

Associations between self-reported stress, emotional eating, and overnutrition among adolescents at a private Islamic school in southern Thailand: a cross- sectional study

Nasreeya Krommuang¹

Mahidol University, Nakhonsawan Campus

Wararat Noowattana¹

`wararat.noo@mahidol.ac.th`

Mahidol University, Nakhonsawan Campus

Wanabhorn Tongchom²

Mahidol University

Research Article

Keywords: adolescents, emotional eating, mental health, overnutrition, school health, stress

Posted Date: October 12th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-11004156/v1>

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Additional Declarations: No competing interests reported.

Abstract

Background

Emotional eating may link psychological stress with adverse nutritional outcomes during adolescence, but evidence from Southeast Asian school settings remains limited. This study examined associations between self-reported stress, emotional eating, and overnutrition among adolescents in a private Islamic school in southern Thailand.

Methods

This cross-sectional study included 145 students in grades 10–12 selected from three classrooms. Self-reported stress was assessed using an adapted 20-item scale and emotional eating using an adapted 12-item emotional-eating subscale of the Thai Eating Style Scale. Weight and height were measured directly by the investigator, and nutritional status was classified using Thai national growth references. Associations were examined using correlation, a general linear model, and logistic regression adjusted for sex and grade level.

Results

Moderate stress was reported by 55.2% of participants, and 47.6% had study-defined moderate-to-high emotional eating. Self-reported stress correlated positively with emotional eating ($r = 0.287$, $p < 0.001$). Emotional-eating scores differed across stress groups after adjustment for sex and grade level ($p = 0.017$). Among students with normal weight or overnutrition ($n = 137$), each one-point increase in emotional-eating score was associated with higher odds of overnutrition after adjustment for sex and grade level (adjusted odds ratio = 1.135, 95% confidence interval 1.043–1.234; $p = 0.003$). None of four exploratory food-specific associations met the Bonferroni-adjusted significance threshold.

Conclusions

Self-reported stress and emotional eating were modestly associated in this school-based sample, and higher emotional-eating scores were associated with overnutrition. The cross-sectional, single-school design and small number of overnutrition cases limit causal and population-level inference. Multisite longitudinal studies using validated measures and comprehensive dietary assessment are needed.

Background

Adolescent mental health difficulties and overnutrition are increasingly recognized as co-occurring public health problems during adolescence, a period during which eating habits and stress-coping patterns are established and often persist into adulthood [1]. Emotional eating—eating in response to negative

emotional states such as irritation, sadness, loneliness, or anxiety rather than physiological hunger—has been proposed as one behavioral pathway that may link psychological stress to nutritional outcomes [2], and is particularly prevalent during adolescence, a developmental stage marked by hormonal changes, greater food autonomy, and heightened emotional reactivity [3]. Stress and related mental health difficulties are common during this period [4]. Academic and social pressures characteristic of high school may further intensify emotional eating tendencies; daily stress has been linked to poor dietary choices among children and adolescents more broadly [5].

Emotional eating has been associated with adverse health outcomes. Cross-sectional and longitudinal evidence links it to weight gain, poor body image, disordered eating patterns, and adverse nutritional outcomes in adolescents and young adults [6–9], and a recent systematic review confirms consistent associations between emotional eating and overweight/obesity, depression, and anxiety across clinical and community samples [10]; a broader review of the adult literature similarly links emotional eating to weight gain and difficulty with weight-loss maintenance [11]. Related psychosocial stressors, such as household food insecurity, have also been associated with elevated emotional eating and disordered eating among adolescents in other settings [12–15], including in Southeast Asia [16]. Perceived stress in particular has been repeatedly identified as a proximal correlate of emotional eating in cross-sectional studies among both adult and adolescent populations [17–19], with comparable findings reported among Malaysian adolescents in the period surrounding academic examinations [20]. From a public health perspective, the co-occurrence of psychological distress and adverse nutritional trajectories is of direct relevance to school health services, which are often positioned to support both mental health and nutrition surveillance among students. In Thailand, overweight and obesity among adolescents aged 15–18 years reached approximately 15% nationally in 2022, exceeding the national target of $\leq 10\%$ [21], consistent with a broader global rise in adolescent overweight and obesity [22], underscoring the need for coordinated school-based mental health and nutrition surveillance.

Evidence concerning the co-occurrence of perceived stress, emotional eating, and nutritional status remains particularly limited in Southeast Asian school settings. Pattani Province, in southern Thailand, includes private Islamic schools that combine religious and national academic curricula; school-based evidence on this co-occurrence is especially scarce in such settings. Data from this understudied setting may help broaden the geographic and school-context representation available to inform adolescent school health services. However, religious practices, religiosity, academic workload, and exposure to the broader sociopolitical context were not measured in this study and were therefore not examined as explanatory factors; accordingly, this study makes no claims about the role of religion, religious schooling, or regional sociopolitical conditions in the associations examined.

Based on this literature, we hypothesized that (H1) self-reported stress would be positively associated with emotional eating, and (H2) emotional eating would be positively associated with nutritional status (overnutrition), among high school students in this setting.

This study aimed to examine the association between self-reported stress and emotional eating and the association between emotional eating and overnutrition among adolescents at a private Islamic school in southern Thailand. A secondary exploratory aim was to describe food-consumption patterns and examine whether emotional-eating scores were associated with frequent consumption of four selected food categories.

Methods

Study design and participants

A cross-sectional study was conducted among high school students in grades 10–12 (Thai upper-secondary years 4–6) at a private Islamic school in Mueang District, Pattani Province, Thailand. Eligible participants were students enrolled in grades 10–12 who were able to read and write Thai. Students were excluded if they declined to participate, returned an incomplete questionnaire, or, if younger than 18 years, did not have written informed consent from a parent or legal guardian. Study size was determined by the cluster-sampling procedure rather than by an a priori power calculation: the study was constrained to the three intact classrooms (one per grade level) available for research access within a single participating school, so all eligible students in these classrooms were enrolled to maximise the achievable sample within this practical limit. One classroom from each grade level was selected by lottery, and all eligible students in the three selected classrooms were invited to participate. The selected classrooms comprised 145 students; all 145 participated and were included in the final analytical sample (response rate, 100%): Grade 10, $n = 52$; Grade 11, $n = 51$; and Grade 12, $n = 42$. Questionnaire data were collected from 19 to 26 February 2025, before Ramadan began on 28 February 2025.

