiple linear regression analyses to examine the predictive relationships among these variables.

3. RESULTS

A total of 250 women participated in this study. The mean age was 23.57 ± 9.74 years, with a mean body weight of 55.07 ± 15.62 kg and mean height of 157.05 ± 5.71 cm. Participants were categorised by body mass index (BMI) as follows: 41.6% normal weight, 25.2% underweight, 14% overweight, 11.6% class 1 obesity, and 7.6% class 2 obesity (Table 1).

Table 1. **Descriptive characteristics of participants**

Characteristic	N (%)	Mean ± SD
Age (years)	250 (100)	23.57 ± 9.74
Weight (kg)	250 (100)	55.07 ± 15.62
Height (cm)	250 (100)	157.05 ± 5.71
BMI – Underweight (<18.5)	63 (25.2)	16.92 ± 1.01
BMI – Normal (18.5–22.9)	104 (41.6)	20.56 ± 1.28
BMI – Overweight (23–24.9)	35 (14.0)	23.91 ± 0.61
BMI – Obesity class 1 (25–29.9)	29 (11.6)	27.51 ± 1.36
BMI – Obesity class 2 (>30)	19 (7.6)	34.56 ± 3.21

Note: BMI – body mass index.

Regarding occupational status, 75.6% of participants were college students, 9.2% employees, 4.4% homemakers, 2.8% other students, and 8% classified as other occupations (Figure 1).

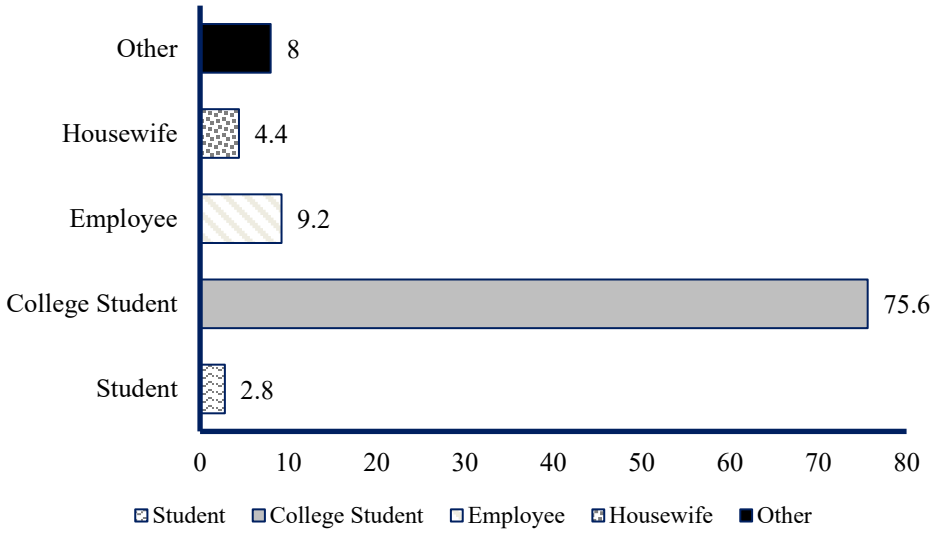

Figure 1. **Participant employment status**

Emotional eating behaviour was primarily moderate (66%), with low (17.6%) and high (16.4%) categories. Physical activity was reported as moderate in 42.4%, light in 36%, and vigorous in 21.6%.

Stress levels were predominantly moderate (74.4%), with low (9.6%) and high (16%) categories. Regarding depression, 38.8% of participants were non-depressed, 23.2% mildly depressed, 29.6% moderately depressed, and 8.4% severely depressed (Table 2).

Table 2. **Distribution of emotional eating, physical activity, stress, and depression categories**

Variable	Category	N (%)	Mean ± SD
Emotional Eating (EE-DEBQ)	Low	44 (17.6)	19.07 ± 2.04
	Moderate	165 (66.0)	33.85 ± 6.58
	High	41 (16.4)	55.61 ± 6.64
Physical Activity (IPAQ)	Light	90 (36.0)	301.86 ± 151.90
	Moderate	106 (42.4)	1,577.29 ± 719.80
	Vigorous	54 (21.6)	7,335.10 ± 6,040.92
Stress (PSS-10)	Low	24 (9.6)	10.58 ± 1.99
	Moderate	186 (74.4)	19.58 ± 3.57
	High	40 (16.0)	29.10 ± 1.82
Depression (BDI)	None	97 (38.8)	4.22 ± 3.02
	Mild	58 (23.2)	12.78 ± 1.91
	Moderate	74 (29.6)	22.55 ± 3.87
	Severe	21 (8.4)	35.71 ± 4.57

Note: EE-DEBQ – Emotional Eating subscale of the Dutch Eating Behaviour Questionnaire; IPAQ – International Physical Activity Questionnaire; PSS-10 – Perceived Stress Scale; BDI – Beck Depression Inventory.

