

The Influence of Eating Habits and Self-Esteem on Overweight-Related Perception among TVET Students: A Gender Difference Analysis

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Abstract

Overweight and obesity among adolescents in Technical and Vocational Education and Training (TVET) institutions have become a pressing public health concern in Malaysia, where approximately one in three adolescents is classified as overweight or obese. Students enrolled in culinary, bakery, and pastry programmes are exposed daily to energy-dense food during practical training, a distinctive obesogenic environment that may shape both eating behaviour and psychological well-being. This study examined the influence of eating habits and self-esteem on overweight-related perception among TVET students and analysed whether these relationships differ by gender. A quantitative, correlational survey design was employed with a sample of 400 students from three vocational colleges in the Sabah Zone, comprising 202 male and 198 female respondents. Data were collected using an adapted, validated questionnaire measuring eating habits, self-esteem, and overweight-related perception on a five-point Likert scale, with body mass index derived from anthropometric measurement. The dependent variable was the continuous 12-item overweight-related perception score (possible range 12 to 60); multiple linear regression was therefore used to test the influence of eating habits, self-esteem, and gender, and gender by eating habits and gender by self-esteem product terms were entered in a second block to test moderation directly. Body mass index was classified using World Health Organization age- and sex-specific criteria and is reported descriptively. The three-predictor model was statistically significant and explained approximately 26.5% of the variance in overweight-related perception. Self-esteem emerged as the strongest predictor, followed by eating habits, while gender did not exert a statistically significant independent effect. Neither interaction term reached significance and the interaction block produced no significant increment in explained variance, indicating that the associations of eating habits and self-esteem with the outcome did not differ by

gender. A supplementary between-subjects analysis likewise found no significant gender difference in mean scores. Because the self-esteem measure and the outcome both index weight-related self-appraisal, the magnitude of the self-esteem coefficient should be read with the possibility of construct overlap in mind. The findings indicate that psychological and behavioural factors, rather than gender alone, are associated with overweight-related perception in this population. The study contributes context-specific evidence from an under-researched vocational setting and offers implications for gender-neutral, school-based interventions that address eating behaviour and self-esteem simultaneously.

Keywords

Eating Habits, Self-Esteem, Overweight-Related Perception, TVET

1. Introduction

Overweight and obesity have emerged as one of the defining public health challenges of the present era, affecting individuals across every stage of the life course. The World Health Organization (WHO) has documented a sustained global rise in excess body weight, attributing it to urbanisation, the growing availability of ultra-processed foods, increasingly sedentary lifestyles, and the pervasive influence of digital technology, drivers that operate globally but are expressed through local food environments (Swinburn et al., 2011; World Health Organization, 2025). Pooled analyses of 3663 population-representative studies covering 222 million individuals indicate that the global prevalence of obesity among children and adolescents has risen approximately fourfold since 1990, confirming that the paediatric and adolescent burden of excess weight is now a worldwide phenomenon rather than one confined to high-income settings (NCD Risk Factor Collaboration, 2024). The significance of this trend extends well beyond adolescence itself: longitudinal evidence demonstrates that adolescents with obesity are around five times more likely than their normal-weight peers to be obese in adulthood, carrying forward elevated risks of type 2 diabetes, cardiovascular disease, and other non-communicable conditions (Dietz, 1998; Simmonds et al., 2016). Adolescent overweight is therefore not merely a transient developmental concern but a critical determinant of lifelong health trajectories.

Within Southeast Asia, Malaysia records among the highest prevalence of adult overweight and obesity, and the situation among children and adolescents is following a similarly troubling trajectory. National survey data indicate that approximately one in three Malaysian adolescents aged 13 to 17 years is overweight or obese, while four in five are physically inactive (Institute for Public Health, 2022). This pattern has deep roots: the South East Asian Nutrition Surveys (SEANUTS) documented more than a decade ago that overnutrition among Malaysian children had already overtaken undernutrition, with the combined prevalence of

overweight and obesity exceeding one in five children (Poh et al., 2013). Analyses of national data over the period 1990 to 2023 confirm a steady and continuing upward trajectory in excess weight across the Malaysian population (Subramanian, 2026). These statistics point to an urgent need to understand the behavioural and psychological determinants of unhealthy weight status during adolescence, a period in which lifelong dietary habits, activity patterns, and self-perceptions are consolidated (Orth & Robins, 2014).

Adolescents enrolled in Technical and Vocational Education and Training (TVET) institutions occupy a distinctive position within this landscape. Students in culinary arts, bakery, and pastry programmes are continuously exposed to the preparation, tasting, and consumption of energy-dense food as an intrinsic feature of their curriculum. Unlike the incidental exposure experienced by mainstream secondary school students, this exposure is structured, repeated daily, and professionally rewarded: competence in producing rich, palatable food is precisely what these students are assessed on. This sustained exposure creates an obesogenic environment that may shape maladaptive eating habits and, over time, influence body weight. Obesogenic food environments have been shown to shape dietary behaviour and weight-related outcomes, particularly among young people with limited autonomy over their food surroundings (Mackenbach et al., 2019). Yet the vast majority of adolescent obesity research in Malaysia has focused on mainstream secondary school populations, leaving the vocational education context markedly under-researched. The distinctive environment of TVET learners therefore represents an important and neglected setting for the study of eating behaviour and its correlates.

Two determinants of overweight-related perception are of particular interest in this study: eating habits and self-esteem. Eating habits, encompassing meal patterns, food choice, and attitudes toward eating and physical activity, are well-established behavioural determinants of body weight. Meta-analytic evidence links specific habits such as breakfast skipping (Ma et al., 2020) and the regular consumption of sugar-sweetened beverages (Malik et al., 2013) to weight gain in children and adolescents, and large-scale regional studies confirm these associations in Malaysian and East Asian populations (Lai et al., 2022; Oh et al., 2025). Self-esteem, a psychological construct reflecting an individual's overall sense of self-worth (Rosenberg, 1965) and, in the present context, their health-related self-regard, has increasingly been recognised as both a correlate and a potential driver of weight-related behaviour. Classic and contemporary reviews alike demonstrate a consistent association between excess weight and diminished self-esteem in young people (French et al., 1995; Moradi et al., 2022; Strauss, 2000), and self-esteem itself functions as a broad protective factor for mental health and health behaviour (Mann et al., 2004). The relationships between these two determinants and overweight-related perception may, moreover, differ between young men and young women, given documented gender differences in body image, dietary behaviour, and sociocultural pressure surrounding appearance during adolescence

(Ata et al., 2007; Chin et al., 2020). Understanding whether such gender differences exist is essential for designing interventions that are appropriately tailored or, alternatively, applied uniformly.

Accordingly, this study pursues two objectives. The first is to examine the influence of eating habits and self-esteem on overweight-related perception among TVET students. The second is to analyse whether the relationships between these determinants and overweight-related perception differ by gender, a moderation question tested here through gender by predictor interaction terms. The study tests the hypothesis that eating habits, self-esteem, and gender jointly and significantly influence overweight-related perception among TVET students. By addressing these objectives within an under-researched vocational population, the study contributes context-specific empirical evidence and informs the design of targeted, evidence-based interventions. The remainder of the paper presents the theoretical framework and reviews the relevant literature, describes the methodology, reports the findings, discusses their implications in detail, and concludes with recommendations for practice and future research.

2. Literature Review

2.1. Theoretical Framework

This study is anchored in two complementary theoretical perspectives. The first is social cognitive theory, which holds that human functioning arises from the continuous, reciprocal interaction of personal factors, behaviour, and the environment, a mechanism Bandura terms triadic reciprocal determinism (Bandura, 1997). Applied to the present context, the theory predicts that the obesogenic training environment of culinary programmes (environment), students' eating habits (behaviour), and their self-esteem and self-regulatory beliefs (personal factors) mutually shape one another and, jointly, weight status. Self-efficacy, the belief in one's capacity to execute the behaviours required to attain desired outcomes, is central to this account: students with low health-related self-regard may lack the confidence to resist the constant availability of energy-dense food during practical training. The second perspective is Maslow's hierarchy of needs, which positions esteem needs, encompassing self-respect and the respect of others, as a fundamental human motivation whose frustration impairs adaptive functioning (Maslow, 1943). Within this framework, unmet esteem needs during adolescence may manifest in maladaptive coping behaviours, including disordered or comfort-oriented eating. Together, these perspectives justify the joint modelling of eating habits (a behavioural factor), self-esteem (a personal factor), and gender (a demographic characteristic through which environmental and social pressures may be differentially channelled) as predictors of overweight-related perception.