Measures

The self-administered questionnaire was administered in Thai and comprised four parts: (A) sociodemographic characteristics and (B) food consumption behavior (14 items), both developed by the research team; (C) emotional eating (12 items), adapted from Sakulsriprasert [25]; and (D) stress (20 items), adopted from Tontuan [23]. Permission to use both instruments was obtained from their developers by email. Content validity of the complete questionnaire was reviewed by three experts using the index of item-objective congruence (mean IOC = 0.75). An English translation of the complete questionnaire is provided in Additional file 1.

Stress was assessed using the 20-item stress questionnaire of Tontuan [23], which was adapted from the Suan Prung Stress Test (SPST-20) developed by Suan Prung Hospital, Department of Mental Health, Ministry of Public Health, Thailand [24]. The questionnaire comprises 10 items on physical symptoms and 10 items on psychological symptoms associated with stress; respondents rate how stressed they felt about each event or symptom during the preceding 6 months on a 5-point scale (highest = 5, high = 4, moderate = 3, low = 2, lowest = 1; total possible score 20–100). The items, response format, reference

period and scoring were used without modification. In the source study, item-total correlations ranged from .285 to .785 and Cronbach's alpha was .920 in a try-out sample of 100 upper-secondary students in Bangkok [23]. Stress level was classified from the mean item score (range 1.00–5.00) using the criteria of the source study: low (1.00–2.00), moderate (2.01–3.00), high (3.01–4.00), and severe (4.01–5.00). For analyses requiring a three-level stress variable (the chi-square analysis in Table 6 and the adjusted univariate general linear model), the low and moderate categories were combined into a low-moderate group, with high and severe retained as separate categories. Because the questionnaire assesses self-reported stress symptoms, it does not measure stress appraisal in the sense of the Perceived Stress Scale.

Emotional eating was measured using the 12-item emotional-eating subscale of the Thai Eating Style Scale (T-ESS) developed by Sakulsriprasert [25]. The original eating-style questionnaire was constructed using the Dutch Eating Behaviour Questionnaire [26] as a guide and comprises 31 items in three subscales (emotional eating, 12 items; external eating, 8 items; restrained eating, 11 items), rated on a 5-point frequency scale (never to always) with reference to the preceding month. It was validated by confirmatory factor analysis among 1,375 female upper-secondary students from 46 schools in Chiang Mai Province, with subscale Cronbach's alpha values of 0.819–0.925 (0.886 for the whole questionnaire) and construct reliability of 0.820–0.923 [25]. In the present study, the content of the 12 emotional-eating items was unchanged, but the response format was adapted to a 4-point scale (never = 0; rarely, 1–2 days per week = 1; often, 3–4 days per week = 2; always, every day = 3; total score 0–36) and the reference period to the preceding 6 months. Emotional-eating score was analysed as a continuous variable in the principal adjusted model. For descriptive and secondary crude analyses only, scores were classified using study-defined equal-interval categories: none (0–9), low (10–18), moderate (19–27), and high (28–36); the latter categories were collapsed as none-low (0–18) and moderate-high (19–36) where specified. These categories should not be interpreted as clinically validated cut-points.

Food consumption behavior (14 items, a 4-point rating scale scored 1–4 per item so that the total possible score ranged from 14 to 56: for the 6 positively worded (protective-behavior) items, always = 4, often = 3, sometimes = 2, never = 1; for the 8 negatively worded (risk-behavior) items, scoring was reversed (always = 1, often = 2, sometimes = 3, never = 4) so that higher total scores consistently indicated healthier food consumption behavior overall) was assessed using a questionnaire developed by the research team from a literature review, which underwent content validity review by three experts followed by pilot testing among 30 students at a different Islamic school in Satun Province; initial internal consistency was 0.67, and after removing two items with the lowest item-total correlations, reliability improved to 0.72 for the final 14-item version used in the main study. Following the equal-interval method [27], food consumption behavior scores were classified as needing improvement (14–28), moderate (29–42), or good (43–56); for the bivariate analysis of food consumption behavior against nutritional status, the moderate and good categories were combined into a single moderate-to-good group, with needing improvement retained as a separate (low) category.

Body weight was measured twice using a TANITA HD-380 digital scale and recorded to the nearest 0.1 kg. Standing height was measured twice using an FBT floor-standing stadiometer and recorded to the nearest 0.1 cm. All measurements were performed by the same investigator, and the mean of the two measurements was used in the analysis. Nutritional status was classified using the sex-specific Thai national weight-for-height growth charts for children aged 6–19 years [28], based on weight-for-height standard deviation (SD) scores. Normal nutritional status was defined as a weight-for-height value between -1.5 SD and $+1.5$ SD. Overnutrition was defined as a value above $+1.5$ SD, encompassing the Thai growth-chart categories corresponding to overweight and obesity; undernutrition was defined as a value below -1.5 SD.

Statistical analysis

Data were analyzed using IBM SPSS Statistics version 30. All 145 participants had complete data on the core study variables (stress, emotional eating, food consumption behavior, and measured weight and height used to derive nutritional status); no imputation was therefore required. The $n = 8$ students classified as undernourished were excluded from analyses specifically comparing normal weight and overnutrition groups (yielding $n = 137$ for those analyses), as noted in the relevant tables, rather than treated as missing data. Descriptive statistics summarized participant characteristics and behavior levels. Bivariate associations were tested using chi-square tests, Fisher's exact test, and Pearson's correlation coefficient, with statistical significance set at $p < 0.05$. A crude (unadjusted) odds ratio for the association between emotional eating and nutritional status was first calculated from a 2×2 comparison restricted to students classified as normal weight or overnutrition ($n = 137$), using dichotomized emotional eating (none–low vs moderate–high). To assess whether the principal associations persisted after accounting for sex and grade level, four additional analyses were conducted: (1) a univariate general linear model testing emotional eating score across the three-level stress classification, adjusted for sex and grade level; stress, sex, and grade level were entered as categorical fixed factors in a main-effects-only model, with Bonferroni-adjusted pairwise comparisons of estimated marginal means; (2) exploratory binary logistic regression models testing emotional eating score as a predictor of often/always consumption for four specific food categories (fast food, crispy snacks, sweets/bakery items, and sugar-sweetened beverages), each adjusted for sex and grade; (3) a binary logistic regression model testing continuous emotional eating score as a predictor of overnutrition (vs normal weight), adjusted for sex and grade, restricted to the same $n = 137$ subsample used for the crude odds ratio; and (4) a sensitivity analysis re-estimating the Pearson correlation between stress and emotional eating after excluding the single stress-scale item referencing appetite change, to evaluate whether item-level content overlap between the two measures inflated the observed association. In all logistic regression models, sex and grade level were entered as categorical covariates, with male sex and Grade 10 as the reference categories, respectively; emotional eating score was entered as a continuous predictor. The four food-specific models were prespecified as exploratory; a Bonferroni-adjusted threshold of $p < 0.0125$ was used to account for multiple comparisons. Because the crude overnutrition analysis used dichotomized emotional eating whereas the adjusted model used the continuous score, the

corresponding odds ratios represent different parameterizations and were not compared directly in magnitude.