The Kolmogorov–Smirnov test indicated normal distribution of all variables ($p > 0.05$). ANOVA results showed significant differences in stress and depression across age groups ($p < 0.05$), whereas emotional eating and physical activity did not differ significantly between age groups ($p > 0.05$) (Table 3).

Table 3. **Comparison of emotional eating, physical activity, stress, and depression across age groups**

Variable	Late teens (17–25 y, n = 208)	Early adults (26–35 y, n = 9)	Late adults (36–45 y, n = 17)	Early elderly (46–55 y, n = 12)	Late elderly (56–65 y, n = 4)	p between groups
Emotional Eating (EE-DEBQ)	34.76 ± 11.82	37.22 ± 15.03	36.65 ± 16.44	34.92 ± 14.02	24.25 ± 2.99	0.456
Physical Activity (IPAQ, MET-min/week)	2,203.52 ± 3,489.21	5,587.67 ± 10,369.29	3,176.88 ± 3,441.60	1,736.33 ± 2,719.79	1,747.75 ± 1,385.38	0.103
Stress (PSS-10)	21.09 ± 5.45	17.89 ± 3.72	16.71 ± 5.42	15.08 ± 5.09	12.00 ± 2.45	<0.00*
Depression (BDI)	16.03 ± 10.15	7.67 ± 8.70	6.12 ± 7.79	3.42 ± 5.66	5.00 ± 4.69	<0.00*

Notes: EE-DEBQ – Emotional Eating subscale of the Dutch Eating Behaviour Questionnaire; IPAQ – International Physical Activity Questionnaire; PSS-10 – Perceived Stress Scale; BDI – Beck Depression Inventory. * – significant difference between age groups ($p < 0.05$).

Pearson correlation analysis revealed that emotional eating was not significantly correlated with physical activity ($r = –0.204$; $p > 0.05$) but showed weak yet statistically significant positive correlations

with stress ($r = 0.164$; $p < 0.05$) and depression ($r = 0.150$; $p < 0.05$). The coefficient of determination indicated that stress contributed 2.7% to variance in emotional eating, while depression contributed 2.2%.

Figure 3 illustrates these correlations: no significant association between emotional eating and physical activity, weak but significant positive correlation with stress, and weak but significant positive correlation with depression.

Figure 3. **Correlation of emotional eating with physical activity, stress, and depression in women**

4. DISCUSSION

This study demonstrates that emotional eating is significantly associated with stress and depression, but not with physical activity. These findings align with previous research indicating no direct relationship between emotional eating tendencies and physical activity (Nuraini, 2024). Emotional eating is more strongly influenced by psychological factors, including stress, anxiety, depression, and habitual emotional responses related to food (Brytek-Matera, 2021).

Emotional eating is defined as the tendency to consume food excessively in response to perceived negative emotions. In this study, 66% of participants exhibited moderate emotional eating, suggesting that the majority were able to regulate their food intake in response to stress or depression. This is corroborated by the finding that 41.6% of participants had a normal body mass index.

No significant differences in emotional eating behaviours were observed across age groups. However, the late elderly group (56–65 years) had the lowest mean emotional eating score. This may reflect adherence to structured daily eating schedules among older adults, including regular meals, which may reduce susceptibility to emotional eating (Reicks et al., 2014).

Physical activity did not differ significantly between age groups ($p > 0.05$), consistent with prior research showing similar activity levels across young and older adults. Despite age-related declines in energy expenditure, physical activity may be maintained from young adulthood through older age (Roberts & Dallal, 2005). These findings may also reflect broader societal shifts towards sedentary lifestyles, with increased time spent on computers, mobile devices, and virtual interactions, reducing overall daily activity.

No significant correlation was observed between emotional eating and physical activity ($p > 0.05$). This supports prior evidence suggesting that emotional eating is not directly associated with physical activity but is more closely related to unhealthy lifestyle behaviours (Elran Barak et al., 2021). Although physical activity can mitigate overeating and improve mood, this study did not assess its potential moderating effects on stress or depression.

Significant differences in stress levels were found across age groups ($p < 0.05$). Chronic stress can influence lifestyle behaviours, including dietary choices, increased consumption of high-calorie foods, and emotional eating. Among college-aged women, stress is a primary trigger for emotional eat-

ing (Bennett et al., 2013). Stress may disrupt natural hunger and satiety cues, thereby promoting emotional eating (Tan & Chow, 2014).