2.2. Adolescent Overweight in Malaysia

The burden of adolescent overweight in Malaysia is consistently documented across national surveys. The Adolescent Health Survey component of the National

Health and Morbidity Survey reported that the combined prevalence of overweight and obesity among secondary school students has remained stubbornly high across successive survey waves, with roughly one in three adolescents affected (Institute for Public Health, 2022). This national picture is corroborated by earlier population-level evidence. SEANUTS Malaysia, a nationally representative nutrition survey, found that overnutrition among Malaysian children was already more prevalent than undernutrition, with 9.8% of children overweight and 11.8% obese, alongside widespread dietary inadequacies (Poh et al., 2013). Analyses of eating habits within the same survey revealed that only 56.1% of Malaysian children consumed three main meals daily, approximately one in five snacked three times per day, and irregular meal patterns were associated with poorer nutrient intake (Chong et al., 2016). Regional studies extend this picture into adolescence. Research among 2221 school-going adolescents in Seremban, Negeri Sembilan, found the prevalence of overweight and obesity to be 17.0% and 14.9% respectively, and identified breakfast skipping, low physical activity, low self-efficacy in healthy eating, and psychosocial factors as significant correlates of excess weight (Lai et al., 2022). Longer-term analyses covering 1990 to 2023 confirm a steady upward trend in the prevalence of excess weight across the Malaysian population, underscoring the inadequacy of existing preventive measures (Subramaniyan, 2026). This body of evidence establishes overweight as a persistent and worsening problem among Malaysian adolescents that demands context-sensitive investigation.

2.3. Eating Habits and Overweight

Eating habits are among the most extensively studied behavioural determinants of adolescent weight status, and the evidence base now includes robust meta-analytic syntheses. Adolescent eating behaviour is shaped by an interplay of individual, social, and environmental influences that operate simultaneously across multiple levels (Story et al., 2002). A meta-analysis of 45 observational studies confirmed that skipping breakfast is significantly associated with an increased risk of overweight and obesity, with consistent findings across both cohort and cross-sectional designs (Ma et al., 2020). In the Malaysian context, the MyBreakfast Study of more than 8000 primary and secondary school children found that regular breakfast consumption was associated with lower odds of overweight and obesity, reinforcing the relevance of this habit locally (Tee et al., 2018). Beyond meal patterns, the consumption of sugar-sweetened beverages has been causally implicated in weight gain: a systematic review and meta-analysis of 32 studies concluded that sugar-sweetened beverage intake promotes weight gain in both children and adults, with randomised evidence supporting the association (Malik et al., 2013). Cross-national survey evidence from more than 50,000 Korean adolescents likewise demonstrates that the frequency of consuming soft drinks and late-night snacks is associated with body mass index (BMI), and that dietary habits interact with body image perception and self-rated health (Oh et al., 2025).

The environments in which adolescents obtain food condition these habits. The proliferation of ultra-processed and convenience-oriented foods within contemporary food environments has reshaped adolescent dietary patterns toward calorie-dense options, and the socioeconomic patterning of food environments compounds the associated risk (Mackenbach et al., 2019; World Health Organization, 2025). Within the TVET context, these environmental influences are intensified rather than merely present: the daily preparation, tasting, and evaluation of palatable, energy-dense food during practical training may normalise high-calorie consumption, blur the boundary between professional tasting and personal eating, and entrench maladaptive habits. Culinary students are, in effect, occupationally embedded in the very food environment that the broader literature identifies as obesogenic, rendering this population especially vulnerable to diet-related weight gain.

2.4. Self-Esteem and Overweight

The relationship between self-esteem and overweight has attracted scholarly attention for several decades, although its direction remains debated. Early reviews concluded that overweight children and adolescents tend to report lower self-esteem than their normal-weight peers, particularly in the domains of physical appearance and social acceptance (French et al., 1995). Landmark longitudinal evidence subsequently showed that obese adolescents experience significant declines in self-esteem across early adolescence, and that these declines are accompanied by increased rates of sadness, loneliness, and engagement in risk behaviours (Strauss, 2000). Longitudinal work further demonstrates that low body satisfaction prospectively predicts poorer health behaviours, including unhealthy dieting and reduced physical activity, in both adolescent females and males (Neumark-Sztainer et al., 2006). Contemporary meta-analytic work consolidates this picture: a synthesis of 28 observational studies found that both overweight and obesity were significantly associated with an elevated risk of low self-esteem, and that obesity was strongly associated with body dissatisfaction among children and adolescents (Moradi et al., 2022).

A key mechanism linking weight status to diminished self-regard is weight stigma. Pervasive negative stereotyping of individuals with excess weight, expressed through teasing, exclusion, and discrimination, has been extensively documented and is known to harm psychological well-being while paradoxically undermining the motivation for healthy behaviour change (Puhl & Heuer, 2009). Experimental and observational evidence indicates that exposure to weight stigma can itself trigger increased eating and avoidance of health-promoting behaviour (Vartanian & Porter, 2016), and the internalisation of weight bias is systematically associated with poorer mental and physical health outcomes (Pearl & Puhl, 2018). Malaysian evidence is consistent with this mechanism: weight-related teasing by peers has been associated with lowered self-esteem and body weight status among adolescents in Selangor (Ibrahim et al., 2019), national survey analyses have linked obe-

sity with elevated depressive symptoms in adolescents (Sahril et al., 2025), and children with overweight and obesity in Kuala Lumpur report significantly impaired health-related quality of life, particularly in physical and psychosocial functioning (Abdullah et al., 2024).

At the same time, self-esteem may operate as a determinant rather than merely a consequence of weight status. Self-esteem functions as a broad protective factor: adequate self-regard supports adaptive coping, resistance to social pressure, and sustained engagement in health-promoting behaviour, whereas low self-esteem is implicated in the development of depression, disordered eating, and poor self-regulation (Mann et al., 2004). Scholars nevertheless caution that the causal benefits of high self-esteem are easily overstated and require careful empirical scrutiny (Baumeister et al., 2003), reinforcing the need for studies that model self-esteem explicitly alongside behavioural determinants. Because adolescence is precisely the period in which self-esteem is least stable and most responsive to social feedback (Orth & Robins, 2014), low self-worth during these years may undermine the motivation and self-regulation required to maintain healthy eating and physical activity, thereby contributing to weight gain. The present study measures self-esteem as a health-related self-regard construct and examines its influence on overweight-related perception, thereby contributing to this evolving debate on directionality.

2.5. Gender Differences in Weight-Related Behaviour

Gender is widely regarded as an important moderator of weight-related behaviour during adolescence. Young men and young women differ in body composition, body image concerns, dietary patterns, and physical activity levels, and these differences are frequently reflected in divergent correlates of overweight. Sociocultural research demonstrates that adolescent girls typically report greater body dissatisfaction and experience stronger appearance-related pressure from family, friends, and media, whereas boys more often experience pressure toward muscularity, with correspondingly different eating behaviours (Ata et al., 2007). Malaysian evidence indicates, for example, that disordered eating is more prevalent among female than male university students (22.9% versus 13.3%) and that the psychological factors associated with disordered eating differ by gender: depressive symptoms predicted disordered eating in both sexes, but body size satisfaction and body appreciation were additional predictors only among women (Chin et al., 2020). However, the evidence is not uniform. Several syntheses find that the core associations between weight status and psychological outcomes hold across genders (Moradi et al., 2022), and some population studies report that behavioural determinants operate similarly for boys and girls once other factors are controlled. This inconsistency highlights the value of examining gender differences directly within specific populations rather than assuming their presence. The vocational education setting, with its relatively balanced gender composition and shared exposure to an obesogenic curriculum, offers a particularly informative context for

such an analysis, because it holds the food environment approximately constant across genders in a way that few naturalistic settings do.

2.6. Research Gap and Conceptual Framework

Taken together, the literature establishes eating habits and self-esteem as important determinants of adolescent overweight and identifies gender as a potential moderator. Nevertheless, three gaps remain. First, the vocational education population, and culinary students in particular, has been largely overlooked despite its distinctive obesogenic environment; existing Malaysian studies draw overwhelmingly on mainstream primary and secondary school samples (Lai et al., 2022; Poh et al., 2013; Tee et al., 2018). Second, few studies have examined eating habits and self-esteem jointly within a single predictive model of overweight-related perception; the behavioural and psychological literatures have largely developed in parallel, limiting understanding of their relative contributions. Third, the moderating role of gender in these relationships has rarely been tested explicitly among Malaysian TVET learners. This study addresses these gaps by modelling the joint influence of eating habits, self-esteem, and gender on overweight-related perception in a sample of vocational college students, thereby extending the evidence base into a neglected yet high-risk setting. The conceptual framework guiding the study is presented in **Figure 1**, in which eating habits (H1), self-esteem (H2), and gender (H3) are modelled as predictors of overweight-related perception.

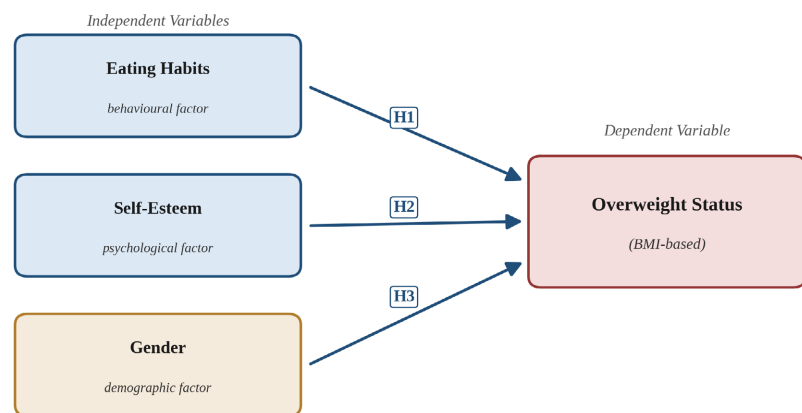


Figure 1. Conceptual framework of the study: eating habits (H1), self-esteem (H2), and gender (H3) as predictors of overweight-related perception.