Ethics approval and consent procedures

The study was conducted in accordance with the Declaration of Helsinki and was approved by the Mahidol University Central Institutional Review Board (MU-CIRB; Certificate of Exemption, Protocol No. MU-CIRB 2024/484.2211; COE No. MU-CIRB 2025/003.0701) on 7 January 2025.

Participants aged 18 years or older, including all participants aged 18–19 years, provided written informed consent using the consent form approved for adults aged 18 years or older. For participants younger than 18 years, written informed consent was obtained from a parent or legal guardian and assent was obtained from the participant, in accordance with the MU-CIRB-approved consent documents.

Use of AI-assisted tools

Claude (Anthropic) and ChatGPT (OpenAI) were used to improve English-language clarity and to assist the authors in checking the consistency of reported results against IBM SPSS Statistics version 30 output. The researchers independently selected and performed all statistical procedures, reviewed and verified all AI-assisted content, and take full responsibility for the manuscript.

Results

Participant characteristics

A total of 145 students in grades 10–12 participated in the study. Most participants were female (67.6%), aged 17–18 years (66.9%), and enrolled in grades 10–11 (71.0%). The majority (86.9%) received 50–100 baht per day from their parents for school expenses. Full demographic characteristics, including nutritional status, are presented in Table 1.

Table 1
Demographic and nutritional
characteristics of participants (n = 145)

Characteristic	n	%
Sex		
Male	47	32.4
Female	98	67.6
Age (years)		
15	2	1.4
16	43	29.7
17	48	33.1
18	49	33.8
19	3	2.1
Grade level		
Grade 10	52	35.9
Grade 11	51	35.2
Grade 12	42	29.0
Daily allowance (baht)		
<50	12	8.3
50–100	126	86.9
>100	7	4.8
Nutritional status		
Undernutrition	8	5.5
Normal	116	80.0
Overnutrition	21	14.5

Stress and emotional eating levels

Using the 20-item stress scale, 55.2% of participants reported moderate stress levels (mean item score = 2.94, SD = 0.67, on the 1.00–5.00 scale). The most highly endorsed stressor was worry about academic work, rated as occurring “highest” or “high” by 71.0% of students (Table 2). On the Thai Eating Style Scale (T-ESS), 47.6% of participants had study-defined moderate-to-high emotional eating (scores 19–36).

Table 2
Frequency of stress-related symptoms among high school students, SPST-20 (n = 145)

Item	Highest n(%)	High n(%)	Moderate n(%)	Low n(%)	Lowest n(%)
1. Worry about academic work	47(32.4)	56(38.6)	37(25.5)	5(3.4)	0(0.0)
2. Not reaching set goals	29(20.0)	43(29.7)	56(38.6)	14(9.7)	3(2.1)
3. Family conflict over money/household matters	5(3.4)	7(4.8)	45(31.0)	53(36.6)	35(24.1)
4. Feeling bored with study	17(11.7)	31(21.4)	64(44.1)	28(19.3)	5(3.4)
5. Feeling the need to compete or compare oneself	21(14.5)	34(23.4)	40(27.6)	36(24.8)	14(9.7)
6. Difficulty sleeping	17(11.7)	21(14.5)	42(29.0)	38(26.2)	27(18.6)
7. Muscle tension/pain	14(9.7)	19(13.1)	45(31.0)	37(25.5)	30(20.7)
8. Tension headache	20(13.8)	30(20.7)	42(29.0)	40(27.6)	13(9.0)
9. Back pain	25(17.2)	40(27.6)	47(32.4)	20(13.8)	13(9.0)
10. Loss of appetite or wanting to eat more than usual	16(11.0)	29(20.0)	50(34.5)	33(22.8)	17(11.7)
11. One-sided (migraine-type) headache	12(8.3)	27(18.6)	27(18.6)	36(24.8)	43(29.7)
12. Feeling anxious	15(10.3)	22(15.2)	49(33.8)	41(28.3)	18(12.4)
13. Feeling frustrated	10(6.9)	20(13.8)	46(31.7)	47(32.4)	22(15.2)
14. Feeling angry or irritated	8(5.5)	30(20.7)	57(39.3)	35(24.1)	15(10.3)
15. Feeling sad	14(9.7)	19(13.1)	51(35.2)	39(26.9)	22(15.2)
16. Poor memory	10(6.9)	27(18.6)	49(33.8)	39(26.9)	20(13.8)
17. Feeling confused	14(9.7)	28(19.3)	47(32.4)	39(26.9)	17(11.7)
18. Difficulty concentrating	14(9.7)	24(16.6)	37(25.5)	40(27.6)	30(20.7)
19. Feeling easily fatigued	26(17.9)	43(29.7)	39(26.9)	28(19.3)	9(6.2)
20. Frequent colds	20(13.8)	16(11.0)	33(22.8)	45(31.0)	31(21.4)

Emotional eating behavior patterns

Item-level analysis of the T-ESS (Table 3) revealed that comfort-seeking behaviors were the most commonly endorsed forms of emotional eating. The item “eating something reduces worry” was endorsed as occurring often or always by 60.0% of students, and “comforting oneself with preferred food

when lonely” was endorsed by 60.7%. In contrast, socially triggered eating—“seeking food when working with someone disliked”—was the least frequently endorsed item (19.3% often/always; 47.6% never).