Depression also showed significant differences between age groups and was significantly correlated with emotional eating ($p < 0.05$). Biological factors, such as hormonal fluctuations during puberty, menstruation, pregnancy, and perimenopause, likely contribute to elevated depression prevalence among women. Conditions including postpartum depression, postmenopausal depression, and premenstrual dysphoric disorder are associated with changes in ovarian hormones and may increase vulnerability to depressive symptoms. Progesterone and oestrogen exert neuromodulatory effects that influence female emotionality (Kundakovic & Rocks, 2022).

The observed association between emotional eating and depression is consistent with previous studies demonstrating that depressive symptoms are linked to disrupted eating patterns and maladaptive eating behaviours (Konttinen et al., 2019; Paans et al., 2018). Middle-aged to late-adolescent adults with anxiety or depression are particularly prone to emotional eating (van Strien et al., 2016).

This study has limitations. The sample predominantly consisted of young students, with 83.2% aged 17–25 years and 75.6% actively enrolled in college. Consequently, generalisability to older adults or non-student populations is limited. Additionally, the findings may reflect cultural or academic context-specific behavioural patterns, and caution should be exercised when extrapolating to other populations.

5. CONCLUSIONS AND PERSPECTIVES

Maintaining emotional stability in women is essential, as negative moods, including stress and depression, can significantly influence emotional eating behaviours. The effects of stress on eating patterns are complex and influenced by multiple factors, including biological mechanisms such as fluctuations in ovarian hormone levels and declines in oestrogen, which may contribute to the higher prevalence of stress and depression among women. Emotional eating was not associated with physical activity in this study. The observed similarity in activity levels across age groups suggests that modern lifestyle changes, particularly increased sedentary behaviour due to technological advancements, may contribute to low physical activity among younger populations.

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Moterų emocinio valgymo elgsenos sąsajos su fiziniu aktyvumu, stresu ir depresija: skerspjūvio tyrimas

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Santrauka

Tyrimo pagrindimas. Emocinis valgymas, apibrėžiamas kaip maisto vartojimas reaguojant į neigiamas emocijas, tokias kaip liūdesys, stresas ar depresija, paveikia daugiau nei pusę gyventojų ir dažniau pasireiškia moterims, kelia riziką tiek fizinei, tiek psichinei sveikatai.

Tikslas. Tyrimo tikslas – ištirti moterų emocinio valgymo elgseną ir jos sąsajas su liūdesiu, stresu, depresija bei fiziniu aktyvumu skirtingose amžiaus grupėse.

Metodai. Buvo atliktas moterų nuo paauglystės iki vyresnio amžiaus (n = 250) kiekybinis skerspjūvio tyrimas. Emocinis valgymas vertintas naudojant Nyderlandų valgymo elgsenos klausimyną (angl. *Dutch Eating Behaviour Questionnaire*), fizinis aktyvumas – naudojant Tarptautinį fizinio aktyvumo klausimyną (angl. *International Physical Activity Questionnaire*), suvokiamas stresas – pagal suvokiamo streso skalę (angl. *Perceived Stress Scale*), o depresija – pagal Beko depresijos skales (angl. *Beck Depression Inventory*).

Rezultatai. Dauguma dalyvių buvo 17–25 metų amžiaus (83,2 %), studentės (75,6 %) ir turėjo normalų kūno masės indeksą (41,6 %). Iš viso 66 % dalyvių pasižymėjo vidutinio lygio emociniu valgymu, 42,4 % nurodė vidutinį fizinį aktyvumą, 74,4 % teigė patiriančios vidutinį stresą, o 38,8 % buvo priskirtos prie depresijos nepatiriančiųjų. Reikšmingi skirtumai tarp amžiaus grupių buvo pastebėti streso ir depresijos srityse ($p < 0,05$), tačiau emocinio valgymo ir fizinio aktyvumo srityse reikšmingų skirtumų nenustatyta ($p > 0,05$). Koreliacijos analizė parodė, kad emocinis valgymas reikšmingai nesusijęs su fiziniu aktyvumu, tačiau reikšmingai susijęs su stresu ir depresija ($p < 0,05$).

Išvados. Emocinis valgymas ir fizinis aktyvumas skirtingo amžiaus moterų grupėse žymiai nesiskiria, o streso ir depresijos lygis skiriasi reikšmingai. Emocinio valgymo elgsena yra reikšmingai susijusi su stresu ir depresija, bet ne su fiziniu aktyvumu. Šie rezultatai pabrėžia emocinių ir psichologinių veiksnių svarbą, vertinant moterų valgymo elgseną.

Reikšminiai žodžiai: emocinis valgymas; fizinis aktyvumas; stresas; depresija; moterys

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