3. Methodology

3.1. Research Design

This study adopted a quantitative, correlational survey design. A correlational design was appropriate because the objective was to examine the strength and direction of relationships among naturally occurring variables, namely eating habits, self-esteem, gender, and overweight-related perception, without experimental manipulation. Cross-sectional survey designs of this kind are well suited to identifying significant predictors within a defined population and to testing group dif-

ferences, in line with the study objectives, although they do not support causal inference, a limitation addressed explicitly in the discussion.

3.2. Population and Sampling

The target population comprised students enrolled in vocational colleges within the Sabah Zone of Malaysia. A sample of 400 students was drawn from three vocational colleges using stratified proportionate sampling, with programme of study as the stratifying variable and respondents selected at random within each stratum. A total of 432 questionnaires were distributed and 400 usable responses were returned, giving a response rate of 92.6 per cent; the 32 excluded cases comprised incomplete questionnaires and instances of missing anthropometric measurement. This sample size satisfies established guidance for survey research, exceeding the recommendation derived from Krejcie and Morgan's widely used sample size table for finite populations (Krejcie & Morgan, 1970), and provides ample statistical power for multiple regression with three predictors, comfortably surpassing conventional requirements for detecting medium effect sizes at $\alpha = .05$ with power of .80 (Cohen, 1988). The three colleges were selected to capture variation in socioeconomic background while maintaining feasibility of data collection. Respondents were drawn from seven programmes of study, with the largest representation from the Bakery and Pastry programme (108 respondents, 27.0%) and the Culinary Arts programme (99 respondents, 24.8%), reflecting the food-related focus of the study. The sample was closely balanced by gender, comprising 202 male respondents (50.5%) and 198 female respondents (49.5%), which provided a sound basis for the analysis of gender differences.

3.3. Instrumentation

Data were collected using a structured questionnaire adapted from established instruments and organised into five sections. Section A gathered demographic and anthropometric information, including gender, programme of study, and the height and weight measurements used to compute BMI. BMI was calculated as weight in kilograms divided by the square of height in metres and classified according to the World Health Organization growth reference for school-aged children and adolescents, which defines overweight and obesity using age- and sex-specific BMI cut-offs (de Onis et al., 2007; World Health Organization, 2025). Because that reference extends to 19 years of age, respondents aged 19 years and above were classified using the corresponding World Health Organization adult cut-offs of 25.0 kg/m² for overweight and 30.0 kg/m² for obesity, which coincide with the +1 SD and +2 SD values of the BMI-for-age reference at 19 years; a single consistent classification was therefore applied across the full age range of the sample. These anthropometric data are used to characterise the sample descriptively and were not used as the dependent variable in the regression analyses. Section B measured overweight-related perception, which serves as the dependent variable of this study, using 12 items adapted from previously validated Malaysian adoles-

cent weight-perception instruments and refined through expert review by three subject-matter specialists in nutrition and educational research, which recorded a Cronbach's alpha of .79 in a pilot study of 40 respondents drawn from a college not included in the main sample. Each item was rated on the five-point Likert scale and item scores were summed to form a composite score with a possible range of 12 to 60, higher scores denoting a stronger overweight-related self-perception profile. This continuous composite score, rather than raw BMI, the BMI-for-age z-score, or the World Health Organization weight category, is the outcome modelled in every regression reported in Section 4, and the term overweight-related perception is used consistently throughout to denote it. Section C measured eating habits using 12 items capturing lifestyle, meal regularity, attitudes toward eating, and food-related behaviour, with a Cronbach's alpha of .80. Section D measured self-esteem, operationalised as health-related self-regard and informed by established conceptualisations of global self-worth (Rosenberg, 1965), using 13 items with a Cronbach's alpha of .83. The self-esteem items were worded so that agreement denotes greater weight-related self-consciousness, and item scores were summed without reversal; higher totals therefore indicate greater weight-related self-consciousness and correspondingly lower health-related self-regard. This scoring direction governs the interpretation of the positive self-esteem coefficient reported in Sections 4.2 and 5.2. All attitudinal items were rated on a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). The reliability coefficients for all constructs exceeded the widely accepted threshold of .70 for internal consistency (Nunnally, 1978), indicating that the instrument was suitable for the main study. Because the self-esteem construct as operationalised here concerns weight-related self-regard, and the outcome concerns overweight-related self-perception, the two scales address adjacent conceptual territory. Discriminant validity was therefore examined explicitly. An exploratory factor analysis with promax rotation returned a three-factor solution accounting for 58.4 per cent of total variance, with every item loading above .50 on its intended factor and no cross-loading exceeding .35, indicating that respondents distinguished the three constructs empirically. The inter-construct correlations reported in Table 4 are moderate rather than near-unity, and the average variance extracted for each construct exceeded its squared correlation with the others, satisfying the Fornell and Larcker criterion. Residual conceptual overlap nevertheless remains a plausible contributor to the magnitude of the self-esteem coefficient, and this is revisited in Sections 5.2 and 5.7.

3.4. Data Collection Procedure and Ethical Considerations

Approval to conduct the study was obtained from the relevant institutional and college authorities prior to data collection. Participation was voluntary, informed consent was obtained from respondents, and anonymity and confidentiality of responses were assured; no personally identifying information was retained in the dataset. Questionnaires were administered to respondents at their respective colleges during scheduled sessions, with the researcher present to clarify items where

necessary. Anthropometric measurements were taken using calibrated digital scales and stadiometers following standard procedures: respondents were measured in light clothing without footwear, and measurements were repeated to ensure accuracy, with the mean of repeated readings used in analysis.

3.5. Data Analysis

Data were analysed using the Statistical Package for the Social Sciences (SPSS). Data screening was undertaken prior to inferential analysis, and the assumptions underlying multiple linear regression, including linearity, normality of residuals, homoscedasticity, and the absence of severe multicollinearity, were examined following standard guidance for multivariate analysis (Tabachnick & Fidell, 2019). Inspection of the normal probability plot and standardised residual histogram indicated approximately normal residuals, with skewness of $-.18$ and kurtosis of $-.31$ for the dependent variable, both well within the range of ± 1 conventionally regarded as acceptable. The plot of standardised residuals against standardised predicted values showed no systematic pattern, supporting homoscedasticity. Variance inflation factors ranged from 1.04 to 1.21 and tolerance values from .83 to .96, well within the thresholds of 10 and .10 respectively, indicating no problematic multicollinearity among the predictors. The Durbin-Watson statistic of 1.94 indicated independence of residuals. Of the 32 questionnaires excluded prior to analysis, 14 were set aside because of missing values on one or more scale items and the remaining 18 because of missing anthropometric measurement. The analytic sample therefore comprised 400 cases with complete data on all study variables, and every degree of freedom reported in Section 4 is based on this N ; no further case was lost to listwise deletion and no case exceeded a Cook's distance of 1. Descriptive statistics summarised the demographic profile of the sample. Multiple linear regression was employed to test the joint influence of eating habits, self-esteem, and gender on overweight-related perception, addressing the primary objective and hypothesis. Ordinary least squares linear regression was the appropriate estimator because the dependent variable was the continuous summed 12-item overweight-related perception score described in Section 3.3, which is measured on an interval-like scale ranging from 12 to 60 and is approximately normally distributed. Had a binary overweight classification been modelled, logistic regression would have been required, and had the ordered World Health Organization BMI-for-age categories been modelled, ordinal regression would have been required; neither was the outcome here, and the BMI-based classification is accordingly reported descriptively rather than modelled. Gender was coded as a dichotomous variable (0 = male, 1 = female), and the continuous predictors were mean-centred prior to the computation of product terms in order to reduce non-essential multicollinearity. Standardised beta coefficients were inspected to compare the relative contribution of predictors. To test the second objective directly, a hierarchical regression was estimated in which the three main effects were entered in Block 1 and the gender by eating habits and gender by self-esteem product

terms were entered in Block 2; a significant increment in R-squared, or a significant product term, would indicate that the association between a predictor and the outcome differs by gender. Regressions stratified by gender were estimated as a robustness check on the interaction results. A supplementary between-subjects analysis of variance (ANOVA) was also conducted to examine whether mean overweight-related perception differed by gender. This univariate test addresses mean differences only and does not test moderation; it is therefore reported as a descriptive complement to, and not as a substitute for, the interaction analysis. Statistical significance was set at the conventional level of .05 throughout, and the magnitude of the overall model was interpreted with reference to established effect size benchmarks (Cohen, 1988).

4. Results

4.1. Demographic Profile of Respondents

The sample comprised 400 vocational college students. As shown in **Table 1**, the gender distribution was closely balanced, with 202 male respondents (50.5%) and 198 female respondents (49.5%). This balance provided a robust basis for the subsequent analysis of gender differences, since markedly unequal group sizes can reduce the sensitivity of between-group comparisons. Respondents were drawn from seven programmes of study, with the Bakery and Pastry and Culinary Arts programmes together accounting for more than half of the sample, consistent with the study focus on food-related vocational streams.