Table 3
Frequency of emotional eating behaviors among high school students, T-ESS (n = 145)

Item	Always n(%)	Often n(%)	Rarely n(%)	Never n(%)
1. Eat to feel better when irritated	36(24.8)	55(37.9)	46(31.7)	8(5.5)
2. Eat to feel calm when confused/troubled	19(13.1)	56(38.6)	54(37.2)	16(11.0)
3. Overeat when upset	15(10.3)	41(28.3)	61(42.1)	28(19.3)
4. Finding food helps when sad/discouraged	30(20.7)	57(39.3)	53(36.6)	5(3.4)
5. Comfort self with preferred food when lonely	29(20.0)	59(40.7)	47(32.4)	10(6.9)
6. Eat more when stressed	18(12.4)	49(33.8)	56(38.6)	22(15.2)
7. Eating reduces worry	25(17.2)	62(42.8)	44(30.3)	14(9.7)
8. Eat something when fearful/anxious	11(7.6)	46(31.7)	64(44.1)	24(16.6)
9. Eat to feel better in difficult situations	6(4.1)	42(29.0)	66(45.5)	31(21.4)
10. Seek food when working with disliked people	4(2.8)	24(16.6)	48(33.1)	69(47.6)
11. Eat when troubled/uneasy	15(10.3)	40(27.6)	68(46.9)	22(15.2)
12. Food helps when disappointed	23(15.9)	54(37.2)	53(36.6)	15(10.3)

Food consumption patterns

Beyond the T-ESS items, participants also reported specific patterns of snacking on the 14-item food consumption behavior questionnaire (Table 4). Often/always consumption of crispy snacks such as potato chips, wafers, and biscuit sticks was reported by 27.6% of students, of sweets/bakery items (e.g., roti, cake, brownies, ice cream) by 33.8% of students, and of sugar-sweetened beverages (e.g., soft drinks, sweetened tea, bubble tea, blended fruit drinks) by 31.7% of students. Fast food consumption was more common, with 51.7% of students reporting often/always intake, whereas protective behaviors such as eating ≥ 5 servings of vegetables daily were reported by only 29.7% of students at the often/always level.

Table 4
Frequency of food consumption behaviors among high school students (n = 145)

Item	Always n(%)	Often n(%)	Sometimes n(%)	Never n(%)
1. Eats breakfast daily (+)	59(40.7)	45(31.0)	38(26.2)	3(2.1)
2. Eats a late meal after dinner (–)	6(4.1)	81(55.9)	49(33.8)	9(6.2)
3. Eats ≥ 5 servings of vegetables/day (+)	4(2.8)	39(26.9)	78(53.8)	24(16.6)
4. Eats ≥ 4 servings of fruit/day (+)	3(2.1)	44(30.3)	87(60.0)	11(7.6)
5. Eats fish (+)	21(14.5)	78(53.8)	46(31.7)	0(0.0)
6. Drinks ≥ 6–8 glasses of water/day (+)	54(37.2)	61(42.1)	30(20.7)	0(0.0)
7. Eats iron-rich foods (liver, egg yolk, offal) (+)	33(22.8)	64(44.1)	44(30.3)	4(2.8)
8. Eats high-fat foods (fried meatballs, fried chicken, curry with coconut milk) (–)	0(0.0)	31(21.4)	75(51.7)	39(26.9)
9. Eats fast food (burgers, fries, nuggets) (–)	0(0.0)	75(51.7)	50(34.5)	20(13.8)
10. Eats crispy snacks (chips, wafers, biscuit sticks) (–)	2(1.4)	38(26.2)	64(44.1)	41(28.3)
11. Eats sweets/bakery items (roti, cake, brownies, ice cream, crepes) (–)	0(0.0)	49(33.8)	73(50.3)	23(15.9)
12. Drinks flavored milk (chocolate, sour milk) (–)	2(1.4)	36(24.8)	72(49.7)	35(24.1)
13. Drinks sugar-sweetened beverages (soft drinks, sweetened tea, bubble tea, blended fruit drinks) (–)	1(0.7)	45(31.0)	57(39.3)	42(29.0)
14. Adds seasoning (sugar, fish sauce, soy sauce, sauces) to cooked food (–)	9(6.2)	68(46.9)	46(31.7)	22(15.2)

(+) protective/healthy behavior; (–) risk/unhealthy behavior.

Association between stress, emotional eating, and nutritional status

Sex was associated with nutritional status (Pearson $\chi^2 = 8.706$, $p = .013$). Grade level was also associated with nutritional status using the Fisher–Freeman–Halton exact test (exact $p = .034$), whereas age and daily allowance showed no significant association with nutritional status (Table 5). Food consumption behavior level (low vs moderate-to-good) was likewise not significantly associated with nutritional status using the Fisher–Freeman–Halton exact test (exact $p = .660$).

Table 5
Association between personal characteristics and nutritional status (n = 145)

Variable	Overnutrition n(%)	Undernutrition n(%)	Normal n(%)	χ ²	p-value
Sex					
Male	12(57.1)	4(50.0)	31(26.7)	8.706	.013 a*
Female	9(42.9)	4(50.0)	85(73.3)		
Age					
15–16 years	6(28.6)	2(25.0)	37(31.9)	—	1.000 b
≥17 years	15(71.4)	6(75.0)	79(68.1)		
Grade level					
Grade 10	7(33.3)	2(25.0)	43(37.1)	—	.034 b*
Grade 11	12(57.1)	1(12.5)	38(32.8)		
Grade 12	2(9.5)	5(62.5)	35(30.2)		
Daily allowance					
<50 baht	3(14.3)	0(0.0)	9(7.8)	—	.478 b
50–100 baht	16(76.2)	8(100.0)	102(87.9)		
>100 baht	2(9.5)	0(0.0)	5(4.3)		

Percentages are calculated within nutritional-status columns. a Pearson chi-square test; b Fisher–Freeman–Halton exact test (— indicates that a conventional χ^2 statistic is not applicable for this exact test); * statistically significant at $p < 0.05$.

Stress showed a statistically significant, low-magnitude positive correlation with emotional eating ($r = .287$, $p < .001$). When stress and emotional eating were each categorized into ordinal levels, a separate chi-square test likewise showed a significant association ($\chi^2 = 6.359$, $p = .042$): the proportion of students exhibiting moderate-to-high emotional eating increased with stress level, from 42.0% among those with low–moderate stress, to 50.0% among those with high stress, to 81.8% among those with severe stress (Table 6).

Table 6
Association between stress level and emotional eating level (n = 145)

Stress Level	Row Total n	Low Emotional Eating n(%)	Moderate–High Emotional Eating n(%)	χ^2	p-value
Low–Moderate	88	51(58.0)	37(42.0)	6.359	.042*
High	46	23(50.0)	23(50.0)		
Severe	11	2(18.2)	9(81.8)		
Total	145	76	69		

Percentages calculated by row (i.e., within each stress-level category). * statistically significant at $p < 0.05$ (Chi-square test).

In a crude (unadjusted) analysis restricted to students classified as normal weight or overnutrition (n = 137; the n = 8 students with undernutrition were excluded from this specific comparison due to small cell size), emotional eating was significantly associated with nutritional status ($\chi^2 = 10.672$, $p = .001$; crude OR = 5.81, 95% CI = 1.840–18.349): 81.0% of students with overnutrition reported moderate-to-high emotional eating, compared with 42.2% of students with normal nutritional status (Table 7).

Table 7
Crude association between emotional eating level and nutritional status (n = 137)

Emotional Eating Level	Overnutrition n(%)	Normal n(%)	χ^2	p-value
Moderate–High	17(81.0)	49(42.2)	10.672	.001*
None–Low	4(19.0)	67(57.8)		
Total	21(100.0)	116(100.0)		

* statistically significant at $p < 0.05$ (Chi-square test); crude OR = 5.81, 95% CI = 1.840–18.349; n = 8 students with undernutrition excluded from this comparison.

Among the subgroup of students reporting high or severe stress (n = 57), the most frequently endorsed emotional eating behaviors (always/often combined) were eating to feel better when irritated (70.2%), finding food helps when sad or discouraged (68.4%), and comforting oneself with preferred food when lonely (63.2%) (Table 8), mirroring the overall item ranking observed in the full sample (Table 3) but at consistently higher endorsement rates.

Table 8
Top five emotional eating items among students with high-to-severe stress (n = 57)

Emotional Eating Item	Always n(%)	Often n(%)	Rarely n(%)	Never n(%)
1. Eat to feel better when irritated	16(28.1)	24(42.1)	16(28.1)	1(1.8)
2. Finding food helps when sad/discouraged	16(28.1)	23(40.4)	18(31.6)	0(0.0)
3. Comfort self with preferred food when lonely	14(24.6)	22(38.6)	19(33.3)	2(3.5)
4. Eat something when fearful/anxious	8(14.0)	20(35.1)	23(40.4)	6(10.5)
5. Eat to feel calm when confused/troubled	11(19.3)	23(40.4)	20(35.1)	3(5.3)

Adjusted analyses

To evaluate whether the associations reported above persisted after accounting for sex and grade level, four additional analyses were conducted: (1) an adjusted univariate general linear model testing emotional eating across the three-level stress classification, with stress, sex, and grade level entered as categorical fixed factors in a main-effects-only model; (2) adjusted binary logistic regression models testing emotional eating as a predictor of frequent (often/always) consumption of four specific food categories; (3) an adjusted binary logistic regression model testing emotional eating as a predictor of overnutrition; and (4) a sensitivity analysis re-estimating the stress–emotional eating correlation after excluding the stress-scale item referencing appetite change.

Stress and emotional eating, adjusted. In the adjusted univariate general linear model, stress group remained significantly associated with emotional eating score after adjustment for sex and grade level ($F(2,139) = 4.175$, $p = .017$, partial $\eta^2 = .057$). Neither sex ($F(1,139) = 1.054$, $p = .306$, partial $\eta^2 = .008$) nor grade level ($F(2,139) = 0.195$, $p = .823$, partial $\eta^2 = .003$) was significant (Table 9). The overall corrected model explained 7.1% of the variance but did not reach conventional statistical significance ($F(5,139) = 2.132$, $p = .065$, $R^2 = .071$, adjusted $R^2 = .038$). Levene's test supported homogeneity of variance ($F(15,129) = 1.277$, $p = .226$).

Table 9
Adjusted univariate general linear model of emotional eating by stress level (n = 145)

Source	df	F	p-value	Partial η^2
Sex	1	1.054	.306	.008
Grade level	2	.195	.823	.003
Stress level (3-group)	2	4.175	.017*	.057
Error	139			

* statistically significant at $p < 0.05$. $R^2 = .071$ (Adjusted $R^2 = .038$).

Adjusted mean emotional-eating scores were higher in the higher stress groups (Table 10). Bonferroni-adjusted pairwise comparisons indicated that the difference between the low–moderate and severe stress groups was statistically significant (mean difference = -5.880 , $p = .030$), whereas the low–moderate vs. high ($p = .234$) and high vs. severe ($p = .372$) comparisons were not significant after correction for multiple comparisons.

Table 10
Adjusted (estimated marginal) mean emotional eating scores by stress level

Stress Level	Adjusted Mean	SE	95% CI
Low–Moderate (n = 88)	16.00	.761	14.50–17.50
High (n = 46)	18.27	1.073	16.15–20.40
Severe (n = 11)	21.88	2.132	17.66–26.10

Estimated marginal means adjusted for sex and grade level.

Emotional eating and specific food consumption, adjusted. In exploratory binary logistic regression models adjusted for sex and grade level, the odds-ratio point estimates for emotional eating were below 1.0 across all four food categories tested (Table 11). The fast-food model yielded a nominal p-value of .028 (aOR = 0.944, 95% CI 0.897–0.993), whereas crispy snacks (aOR = 0.959, $p = .130$), sweets/bakery items (aOR = 0.954, $p = .079$), and sugar-sweetened beverages (aOR = 0.961, $p = .133$) were not statistically significant. With a Bonferroni-adjusted threshold of $p < .0125$ for the four models, none of the food-specific associations was statistically significant; these findings should therefore be interpreted as exploratory rather than as evidence of a confirmed inverse association.

Table 11
Adjusted associations between emotional eating and frequent consumption of selected foods

Food Outcome (often/always vs less)	Adjusted OR	p-value	95% CI
Fast food (n = 145)	.944	.028	0.897–0.993
Crispy snacks (n = 145)	.959	.130	0.908–1.013
Sweets/bakery (n = 145)	.954	.079	0.905–1.006
Sugar-sweetened beverages (n = 145)	.961	.133	0.913–1.011

Nominal $p = .028$ for fast food; none of the four associations met the Bonferroni-adjusted significance threshold of $p < .0125$. Each row represents a separate model; OR reflects the odds of often/always consumption per one-point increase in emotional eating score.