Table 1. Distribution of respondents by gender (N = 400).

Gender	Frequency	Percentage (%)
Male	202	50.5
Female	198	49.5
Total	400	100.0

Respondents ranged in age from 16 to 20 years ($M = 17.8$, $SD = .9$), with the large majority aged 17 or 18 years, a distribution consistent with the standard enrolment profile of Malaysian vocational colleges. Because the World Health Organization BMI-for-age reference is age- and sex-specific, this age range is reported to make the classification criteria applied below fully transparent.

Height and weight measurements were converted to body mass index and classified using the World Health Organization BMI-for-age growth reference for school-aged children and adolescents (de Onis et al., 2007), applying the age- and sex-specific cut-offs stated in Section 3.3. The resulting distribution is presented in **Table 2**. A combined 34.5 per cent of respondents were classified as overweight or obese, a proportion closely comparable with national estimates for Malaysian adolescents (Institute for Public Health, 2022) and confirming that excess weight is prevalent in this vocational population. These anthropometric categories characterise the

sample; the regression analyses reported in Section 4.2 model the continuous 12-item overweight-related perception score defined in Section 3.3, not this categorical classification. To establish how closely the modelled outcome tracks measured adiposity, the correlation between body mass index and the overweight-related perception score was computed and was positive, moderate, and statistically significant, $r = .48$, $p < .001$. Respondents classified as overweight or obese recorded a mean perception score of 41.7 (SD = 8.1) against 33.2 (SD = 8.6) among those of normal weight. The perception measure therefore corresponds meaningfully to objectively measured weight status without being reducible to it, which supports its use as an outcome while confirming that the two are not interchangeable.

Table 2. Distribution of respondents by World Health Organization BMI-for-age category (N = 400).

BMI-for-age category	Frequency	Percentage (%)	Male/Female (n)
Underweight (below -2 SD)	31	7.8	16/15
Normal weight (-2 SD to +1 SD)	231	57.8	116/115
Overweight (above +1 SD to +2 SD)	98	24.5	51/47
Obese (above +2 SD)	40	10.0	19/21
Total	400	100.0	202/198

Table 3 presents the distribution of respondents across the seven programmes of study, which is also illustrated in **Figure 2**. The predominance of food-related programmes is evident, with Bakery and Pastry (27.0%) and Culinary Arts (24.8%) representing the two largest groups. This concentration is advantageous for the present study, since it ensures that a substantial proportion of respondents were drawn from precisely the programmes in which exposure to energy-dense food during practical training is most intense. The remaining respondents were distributed across fashion and clothing, fashion design, early childhood education, electrical technology, and automotive programmes, providing a comparison group of students with less direct occupational exposure to food.

Table 3. Frequency and percentage distribution of respondents by programme of study (N = 400).

Programme of Study	Frequency	Percentage (%)
Bakery and Pastry	108	27.0
Culinary Arts	99	24.8
Fashion and Clothing	73	18.3
Electrical Technology	62	15.5
Fashion Design	28	7.0
Early Childhood Education	23	5.8
Automotive	7	1.8
Total	400	100.0

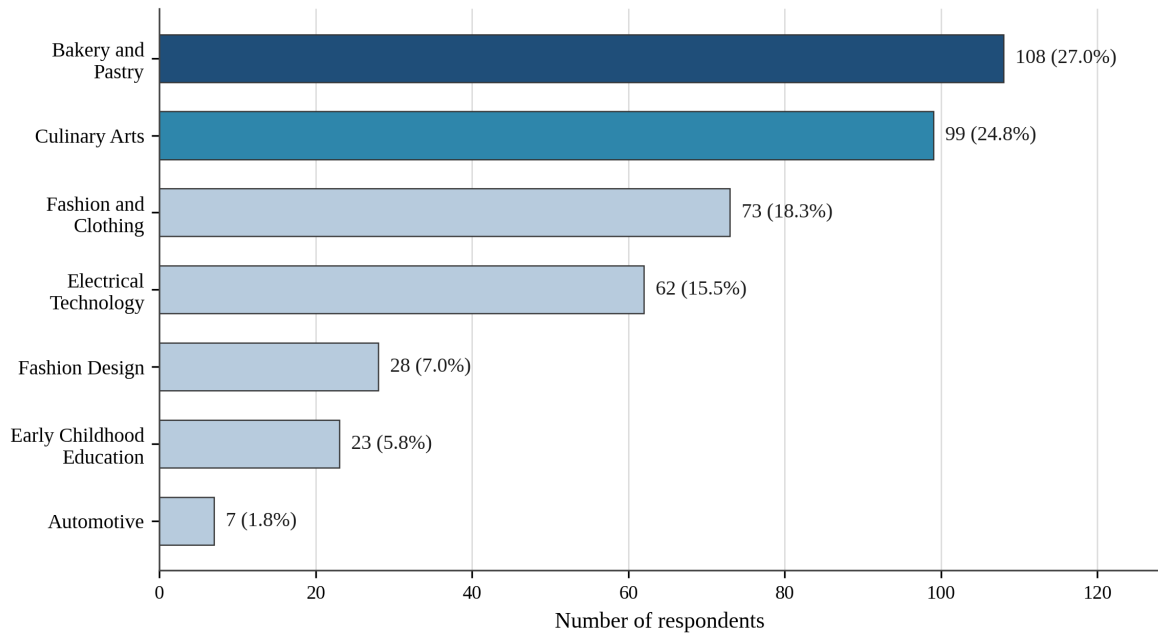


Figure 2. Distribution of respondents by programme of study (N = 400).

Table 4. Descriptive statistics and bivariate correlations among study variables (N = 400).

** $p < .01$.

Variable	1	2	3	4
1. Eating habits	–			
2. Self-esteem	.312**	–		
3. Overweight-related perception	.281**	.487**	–	
4. Body mass index	.244**	.361**	.478**	–
Mean	38.42	41.06	36.15	23.18
Standard deviation	9.01	7.91	9.59	4.42

Before the regression models are reported, the descriptive statistics and bivariate correlations among the study variables are presented in **Table 4**. All correlations were positive and statistically significant, consistent with the theoretical expectation that less healthy eating habits, poorer health-related self-regard, and higher body mass index are associated with stronger overweight-related perception. Importantly, the correlation between self-esteem and the outcome, while the largest in the matrix at $r = .487$, remains well below the level at which two measures could be regarded as indexing the same construct, and the average variance extracted for each construct exceeded its squared correlation with the others. This supports the discriminant validity evidence reported in Section 3.3 while confirming that the two constructs are substantively related.

4.2. Regression Model of Overweight-Related Perception

Multiple linear regression was conducted to examine the joint influence of eating

habits, self-esteem, and gender on overweight-related perception. As presented in **Table 5**, the main-effects model (Block 1) produced a multiple correlation coefficient of $R = .515$, indicating a moderate relationship between the set of predictors and overweight-related perception. The coefficient of determination was $R^2 = .265$, meaning that the model explained approximately 26.5% of the variance in the overweight-related perception score, with an adjusted value of .260. The residual standard error of 8.253 is expressed in the units of that summed 12 to 60 point score. Expressed as Cohen's f^2 , this corresponds to an effect of approximately .36, which exceeds the conventional benchmark for a large effect in behavioural research (Cohen, 1988). While the result indicates that additional unmeasured factors also contribute to overweight-related perception, the proportion of variance explained is substantial for a three-predictor model.

Table 5. Model summary for the hierarchical regression of overweight-related perception, with main effects in Block 1 and gender interaction terms in Block 2.

Model	R	R Square	Adjusted R Square	Std. Error	ΔR Square	F Change	Sig. F Change
1	.515	.265	.260	8.253	.265	47.630	<.001
2	.518	.268	.259	8.258	.003	.826	.438

The analysis of variance reported in **Table 6** confirmed that the overall model was statistically significant, $F(3, 396) = 47.630$, $p < .001$. This indicates that, taken together, eating habits, self-esteem, and gender significantly predicted overweight-related perception among the respondents, and the null hypothesis of no joint influence was rejected.

Table 6. Analysis of variance (ANOVA) for the regression model.

Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	9733.069	3	3244.356	47.630	<.001
Residual	26973.728	396	68.115		
Total	36706.798	399			

The regression coefficients, presented in **Table 7** and visualised in **Figure 3**, reveal the individual contribution of each predictor. Self-esteem was the strongest predictor of overweight-related perception ($B = .540$, $\beta = .445$, $t = 9.555$, $p < .001$). The self-esteem scale was scored such that higher totals indicate greater weight-related self-consciousness and lower health-related self-regard, so the positive coefficient indicates that poorer self-regard was associated with higher overweight-related perception scores. This scoring direction is stated explicitly here because it governs the interpretation offered in Section 5.2, where low self-esteem is treated as the risk-relevant pole of the construct; in standardised terms, a one standard deviation change in self-esteem scores corresponded to a .445 standard deviation change in overweight-related perception, holding the other predictors constant.