Emotional eating and overnutrition, adjusted. In a binary logistic regression restricted to students classified as normal weight or overnutrition (n = 137), emotional eating score (continuous) remained significantly associated with overnutrition after adjustment for sex and grade level (aOR = 1.135 per one-point increase in emotional eating score, 95% CI 1.043–1.234, p=.003; Table 12). Female students had lower odds of overnutrition than male students (aOR = 0.238, 95% CI 0.083–0.686, p=.008). Grade level was not significantly associated with overnutrition overall (Wald = 4.232, df = 2, p=.121); neither Grade 11 (aOR = 1.852, p=.282) nor Grade 12 (aOR = 0.351, p=.230) differed significantly from Grade 10. The model had a Nagelkerke R² of .270. Given the relatively small number of overnutrition cases (n = 21) relative to the number of model parameters, these estimates should be interpreted with caution. This model parameterized emotional eating continuously; therefore, its OR should not be compared directly in magnitude with the dichotomized crude OR reported in Table 7.

Table 12
Adjusted logistic regression: emotional eating predicting overnutrition (n = 137)

Predictor	Adjusted OR	p-value	95% CI
Emotional eating score (per 1-point increase)	1.135	.003*	1.043–1.234
Female sex (ref: Male)	.238	.008*	0.083–0.686
Grade level (overall)	—	.121	—
Grade 11 (ref: Grade 10)	1.852	.282	0.602–5.692
Grade 12 (ref: Grade 10)	.351	.230	0.063–1.945

** statistically significant at p < 0.05. Emotional eating was entered as a continuous score in this model. Male sex and Grade 10 were the reference categories.*

Sensitivity analysis. Because the stress scale includes one item referencing appetite change (“loss of appetite or wanting to eat more than usual”), which overlaps conceptually with the emotional eating outcome, the stress–emotional eating correlation was re-estimated after excluding this item. The correlation changed only marginally, from r = .287 (full 20-item scale) to r = .277 (19-item scale excluding the appetite item), and remained statistically significant (p < .001), suggesting that this item-level overlap did not materially change the observed correlation.

Discussion

This school-based study identified two principal associations: self-reported stress was positively associated with emotional eating, and higher emotional-eating scores were associated with overnutrition after adjustment for sex and grade level. These findings contribute preliminary evidence from an understudied adolescent population in southern Thailand, while the cross-sectional design and single-school sample require cautious interpretation.

Emotional-eating patterns. Eating to feel better when irritated, comforting oneself with preferred food when lonely, and eating to reduce worry were the most frequently endorsed emotional-eating behaviours. These item-level findings suggest that emotional eating in this sample was reported primarily in response to negative affect. Because emotional processes and mechanisms were not directly tested, these patterns should be interpreted descriptively rather than as evidence for a specific psychological mechanism.

Selected food-consumption outcomes: exploratory findings. Often/always consumption of crispy, energy-dense snacks (27.6%), sweets/bakery items (33.8%), and sugar-sweetened beverages (31.7%) was reported by a substantial minority of students. Prior literature has linked negative affect and emotional eating with intake of palatable, high-fat, and high-sugar foods [5, 29], and studies among adolescents elsewhere have reported higher consumption of energy-dense snacks and sugar-sweetened beverages among those with higher emotional eating [30, 31]. In the present exploratory adjusted models, odds-ratio point estimates were below 1.0 for all four food categories. The fast-food model reached nominal significance (aOR = 0.944, $p=.028$), whereas crispy snacks (aOR = 0.959, $p=.130$), sweets/bakery items (aOR = 0.954, $p=.079$), and sugar-sweetened beverages (aOR = 0.961, $p=.133$) were not significant; none of the four associations met the Bonferroni-adjusted threshold of $p<.0125$. Accordingly, these analyses do not provide statistically robust evidence of an inverse association. This direction was not hypothesized, and this study did not collect data (e.g., on measurement overlap between the emotional-eating scale and individual food items, social desirability, or portion size) that would allow any explanation for it to be tested; consequently, no interpretation of this pattern is offered here, and replication using more comprehensive dietary assessment is needed before it is examined further.

Cultural and contextual considerations. This study adds descriptive data from an understudied setting, a private Islamic school in southern Thailand. Nevertheless, the study did not measure religiosity, fasting practices, communal eating, academic workload, or exposure to the regional sociopolitical context. The findings therefore should not be attributed to Islamic schooling, religious practice, or regional conditions. Multisite studies that directly measure these contextual factors are needed before cultural explanations can be evaluated.

Stress, emotional eating, and nutritional status. Consistent with prior findings among adolescents [3, 32], stress showed a modest but statistically significant positive correlation with emotional eating ($r=.287$, $p<.001$). The stress–emotional eating association was also supported in the adjusted analysis: emotional eating differed significantly across stress groups after adjustment for sex and grade level (adjusted univariate general linear model, $p=.017$). For nutritional status, dichotomized emotional eating was associated with overnutrition in the crude 2×2 analysis (OR = 5.81, $p=.001$), while a separate adjusted logistic model using the continuous emotional eating score showed higher odds of overnutrition per one-point increase in score (aOR = 1.135, $p=.003$). Female students had lower adjusted odds of overnutrition than male students (aOR = 0.238, $p=.008$), whereas grade level was not significant overall ($p=.121$). Because the crude and adjusted models used different parameterizations of emotional

eating, their OR magnitudes should not be compared directly. The principal associations persisted after adjustment for sex and grade level, although residual confounding cannot be excluded and the modest number of overnutrition cases ($n = 21$) warrants caution regarding precision and model stability. Because this study remains cross-sectional, these results describe associations rather than a confirmed causal pathway; a model in which stress influences nutritional status indirectly through eating behavior is plausible and consistent with the broader coping literature [1, 9, 32], but mediation was not directly tested here.

Limitations. This study has several limitations. First, the cross-sectional design precludes causal inference regarding the direction of the stress–emotional eating–nutritional status pathway. Second, the single-site sample from one Islamic school in Pattani Province limits generalizability to adolescents in other cultural or religious school settings, including other regions of Thailand where comparable but distinct patterns have been reported [33]. Third, no valid a priori sample-size calculation accounting for the cluster design was applied. The cluster sampling design selected only one classroom per grade level (three classroom clusters in total), and the analyses did not account for within-class correlation; precision may be limited and standard errors may be underestimated. Fourth, self-reported dietary and emotional eating data are subject to recall and social desirability bias. Fifth, the stress scale includes one item referencing appetite change (“loss of appetite or wanting to eat more than usual”), which overlaps conceptually with the emotional eating outcome; although a sensitivity analysis excluding this item showed only a marginal change in the stress–emotional eating correlation ($r=.287$ to $r=.277$), some residual influence of this item-level overlap cannot be fully ruled out. Sixth, although adjusted models controlling for sex and grade level were fitted for the principal associations, the number of covariates that could be examined was limited by the available individual-level dataset (e.g., household income, religiosity, and dietary intake beyond the four food categories tested were not included as covariates), and the adjusted logistic regression for overnutrition was based on only 21 overnutrition cases relative to the number of model parameters, which may affect the precision and stability of the estimates. Seventh, the directionally inverse and largely non-significant point estimates observed between emotional eating and specific food categories were unexpected and are based on only four broad food-behavior items rather than a comprehensive dietary assessment; more detailed dietary intake measures would be needed to clarify this finding. Eighth, several measurement limitations apply. The emotional-eating items were developed and validated only among female students, whereas 32.4% of our sample was male, and measurement invariance by sex was not tested. The source instruments were validated in Chiang Mai (emotional eating) and Bangkok (stress) rather than in southern Thailand, and neither their reliability nor their validity was re-examined in this population. The response format (five to four points) and reference period (1 to 6 months) of the emotional-eating subscale were modified from the source, and its score categories are study-defined rather than clinically validated cut-points. The stress questionnaire measures self-reported stress symptoms rather than stress appraisal as assessed by the Perceived Stress Scale, and its 6-month reference period may introduce recall bias. The food-consumption questionnaire was developed for this study, showed only modest reliability in pilot testing (Cronbach's $\alpha = 0.72$, $n = 30$), and assessed the frequency rather than the quantity of intake. Finally,

this study did not directly assess religious practices (e.g., fasting, communal meal timing) as potential moderators, representing an important direction for future research.

Conclusions

In this school-based sample, self-reported stress was positively associated with emotional eating, and higher emotional-eating scores were associated with greater odds of overnutrition after adjustment for sex and grade level. The modest association between stress and emotional eating, the small number of overnutrition cases, and the cross-sectional single-school design limit causal and population-level inference. The food-specific analyses did not provide statistically robust evidence after adjustment for multiple comparisons. These findings support further multisite longitudinal research using validated measures and comprehensive dietary assessment to evaluate whether integrated mental-health and nutrition approaches may be useful in adolescent school-health programmes.

Abbreviations

aOR	adjusted odds ratio
CI	confidence interval
GLM	general linear model
OR	odds ratio
SD	standard deviation
SPSS	Statistical Package for the Social Sciences
SPST-20	Suan Prung Stress Test-20
T-ESS	Thai Eating Style Scale.

Declarations

Ethics approval and consent to participate

The study was approved by the Mahidol University Central Institutional Review Board (MU-CIRB; Certificate of Exemption, Protocol No. MU-CIRB 2024/484.2211; COE No. MU-CIRB 2025/003.0701) on 7 January 2025. Participants aged 18 years or older provided written informed consent. For participants

younger than 18 years, written informed consent was obtained from a parent or legal guardian and assent was obtained from the participant.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Supplementary Information

Additional file 1: English translation of the study questionnaire (DOCX). The questionnaire was administered in Thai; the English version is provided for reference only.

Funding

This research received no external funding.

Author Contribution

NK entered the data into IBM SPSS Statistics and conducted the investigation. WN conceptualised the study, developed the methodology, performed all statistical analyses, interpreted the results, and drafted and revised the manuscript. WT contributed to validation and supervision. All authors read and approved the final manuscript.

Acknowledgement

The authors thank the students who participated in this study and the school administration for their cooperation and support in facilitating data collection.

Data Availability

The datasets generated and analysed during the current study are not publicly available because they contain data from minor participants collected under confidentiality conditions approved by MU-CIRB, but de-identified data may be available from the corresponding author on reasonable request and subject to ethics approval and applicable data-sharing requirements.

References

1. Neumark-Sztainer D, Wall M, Story M, Standish AR. Dieting and unhealthy weight control behaviors during adolescence: associations with 10-year changes in body mass index. *J Adolesc Health*. 2012;50(1):80–6. 10.1016/j.jadohealth.2011.05.010.
2. Macht M. How emotions affect eating: a five-way model. *Appetite*. 2008;50(1):1–11. 10.1016/j.appet.2007.07.002.
3. Nguyen-Rodriguez ST, Unger JB, Spruijt-Metz D. Psychological determinants of emotional eating in adolescence. *Eat Disord*. 2009;17(3):211–24. 10.1080/10640260902848543.
4. World Health Organization. Adolescent mental health. 2021. <https://www.who.int/news-room/fact-sheets/detail/adolescent-mental-health>. Accessed 10 Sep 2026.
5. Michels N, Sioen I, Braet C, Eiben G, Hebestreit A, Huybrechts I, et al. Stress, emotional eating behaviour and dietary patterns in children. *Appetite*. 2012;59(3):762–9. 10.1016/j.appet.2012.08.010.
6. Kidwell KM, Milligan MA, Deyo A, Lasker J, Vrabec A. Emotional eating prevalence and correlates in adolescents in the United States. *Child Obes*. 2024;20(8):590–7. 10.1089/chi.2023.0184.
7. Lim MC, Parsons S, Goglio A, Fox E. Anxiety, stress, and binge eating tendencies in adolescence: a prospective approach. *J Eat Disord*. 2021;9:94. 10.1186/s40337-021-00444-2.
8. Shriver LH, Dollar JM, Lawless M, Calkins SD, Keane SP, Shanahan L, et al. Longitudinal associations between emotion regulation and adiposity in late adolescence: indirect effects through eating behaviors. *Nutrients*. 2019;11(3):517. 10.3390/nu11030517.
9. Shriver LH, Dollar JM, Calkins SD, Keane SP, Shanahan L, Wideman L. Emotional eating in adolescence: effects of emotion regulation, weight status and negative body image. *Nutrients*. 2021;13(1):79. 10.3390/nu13010079.
10. Dakanalis A, Mentzelou M, Papadopoulou SK, Papandreou D, Spanoudaki M, Vasios GK, et al. The association of emotional eating with overweight/obesity, depression, anxiety/stress, and dietary patterns: a review of the current clinical evidence. *Nutrients*. 2023;15(5):1173. 10.3390/nu15051173.
11. Frayn M, Knäuper B. Emotional eating and weight in adults: a review. *Curr Psychol*. 2018;37(4):924–33. 10.1007/s12144-017-9577-9.
12. Andrade L, Balantekin KN, Temple JL. Adolescent disordered eating: associations among food insecurity, stress, and emotional eating patterns. *Appetite*. 2025;215:108241. 10.1016/j.appet.2025.108241.
13. Bidopia T, Vivas Carbo A, Ross RA, Burke NL. Food insecurity and disordered eating behaviors in children and adolescents: a systematic review. *Eat Behav*. 2023;49:101731. 10.1016/j.eatbeh.2023.101731.
14. Hooper L, Mason SM, Telke S, Larson N, Neumark-Sztainer D. Experiencing household food insecurity during adolescence predicts disordered eating and elevated body mass index 8 years