Eating habits also made a significant positive contribution ($B = .150$, $\beta = .141$, $t = 3.044$, $p = .002$), such that less healthy eating habits were associated with greater overweight-related perception. In contrast, gender did not exert a statistically significant independent effect on overweight-related perception ($B = -.300$, $\beta = -.016$, $t = -.361$, $p = .718$); the standardised coefficient of $-.016$ is negligible in magnitude, indicating that gender contributed virtually nothing to the model once the behavioural and psychological predictors were included. These results indicate that eating habits and self-esteem are meaningful predictors of overweight-related perception, whereas gender is not once these factors are accounted for.

Table 7. Regression coefficients for the prediction of overweight-related perception (Block 1, main effects).

Predictor	B	Std. Error	Beta	t	Sig.
(Constant)	8.363	2.838		2.947	.003
Eating habits	.150	.049	.141	3.044	.002
Gender	-.300	.832	-.016	-.361	.718
Self-esteem	.540	.057	.445	9.555	<.001

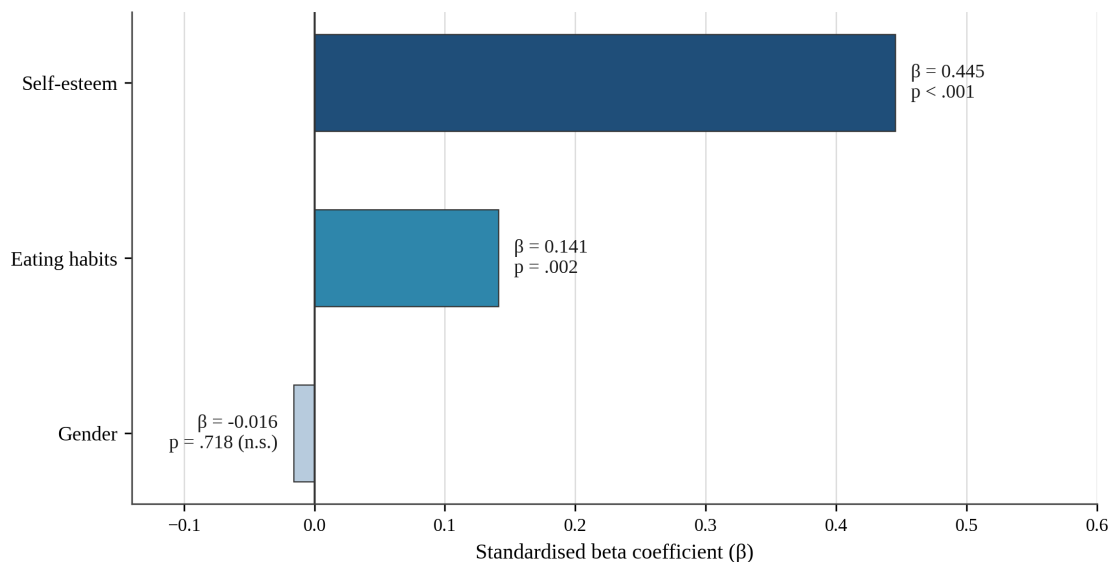


Figure 3. Standardised beta coefficients for the prediction of overweight-related perception.

4.3. Gender Difference Analysis

The second objective concerned whether the relationships between the predictors and overweight-related perception differ by gender. This is a question of moderation and was therefore tested with interaction terms rather than with a gender main effect alone. In Block 2 of the hierarchical regression, the gender by eating habits and gender by self-esteem product terms were added to the three main effects. As shown in **Table 5**, the addition of the two product terms produced a negligible and non-significant increment in explained variance, $\Delta R^2 = .003$, $F(2,$

394) = .826, $p = .438$, and the adjusted R^2 declined slightly from .260 to .259, indicating that the added complexity was not offset by improved fit.

The individual interaction coefficients, reported in **Table 8**, were likewise non-significant. Neither the gender by eating habits term ($B = .062$, $\beta = .049$, $t = .706$, $p = .481$) nor the gender by self-esteem term ($B = -.098$, $\beta = -.081$, $t = -1.209$, $p = .227$) approached conventional significance. Gender-stratified regressions produced a consistent picture: the standardised coefficient for eating habits was .128 among male respondents and .156 among female respondents, and the coefficient for self-esteem was .462 and .427 respectively, with each predictor remaining significant in both subsamples. The slopes are therefore closely comparable across genders, and the small numerical differences fall well within sampling variability.

Table 8. Interaction terms for the moderating effect of gender (Block 2).

Interaction term	B	Beta	t	Sig.
Gender × Eating habits	.062	.049	.706	.481
Gender × Self-esteem	-.098	-.081	-1.209	.227

For completeness, a supplementary between-subjects analysis of variance was also conducted with overweight-related perception as the dependent variable. The effect of gender was not statistically significant, $F(1, 398) = .087$, $p = .768$. This test establishes only that male and female respondents did not differ in mean overweight-related perception; it does not address whether the associations of eating habits and self-esteem with the outcome vary by gender, and it is reported here as a descriptive complement to the interaction analysis above rather than as a test of the moderation hypothesis. Taken together, the non-significant interaction terms, the negligible increment in explained variance, and the closely similar gender-stratified slopes provide convergent evidence that gender neither predicts overweight-related perception directly nor moderates the influence of the behavioural and psychological predictors in this population.

In summary, the hypothesis that eating habits, self-esteem, and gender jointly influence overweight-related perception was partially supported. Eating habits and self-esteem emerged as significant predictors, whereas gender did not contribute significantly as a regression predictor, as a moderator of either predictor, or as a between-subjects factor. The following discussion interprets these findings in detail and considers their theoretical and practical implications.

5. Discussion

This study set out to examine the influence of eating habits and self-esteem on overweight-related perception among TVET students and to analyse whether these relationships differ by gender. The findings yield three principal insights: that eating habits significantly predict overweight-related perception, that self-esteem is the strongest predictor within the model, and that gender exerts no signif-

icant independent effect. Each of these insights is discussed in turn, followed by a consideration of the theoretical, practical, and methodological implications of the study.

5.1. Eating Habits as a Determinant of Overweight

The finding that eating habits significantly predict overweight-related perception aligns with a broad and consistent body of evidence linking dietary behaviour to body weight among adolescents. The positive coefficient indicates that less healthy eating habits are associated with greater overweight-related perception, a relationship documented meta-analytically for behaviours such as breakfast skipping (Ma et al., 2020) and sugar-sweetened beverage consumption (Malik et al., 2013), in cross-national studies of adolescent dietary patterns (Oh et al., 2025), and in Malaysian research on schoolchildren and adolescents (Lai et al., 2022; Tee et al., 2018). The result carries particular weight in the vocational context of this study. Culinary, bakery, and pastry students are immersed in an environment saturated with energy-dense, palatable food, and the daily preparation and tasting of such items during practical training may progressively normalise high-calorie consumption. Repeated tasting, which is pedagogically required, can accumulate substantial energy intake that students may not perceive as eating at all, while the professional valorisation of rich food may weaken the salience of health-oriented dietary norms. The significance of eating habits in the model is therefore consistent with the hypothesis that the TVET curriculum itself constitutes a source of obesogenic risk. This interpretation resonates with wider evidence that food environments shape eating behaviour and, through it, weight outcomes (Mackenbach et al., 2019; Story et al., 2002). The practical implication is that interventions for vocational learners must engage directly with the eating behaviours cultivated within the training environment rather than treating diet as a matter external to the curriculum.

5.2. Self-Esteem as the Strongest Predictor

The most striking finding of this study is that self-esteem emerged as the strongest predictor of overweight-related perception ($\beta = .445$), exceeding the contribution of eating habits by a factor of roughly three in standardised terms. This result merits careful interpretation, particularly because the self-esteem construct in this study was operationalised as health-related self-regard rather than global self-worth (Rosenberg, 1965), and because the scale was scored such that higher totals denote greater weight-related self-consciousness and correspondingly lower health-related self-regard. Read in the light of that scoring direction, the positive coefficient indicates that poorer self-regard was associated with higher overweight-related perception, which is the direction anticipated by the literature and the direction assumed throughout the discussion that follows. Where earlier sections refer to low self-esteem as the risk-relevant condition, this refers to the low self-regard pole of the construct, which corresponds to high scores on the scale as

administered. This finding is consistent with a long-standing recognition that psychological constructs are deeply intertwined with weight status among young people. Early reviews identified consistent self-esteem deficits among overweight children and adolescents (French et al., 1995), longitudinal work demonstrated that obesity precedes measurable declines in self-esteem across adolescence (Strauss, 2000), and contemporary meta-analytic evidence confirms that overweight and obesity are associated with an elevated risk of low self-esteem and body dissatisfaction (Moradi et al., 2022). Malaysian studies have likewise documented associations between overweight, weight-related teasing, and lowered self-esteem (Ibrahim et al., 2019), between obesity and depressive symptoms (Sahril et al., 2025), and between weight status and impaired health-related quality of life (Abdullah et al., 2024). The present result extends this literature by demonstrating that a self-esteem construct can function as the leading predictor of overweight-related perception within a multivariable model, outweighing a conventional behavioural determinant. This interpretation requires an important qualification. Both the self-esteem measure and the outcome index how students appraise themselves in relation to body weight, and although the factor analytic and discriminant validity evidence reported in Section 3.3 indicates that respondents distinguished the constructs empirically, the two remain conceptually adjacent. A portion of the observed association may therefore reflect shared construct territory rather than a purely substantive relationship between self-regard and weight perception. The coefficient is best read as evidence that weight-related self-appraisal occupies a central place in how vocational students understand their own weight status, rather than as a precise estimate of the causal contribution of self-esteem to adiposity.

The strength of the self-esteem effect invites reflection on the direction of the relationship. Because the study employed a correlational design, it cannot establish whether low or distorted self-regard contributes to overweight, whether overweight erodes self-regard, or whether the two are mutually reinforcing; indeed, the wider self-esteem literature counsels caution before attributing causal power to self-regard alone (Baumeister et al., 2003). The most plausible interpretation, supported by the wider literature, is that the relationship is reciprocal. In one direction, overweight-related perception may diminish self-esteem through mechanisms such as weight-related teasing, stigmatisation, and body dissatisfaction; weight stigma is pervasive, is frequently enacted by peers, and is known to harm psychological well-being while paradoxically discouraging rather than motivating healthy behaviour change (Ibrahim et al., 2019; Puhl & Heuer, 2009; Vartanian & Porter, 2016), and internalised weight bias compounds these harms (Pearl & Puhl, 2018). In the other direction, diminished self-esteem may undermine the motivation, perceived self-efficacy, and self-regulation required to maintain healthy eating and physical activity (Bandura, 1997; Mann et al., 2004), thereby perpetuating a cycle of weight gain and worsening self-regard. The developmental timing compounds the risk: adolescence is the life stage at which self-esteem is most volatile

and most sensitive to social evaluation (Orth & Robins, 2014), meaning that cycles established during these years may consolidate into enduring patterns. This reciprocal conceptualisation underscores the importance of addressing psychological well-being as an integral component of weight management rather than as an afterthought. Interventions that build self-esteem and body confidence may therefore have value not only for mental health but also for the prevention and management of overweight.

5.3. The Absence of a Significant Gender Effect

Contrary to the expectation that weight-related behaviour would differ by gender, this study found neither a significant independent effect of gender on overweight-related perception ($\beta = -.016, p = .718$) nor any evidence of moderation. The gender by eating habits and gender by self-esteem interaction terms were both non-significant, the interaction block added no meaningful explanatory power ($\Delta R^2 = .003, p = .438$), the gender-stratified slopes were closely comparable, and the supplementary between-subjects analysis found no mean difference ($F(1, 398) = .087, p = .768$). The moderation hypothesis is therefore rejected on the basis of a direct test rather than inferred from the absence of a main effect. This finding is important for several reasons. First, it indicates that within this vocational population, the principal drivers of overweight are behavioural and psychological rather than demographic. Male and female students, sharing the same obesogenic curriculum and training environment, appear to be similarly affected by the eating habits and self-esteem processes captured in the model. Second, the result cautions against the assumption that gender-tailored interventions are necessarily required. While gender differences in body image pressure and dietary behaviour are frequently reported in the international and Malaysian literatures (Ata et al., 2007; Chin et al., 2020), the present findings suggest that, at least with respect to overweight-related perception in this setting, interventions targeting eating habits and self-esteem may be applied uniformly across genders without loss of relevance.

The absence of a gender effect should nonetheless be interpreted with care. It does not imply that young men and young women experience weight and body image identically, but rather that gender neither independently predicts overweight-related perception once eating habits and self-esteem are taken into account nor alters the strength of those two associations. It is possible that gender exerts its influence indirectly, through its effects on eating behaviour and self-perception, rather than directly on weight status; sociocultural pressures concerning appearance are known to be channelled differently to boys and girls through family, peers, and media (Ata et al., 2007), and these pressures may already be absorbed into the eating habits and self-esteem scores entered in the model. This possibility is consistent with the balanced gender composition of the sample and the shared environmental exposure of the respondents. Because the present moderation test returned null results, future research employing mediation analysis

could usefully examine whether gender operates indirectly through these behavioural and psychological pathways rather than upon overweight-related perception directly. It should also be noted that the study was powered to detect medium-sized main effects, and that interaction terms are typically detected with lower power than main effects, so small gender differences in slope cannot be excluded on the present evidence.

5.4. Comparison with Prior Studies

Situating the present findings within the wider literature clarifies both their consistency and their distinctiveness. The significant contribution of eating habits accords with numerous studies that identify dietary behaviour as a proximal determinant of adolescent overweight, including meta-analytic syntheses (Ma et al., 2020; Malik et al., 2013), Malaysian school-based research (Lai et al., 2022; Tee et al., 2018), and cross-national evidence on the dietary correlates of BMI (Oh et al., 2025). Where the present study diverges most notably from parts of the literature is in the prominence of the self-esteem construct and the absence of a gender effect. Prior Malaysian research has reported pronounced gender differences in body image and disordered eating among students (Chin et al., 2020), and international work documents gendered patterns of appearance pressure during adolescence (Ata et al., 2007). The failure to detect either a gender main effect or a gender interaction in the present study may reflect the particular characteristics of the vocational population, whose male and female members share an unusually uniform environmental exposure through the culinary curriculum; environmental and behavioural factors of this kind can attenuate demographic differences in weight status (Mackenbach et al., 2019). The prominence of self-esteem, meanwhile, echoes a growing recognition of the psychological dimension of overweight (Moradi et al., 2022; Pearl & Puhl, 2018; Puhl & Heuer, 2009; Sahril et al., 2025) and reinforces the argument that self-regard deserves a central place in models of adolescent weight status.

It is also instructive to consider the magnitude of the variance explained. The model accounted for approximately 26.5% of the variance in overweight-related perception, corresponding to a large effect by conventional benchmarks (Cohen, 1988), yet leaving the majority of variance unexplained. This is consistent with the multifactorial nature of overweight, which is shaped by physical activity, genetic predisposition, sleep, socioeconomic circumstances, and the broader food environment in addition to the factors modelled here (Sallis et al., 2000; Strain et al., 2024; Wang & Lim, 2012). Indeed, global surveillance shows that insufficient physical activity remains highly prevalent and is rising in many regions (Strain et al., 2024), physical activity in young people is itself shaped by a wide set of demographic, psychological, and environmental correlates (Sallis et al., 2000), and socioeconomic gradients in childhood obesity are well documented internationally (Wang & Lim, 2012). The unexplained variance should therefore be read not as a weakness of the model but as an indication of the complexity of the phenomenon

and an invitation to incorporate additional determinants in future work.

5.5. Theoretical Implications

The findings carry meaningful theoretical implications. The prominence of self-esteem and eating habits, coupled with the absence of both a gender main effect and gender moderation, supports a view of adolescent overweight as the product of interacting behavioural and psychological processes rather than fixed demographic characteristics. This view is congruent with social cognitive theory, in which personal factors, behaviour, and environment reciprocally determine one another (Bandura, 1997): the obesogenic training environment shapes eating behaviour, eating behaviour and weight status feed back into self-perception, and self-perception in turn conditions the self-regulatory effort that students bring to their eating. The results are equally consistent with motivational perspectives that locate esteem needs within the hierarchy of human needs (Maslow, 1943), suggesting that unmet esteem needs may find expression in maladaptive eating. Empirically, the leading role of the self-esteem construct supports arguments that self-esteem should be treated as a broad-spectrum factor in health promotion rather than a peripheral outcome (Mann et al., 2004). The results therefore suggest that models of adolescent overweight should accord self-esteem a central rather than peripheral role, and should treat eating habits as embedded within, and shaped by, the specific environment in which learners are situated. For vocational populations, this means recognising the training environment as an active determinant of behaviour. The study thereby reinforces the case for multidimensional frameworks that integrate behavioural, psychological, and environmental determinants of weight status.

5.6. Practical and Educational Implications

Several practical implications follow from the findings. First, because eating habits significantly predict overweight-related perception, vocational institutions should embed nutritional literacy and healthy eating practices within culinary training, so that professional competence and personal health are developed together. Concrete measures could include structured guidance on professional tasting technique that limits cumulative energy intake, the integration of nutrition modules into culinary syllabi, and the availability of healthy options in campus food services. Instructors, as influential models within the students' immediate social environment (Bandura, 1997), can demonstrate portion awareness and balanced tasting practices during practical sessions. Second, because self-esteem is the strongest predictor, institutions should invest in pastoral programmes that foster body confidence, positive self-regard, and a supportive, non-stigmatising climate around body weight; the weight stigma literature cautions that shame-based messaging is counterproductive and that supportive environments are more conducive to behaviour change (Puhl & Heuer, 2009; Vartanian & Porter, 2016). Structured counselling and student-support services are increasingly recognised as cen-

tral to student well-being in Malaysian educational institutions (Jailani et al., 2025), and institutional support systems that build student resilience can buffer learners against the stressors that undermine healthy behaviour (Ibrahim et al., 2025). Such programmes are likely to yield dual benefits for psychological well-being and weight management (Mann et al., 2004). Third, because gender does not significantly influence overweight-related perception, these interventions can be designed and delivered uniformly across male and female students, simplifying implementation without compromising effectiveness.