- later. *J Adolesc Health*. 2022;70(5):788–95. 10.1016/j.jadohealth.2021.11.026.
15. Zickgraf H, Hazzard V, O'Connor S. Food insecurity is associated with eating disorders independent of depression and anxiety: findings from the 2020–2021 Healthy Minds Study. *Int J Eat Disord*. 2022;55(3):354–61. 10.1002/eat.23668.
 16. Andani DP, Adi AC. Household food insecurity is associated with binge eating disorder among adolescents in Semampir District, Surabaya, Indonesia. *Media Gizi Indones*. 2021;16(1):26–32. 10.20473/mgi.v16i1.26-32.
 17. Carpio-Arias TV, Solis Manzano AM, Sandoval V, Vinueza-Veloz AF, Rodriguez Betancourt A, Betancourt Ortiz SL, et al. Relationship between perceived stress and emotional eating: a cross-sectional study. *Clin Nutr ESPEN*. 2022;49:314–8. 10.1016/j.clnesp.2022.03.030.
 18. Chen DR, Sun G, Levin B. Gender-specific responses to multifaceted factors associated with disordered eating among adolescents of 7th to 9th grade. *J Eat Disord*. 2022;10:5. 10.1186/s40337-021-00524-3.
 19. Nguyen-Rodriguez ST, Chou CP, Unger JB, Spruijt-Metz D. BMI as a moderator of perceived stress and emotional eating in adolescents. *Eat Behav*. 2008;9(2):238–46. 10.1016/j.eatbeh.2007.09.001.
 20. Shah NM, Aghamohammadi N, Thangiah N, Ng AK, Majid HA. Association between stress and eating behaviour among Malaysian adolescents prior to examination. *Sci Rep*. 2023;13:7841. 10.1038/s41598-023-34699-3.
 21. Department of Health, Ministry of Public Health, Thailand. Report on food consumption behavior and nutritional status survey among school-age children. 2023. <https://nutrition2.anamai.moph.go.th>. Accessed 10 Sep 2026. (In Thai).
 22. World Health Organization, Obesity. and overweight. 2025. <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>. Accessed 10 Sep 2026.
 23. Tontuan S. A study of stress and coping strategies of high school students [master's thesis]. Bangkok: Srinakharinwirot University; 2010. <https://ir.swu.ac.th/xmlui/handle/123456789/1121>. Accessed 10 Sep 2026. (In Thai).
 24. Department of Mental Health, Ministry of Public Health, Thailand. Suan Prung Stress Test (SPST-20). Chiang Mai: Suan Prung Hospital. 1997. https://kkhos.moph.go.th/kkhos/data_office/SPST20.pdf. Accessed 10 Sep 2026. (In Thai).
 25. Sakulsriprasert S. Antecedents and consequences of eating styles among high school students: multilevel structural equation modeling [doctoral dissertation]. Bangkok: Srinakharinwirot University; 2017. <http://bsris.swu.ac.th/thesis/54199120048RB8992555f.pdf>. Accessed 10 Sep 2026. (In Thai).
 26. van Strien T, Frijters JER, Bergers GPA, Defares PB. The Dutch Eating Behavior Questionnaire (DEBQ) for assessment of restrained, emotional, and external eating behavior. *Int J Eat Disord*. 1986;5(2):295–315. 10.1002/1098-108X(198602)5:2%3C295::AID-EAT2260050209%3E3.0.CO;2-T.
 27. Best JW, Kahn JV. Research in education. 8th ed. Boston: Allyn & Bacon; 1997.
 28. Bureau of Nutrition, Department of Health, Ministry of Public Health, Thailand. Manual for using growth reference criteria for children aged 6–19 years. 2021. <https://nutrition2.anamai.moph.go.th>.

Accessed 10 Sep 2026. (In Thai).

29. Braet C, Claus L, Goossens L, Moens E, Van Vlierberghe L, Soetens B. Differences in eating style between overweight and normal-weight youngsters. *J Health Psychol.* 2008;13(6):733–43. 10.1177/1359105308093850.
30. Bui C, Lin LY, Wu CY, Chiu YW, Chiou HY. Association between emotional eating and frequency of unhealthy food consumption among Taiwanese adolescents. *Nutrients.* 2021;13(8):2739. 10.3390/nu13082739.
31. Jalo E, Konttinen H, Vepsäläinen H, Chaput JP, Hu G, Maher C, et al. Emotional eating, health behaviours, and obesity in children: a 12-country cross-sectional study. *Nutrients.* 2019;11(2):351. 10.3390/nu11020351.
32. Lazarus RS, Folkman S. *Stress, appraisal, and coping.* New York: Springer; 1984.
33. Srimuen D, Kaewboonruang B. Factors associated with nutritional status of high school students at Selaphum Pittayakhom School, Roi Et Province. *J Health Sci Community Public Health.* 2020;3(2):39–49. <https://he01.tci-thaijo.org/index.php/jhscph/article/view/243789>. Accessed 10 Sep 2026. (In Thai).

Supplementary Files

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