Learner-centred and technology-enabled approaches, increasingly emphasised in Malaysian higher education, offer promising vehicles for delivering such health education in vocational settings. Empowering students to take ownership of their own health learning, in the spirit of self-determined and lifelong learning, may enhance the durability of behaviour change (Kamrozzaman & Jie, 2025). Complementary work on blended and technology-enabled pedagogy in Malaysian higher education similarly points to flexible, learner-centred models that could be adapted for health promotion among vocational learners (Abdul Rais et al., 2025), while research on instructional leadership highlights the role of institutional leaders in enacting such wellness initiatives (Osman & Kamrozzaman, 2024).

5.7. Limitations and Future Research

This study has several limitations that qualify its conclusions and indicate directions for future work. First, the correlational, cross-sectional design precludes causal inference; the significant associations identified cannot establish the direction of influence, particularly for self-esteem and overweight-related perception, where the literature suggests reciprocal effects (Puhl & Heuer, 2009; Strauss, 2000). Longitudinal or experimental designs would be needed to clarify causality. Second, the self-esteem construct was operationalised as health-related self-regard rather than through a standard global measure such as the Rosenberg Self-Esteem Scale (Rosenberg, 1965), which may limit comparability with studies employing established scales; future research could administer validated instruments alongside the present construct to corroborate the findings. Third, the sample was drawn from three vocational colleges in the Sabah Zone, and although adequate in size (Cohen, 1988; Krejcie & Morgan, 1970), its geographic specificity may constrain generalisability to other regions or educational settings; replication in Peninsular Malaysia and in other TVET streams would strengthen external validity. Fourth, the model explained approximately 26.5% of the variance in overweight-related perception, indicating that important determinants such as physical activity, sleep, genetic predisposition, socioeconomic status, and the wider food environment were not captured (Sallis et al., 2000; Strain et al., 2024; Wang & Lim, 2012); incorporating these variables, ideally with objective measures such as accelerometry, would enrich future models. Fifth, the dependent variable was a self-reported perception score rather than a directly measured anthropometric out-

come. Although body mass index was measured objectively and is reported descriptively in **Table 2**, the regression models predict overweight-related perception, and the findings should be read as evidence about self-perceived weight status rather than about measured adiposity. Because the predictors were also self-reported, common-method variance may have inflated the observed associations, and the strength of the self-esteem coefficient in particular may partly reflect conceptual overlap between weight-related self-consciousness and overweight-related perception. Future work should model measured BMI or WHO weight category directly, using logistic or ordinal regression as the outcome scale requires, in order to test whether the same pattern holds for anthropometric outcomes. Addressing these limitations would strengthen the evidence base and refine understanding of overweight among vocational learners.

6. Conclusion

This study examined the influence of eating habits and self-esteem on overweight-related perception among TVET students and analysed whether these relationships differ by gender. The findings demonstrate that eating habits and self-esteem significantly predict overweight-related perception, measured as a continuous 12-item composite score, with self-esteem emerging as the strongest predictor, while gender exerts no significant independent effect and does not moderate either association. Together, eating habits, self-esteem, and gender explained approximately 26.5% of the variance in overweight-related perception, a large effect by Cohen's f^2 benchmark ($f^2 = .36$), while the addition of gender interaction terms yielded no significant increment in explained variance and the supplementary analysis confirmed the absence of a significant mean gender difference. These results indicate that overweight-related perception among vocational learners is associated principally with behavioural and psychological factors rather than with gender, and that the distinctive obesogenic environment of culinary training warrants particular attention. The study contributes context-specific evidence from an under-researched population and offers a clear implication for practice: gender-neutral interventions addressing eating habits and self-esteem simultaneously are likely to be most effective in this setting. By foregrounding self-esteem as a central determinant, the study also underscores the inseparability of psychological well-being and physical health in adolescence, a conclusion that echoes broader calls to treat self-esteem as a core resource for health promotion. Future research employing longitudinal designs, validated psychological measures, objective activity measurement, and a broader set of determinants would further advance understanding and support the development of effective, equitable interventions for vocational learners.

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Author Contributions

The first author conceptualised the study, designed the instrument, collected and analysed the data, and drafted the manuscript. The second author supervised the research, contributed to the interpretation of the findings, and critically revised the manuscript. Both authors read and approved the final version of the paper.

Conflicts of Interest

The authors declare that there is no conflict of interest present in relation to the publication of this paper.

References

- Abdul Rais, N. A., Kamrozzaman, N. A., & Jie, A. L. X. (2025). Investigating Blended Learning Practices in Malaysian Higher Education: A Narrative Approach to the Malaysia Education Blueprint and IR 4.0 Integration. *International Journal of Research and Innovation in Social Science*, 9, 4301-4312. <https://doi.org/10.47772/ijriss.2025.908000345>
- Abdullah, S. R., Victor Chee Wai, H., Ishak, Z., Hamzah, S. S., Nur Zati Iwani, A. K., Wan Mohd Zin, R. M. et al. (2024). Factors Influencing Health-Related Quality of Life of Children with Overweight and Obesity in Kuala Lumpur, Malaysia. *Health Psychology and Behavioral Medicine*, 12, Article ID: 2413980. <https://doi.org/10.1080/21642850.2024.2413980>
- Ata, R. N., Ludden, A. B., & Lally, M. M. (2007). The Effects of Gender and Family, Friend, and Media Influences on Eating Behaviors and Body Image during Adolescence. *Journal of Youth and Adolescence*, 36, 1024-1037. <https://doi.org/10.1007/s10964-006-9159-x>
- Bandura, A. (1997). *Self-Efficacy: The Exercise of Control*. W. H. Freeman.
- Baumeister, R. F., Campbell, J. D., Krueger, J. I., & Vohs, K. D. (2003). Does High Self-Esteem Cause Better Performance, Interpersonal Success, Happiness, or Healthier Lifestyles? *Psychological Science in the Public Interest*, 4, 1-44. <https://doi.org/10.1111/1529-1006.01431>
- Chin, Y. S., Appukutty, M., Kagawa, M., Gan, W. Y., Wong, J. E., Poh, B. K. et al. (2020). Comparison of Factors Associated with Disordered Eating between Male and Female Malaysian University Students. *Nutrients*, 12, Article No. 318. <https://doi.org/10.3390/nu12020318>
- Chong, K. H., Wu, S. K., Noor Hafizah, Y., Bragt, M. C. E., & Poh, B. K. (2016). Eating Habits of Malaysian Children: Findings of the South East Asian Nutrition Surveys (SEA-NUTS). *Asia Pacific Journal of Public Health*, 28, 59S-73S. <https://doi.org/10.1177/1010539516654260>
- Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences* (2nd ed.). Lawrence Erlbaum Associates.
- de Onis, M., Onyango, A. W., Borghi, E., Siyam, A., Nishida, C., & Siekmann, J. (2007). Development of a WHO Growth Reference for School-Aged Children and Adolescents. *Bulletin of the World Health Organization*, 85, 660-667. <https://doi.org/10.2471/blt.07.043497>
- Dietz, W. H. (1998). Health Consequences of Obesity in Youth: Childhood Predictors of Adult Disease. *Pediatrics*, 101, 518-525. <https://doi.org/10.1542/peds.101.s2.518>
- French, S. A., Story, M., & Perry, C. L. (1995). Self-Esteem and Obesity in Children and Adolescents: A Literature Review. *Obesity Research*, 3, 479-490. <https://doi.org/10.1002/j.1550-8528.1995.tb00179.x>

- Ibrahim, N. M., Ibrahim, Z., & Jamaluddin, R. (2019). Associations between Weight Teasing by Peers, Self-Esteem, and Academic Related Stressors with Body Weight Status among Adolescents in Hulu Langat District, Selangor, Malaysia. *Malaysian Journal of Medicine and Health Sciences*, 15, 10-15.
- Ibrahim, S. B. M., Basir, S. N. M., Johanis, M. A., Sultan, N. H. H., & Joharis, N. F. (2025). Exploring the Impact of Social Support and Academic Stress on Engineering Students' Resiliency. *Asian Journal of Social Science Research*, 7, 66-80.
- Institute for Public Health (2022). *Technical Report National Health and Morbidity Survey (NHMS) 2022: Adolescent Health Survey*. National Institutes of Health, Ministry of Health Malaysia.
- Jailani, M. A., Yusoff, F., Siew, W. H., & Wan Abas, W. M. U. (2025). A Comparative Analysis of Counselling Needs among Urban and Rural Secondary School Students in the Post-COVID-19 Period (July 2022-June 2024): Implications for School Counselling Services. *Asian Journal of Social Science Research*, 7, 40-53.
- Kamrozzaman, N. A., & Jie, A. L. X. (2025). Empowering the Lifelong Learner: A Systematic Review of Heutagogical Approaches in Language Learning. *Edelweiss Applied Science and Technology*, 9, 1842-1855. <https://doi.org/10.55214/2576-8484.v9i9.10228>
- Krejcie, R. V., & Morgan, D. W. (1970). Determining Sample Size for Research Activities. *Educational and Psychological Measurement*, 30, 607-610. <https://doi.org/10.1177/001316447003000308>
- Lai, W. K., Mohd Sidik, S., Lekhray, R., Gan, W. Y., & Ismail, S. I. F. (2022). Prevalence and Predictors of Overweight and Obesity among Adolescents in Seremban, Negeri Sembilan, Malaysia. *Cureus*, 14, e21795. <https://doi.org/10.7759/cureus.21795>
- Ma, X., Chen, Q., Pu, Y., Guo, M., Jiang, Z., Huang, W. et al. (2020). Skipping Breakfast Is Associated with Overweight and Obesity: A Systematic Review and Meta-Analysis. *Obesity Research & Clinical Practice*, 14, 1-8. <https://doi.org/10.1016/j.orcp.2019.12.002>
- Mackenbach, J. D., Nelissen, K. G. M., Dijkstra, S. C., Poelman, M. P., Daams, J. G., Leijssen, J. B. et al. (2019). A Systematic Review on Socioeconomic Differences in the Association between the Food Environment and Dietary Behaviors. *Nutrients*, 11, Article No. 2215. <https://doi.org/10.3390/nu11092215>
- Malik, V. S., Pan, A., Willett, W. C., & Hu, F. B. (2013). Sugar-Sweetened Beverages and Weight Gain in Children and Adults: A Systematic Review and Meta-Analysis. *The American Journal of Clinical Nutrition*, 98, 1084-1102. <https://doi.org/10.3945/ajcn.113.058362>
- Mann, M. (2004). Self-Esteem in a Broad-Spectrum Approach for Mental Health Promotion. *Health Education Research*, 19, 357-372. <https://doi.org/10.1093/her/cyg041>
- Maslow, A. H. (1943). A Theory of Human Motivation. *Psychological Review*, 50, 370-396. <https://doi.org/10.1037/h0054346>
- Moradi, M., Mozaffari, H., Askari, M., & Azadbakht, L. (2022). Association between Overweight/Obesity with Depression, Anxiety, Low Self-Esteem, and Body Dissatisfaction in Children and Adolescents: A Systematic Review and Meta-Analysis of Observational Studies. *Critical Reviews in Food Science and Nutrition*, 62, 555-570. <https://doi.org/10.1080/10408398.2020.1823813>
- NCD Risk Factor Collaboration (2024). Worldwide Trends in Underweight and Obesity from 1990 to 2022: A Pooled Analysis of 3663 Population-Representative Studies with 222 Million Children, Adolescents, and Adults. *The Lancet*, 403, 1027-1050. [https://doi.org/10.1016/s0140-6736\(23\)02750-2](https://doi.org/10.1016/s0140-6736(23)02750-2)
- Neumark-Sztainer, D., Paxton, S. J., Hannan, P. J., Haines, J., & Story, M. (2006). Does

- Body Satisfaction Matter? Five-Year Longitudinal Associations between Body Satisfaction and Health Behaviors in Adolescent Females and Males. *Journal of Adolescent Health*, 39, 244-251. <https://doi.org/10.1016/j.jadohealth.2005.12.001>
- Nunnally, J. C. (1978). *Psychometric Theory* (2nd ed.). McGraw-Hill.
- Oh, J., Mun, W.-L., Lee, Y.-E., Roh, S.-Y., & Kim, G. (2025). Interrelation between BMI, Dietary Habits, Self-Rated Health, and Body Image Perception among Korean Adolescents: The Korea Youth Risk Behavior Web-Based Survey (2022). *Nutrients*, 17, Article No. 253. <https://doi.org/10.3390/nu17020253>
- Orth, U., & Robins, R. W. (2014). The Development of Self-Esteem. *Current Directions in Psychological Science*, 23, 381-387. <https://doi.org/10.1177/0963721414547414>
- Osman, H., & Kamrozzaman, N. A. (2024). Instructional Leadership Practices among Principals in Rural Areas of Sandakan District, Malaysia. *International Journal of Asian Social Science*, 14, 185-197. <https://doi.org/10.55493/5007.v14i7.5119>
- Pearl, R. L., & Puhl, R. M. (2018). Weight Bias Internalization and Health: A Systematic Review. *Obesity Reviews*, 19, 1141-1163. <https://doi.org/10.1111/obr.12701>
- Poh, B. K., Ng, B. K., Siti Haslinda, M. D., Nik Shanita, S., Wong, J. E., Budin, S. B. et al. (2013). Nutritional Status and Dietary Intakes of Children Aged 6 Months to 12 Years: Findings of the Nutrition Survey of Malaysian Children (SEANUTS Malaysia). *British Journal of Nutrition*, 110, S21-S35. <https://doi.org/10.1017/s0007114513002092>
- Puhl, R. M., & Heuer, C. A. (2009). The Stigma of Obesity: A Review and Update. *Obesity*, 17, 941-964. <https://doi.org/10.1038/oby.2008.636>
- Rosenberg, M. (1965). *Society and the Adolescent Self-Image*. Princeton University Press.
- Sahril, N., Shamsuddin, N., Wan Jusoh, W. S. A., Hamid, N., Zainuddin, A. A., & Ahmad, N. A. (2025). Depression and Its Relationship to Physical Activity, Sedentary Behaviour, and Body Mass Index (BMI) in Malaysian Adolescents: A Cross-Sectional Study. *Archives of Public Health*, 83, Article No. 233. <https://doi.org/10.1186/s13690-025-01729-7>
- Sallis, J. F., Prochaska, J. J., & Taylor, W. C. (2000). A Review of Correlates of Physical Activity of Children and Adolescents. *Medicine & Science in Sports & Exercise*, 32, 963-975. <https://doi.org/10.1097/00005768-200005000-00014>
- Simmonds, M., Llewellyn, A., Owen, C. G., & Woolacott, N. (2016). Predicting Adult Obesity from Childhood Obesity: A Systematic Review and Meta-Analysis. *Obesity Reviews*, 17, 95-107. <https://doi.org/10.1111/obr.12334>
- Story, M., Neumark-Sztainer, D., & French, S. (2002). Individual and Environmental Influences on Adolescent Eating Behaviors. *Journal of the American Dietetic Association*, 102, S40-S51. [https://doi.org/10.1016/s0002-8223\(02\)90421-9](https://doi.org/10.1016/s0002-8223(02)90421-9)
- Strain, T., Flaxman, S., Guthold, R., Semanova, E., Cowan, M., Riley, L. M. et al. (2024). National, Regional, and Global Trends in Insufficient Physical Activity among Adults from 2000 to 2022: A Pooled Analysis of 507 Population-Based Surveys with 5.7 Million Participants. *The Lancet Global Health*, 12, e1232-e1243. [https://doi.org/10.1016/s2214-109x\(24\)00150-5](https://doi.org/10.1016/s2214-109x(24)00150-5)
- Strauss, R. S. (2000). Childhood Obesity and Self-Esteem. *Pediatrics*, 105, e15-e15. <https://doi.org/10.1542/peds.105.1.e15>
- Subramaniyan, V. (2026). Rising Obesity in Malaysia (1990-2023): A Comprehensive Analysis of Temporal Trends, Sex Inequalities, and Lifestyle Drivers. *Public Health Reviews*, 47, Article ID: 1609497. <https://doi.org/10.3389/phrs.2026.1609497>
- Swinburn, B. A., Sacks, G., Hall, K. D., McPherson, K., Finegood, D. T., Moodie, M. L. et al. (2011). The Global Obesity Pandemic: Shaped by Global Drivers and Local Environ-

- ments. *The Lancet*, 378, 804-814. [https://doi.org/10.1016/s0140-6736\(11\)60813-1](https://doi.org/10.1016/s0140-6736(11)60813-1)
- Tabachnick, B. G., & Fidell, L. S. (2019). *Using Multivariate Statistics* (7th ed.). Pearson.
- Tee, E. S., Nurliyana, A. R., Norimah, A. K., Mohamed, H. J. B. J., Tan, S. Y., Appukutty, M., Hopkins, S., Thielecke, F., Ong, M. K., Ning, C., & Nasir, M. T. M. (2018). Break-Fast Consumption among Malaysian Primary and Secondary School Children and Relationship with Body Weight Status: Findings from the MyBreakfast Study. *Asia Pacific Journal of Clinical Nutrition*, 27, 421-432.
- Vartanian, L. R., & Porter, A. M. (2016). Weight Stigma and Eating Behavior: A Review of the Literature. *Appetite*, 102, 3-14. <https://doi.org/10.1016/j.appet.2016.01.034>
- Wang, Y., & Lim, H. (2012). The Global Childhood Obesity Epidemic and the Association between Socio-Economic Status and Childhood Obesity. *International Review of Psychiatry*, 24, 176-188. <https://doi.org/10.3109/09540261.2012.688195>
- World Health Organization (2025). *Obesity and Overweight [Fact Sheet]*. <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>