

The Influence of Combined Profiles of Weight-Appearance Risk Factors and Avoidant/Restrictive Food Intake Disorder on Non-Suicidal Self-Injury (NSSI) Behaviors Among University Students: A Latent Profile Analysis

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ABSTRACT

Among university students, engaging in restrictive eating, and experiencing weight discrimination, weight stigma, and body shame may be interrelated and lead to a higher probability of non-suicidal self-injurious behavior. However, previous studies have tended to examine single risk factors in isolation, failing to adequately consider the coexistence and interaction of multiple risk factors. This study focuses on 3812 Chinese college students, collecting data through standardized questionnaires and employing Latent Profile Analysis (LPA) to identify risk profiles to explore this issue. The latent profile analysis identified two weight and appearance-related risk profiles: "High Body Shame Risk Group" (74%) and "Physical High Stigma and Shame Risk Group" (26%), and three eating disorder-related risk profiles: "Low-Risk-Low Eating Disorder Group" (72%), "Medium-Risk-Medium Eating Disorder Group" (15%), and "High-Risk-High Eating Disorder Group" (13%). The research findings confirm the heterogeneity in the combined profiles of weight and appearance risk factors, as well as individual risk factors for avoidance and restrictive eating disorders, among university students at the level of non-suicidal self-harm behaviors. Additionally, multinomial logistic regression analyses indicate different latent subpopulations of weight and appearance risk factors, as well as avoidance and restrictive eating disorders. Compared to the Low-Risk-Low Eating Disorder group, the incidence of non-suicidal self-injury significantly increases in the Medium-Risk-Medium Eating Disorder group and is even more pronounced in the High-Risk-High Eating Disorder group, with the latter exhibiting the most frequent self-harming behaviors. These findings shed more light on the complex interplay between weight and appearance-related psychological risk factors, as well as risk factors associated with the combined profile of restrictive and eating disorders, and non-suicidal self-injury among university students.

KEYWORDS

Restrictive diet; Appearance risk; Non-suicidal self-injury; Latent profiling; Psychological crisis of university students

1 Introduction

Adolescence is a pivotal period for individual development, with dietary habits and perceptions of body weight during this time having profound implications for psychological well-being (French et al., 1995). Avoidant/Restrictive Food Intake Disorder (ARFID) refers to a condition where individuals deliberately restrict their food intake, often with the intent to control their weight, and is common among university students, especially in sociocultural environments that promote thinness (Zeanandin et al., 2012). Studies have discovered that the occurrence of ARFID in children and university students ranges from 5% to 22.5% (Sanchez et al., 2023). Research indicates that ARFID is often comorbid with physical conditions such as electrolyte imbalances, refeeding syndrome, and hypoglycemia, as well as mental disorders like anxiety, depression, and autism spectrum disorders (Kambanis et al., 2020). In addition, weight-related discrimination, stigma, and shame may lead to lower self-esteem and distorted self-image, they can even trigger eating disorders and NSSI among university students (Leclerc et al., 2013). Non-suicidal self-injury (NSSI) is deliberate self-harm without suicidal intent that results in some form of physical harm. Typical forms of NSSI consist of cutting with a blade, forcefully scratching oneself, burning, or pricking with a needle (Faura-Garcia et al., 2021). The American Diagnostic and Statistical Manual of Mental Disorders (DSM) categorizes self-injury as a disorder for which further research is needed for clarification (Biedermann et al., 2016). Although such behavior does not normally result in death, it can result in further loss of social functioning and even isolation of the patient. This ongoing deterioration can perpetuate the progression of the condition and ultimately increase the risk of suicidal behavior, thereby endangering the individual's life. (Brown et al., 2017). The aim of NSSI is often to cope with life's challenges or to release tension (Rasmussen et al., 2016). A study finds prevalence of NSSI is on the rise among Chinese students (Han et al., 2017), NSSI is sometimes used as a means to cope with stress or traumatic experiences, serving as a way to release tension or emotional distress.

From the perspective of body image theory, during adolescence, due to the rapid changes the body undergoes, teenagers may experience uncertainty and anxiety about their body shape (Smith et al., 2017). The theory explores an individual's cognition and feelings about their own body, which is closely connected to risk factors related to weight and appearance. (Dane et al., 2023). Risk factors such as weight discrimination, weight stigmatization, and body shame can trigger a series of mental health issues in individuals, including depressive moods, anxiety, and ultimately lead to non-suicidal self-injury behaviors. (Gerstmann, 1958). It has been shown that negative body imagery in university students positively predicts suicidal ideation and NSSI (Fan et al., 2022). Weight- and appearance-related risk factors are closely

linked to an individual's body imagery and influence his or her mental health and life through complex psychosocial mechanisms (Jiotsa et al., 2021). Some researchers have suggested that appearance anxiety serves as a partial mediator between fear of negative evaluation and restrictive eating, with a mediating effect of 0.161, accounting for 33.4% of the total effect (Liu & Xu et al., 2024). In short, appearance anxiety and fear of negative evaluations can cause individuals to feel heavier emotional stress. People who are dissatisfied with their body image may resort to avoidance and restrictive behaviors. This in turn can exacerbate mental health problems such as depression and anxiety, creating a vicious cycle. The research findings once again confirm that the physical changes university students, appearance anxiety, and social discrimination jointly affect university students' body image, potentially leading to mental health problems and self-harming behaviors.

Objectification Theory suggests that individuals, especially women, often face pressures from society and the media to conform to a certain idealized body image. This continuous experience of objectification can lead to body surveillance, low self-esteem, depression, and eating disorders (Fredrickson & Roberts, 1997). Social risk factors such as weight discrimination, weight stigma, and body shame, as well as individual risk factors such as avoidance behaviors and restrictive eating disorders, are causally related to non-suicidal self-injurious behaviors (Derrigo et al., 2023; Sala et al., 2019; Mason et al., 2021). Experiences of weight discrimination are connected with heightened eating disorder symptoms. (Cohrdes et al., 2021; Thomeczek et al., 2024). Additionally, body shame has been identified as a predictor of disordered eating symptoms. (Nechita et al., 2021). Weight discrimination in the school setting is significantly associated with eating disorder symptoms in university students (Puhl et al., 2012). Women's appearance dissatisfaction and eating disorders are strongly associated with the idealized portrayal of the female body in the media. (Eagan et al., 2022). Adolescent females may experience self-objectification in the face of society's quest for the "ideal" body type and media stereotypes, which not only affects their self-identity (Coffers et al., 2006). Weight stigma is associated with eating disorders and may promote poor eating habits and weight gain. Individuals may restrict food intake for fear of social evaluation, leading to malnutrition and difficulties in social participation (Bourne et al., 2020; Coffers et al., 1983). Consequently, this can hurt psychological well-being and social adaptability. According to Objectification Theory, these risk factors are closely related to the process of self-objectification described by the theory. The research outcomes underscore that sociocultural influences, along with weight and appearance-related risks, and individual risk factors, make a significant contribution to the body image and mental health of university students. They impact not only self-esteem and body satisfaction but may also precipitate a spectrum of psychological disorders such as depression, anxiety, and eating disorders. Moreover, these factors are correlated with non-suicidal self-injury, underscoring the intricate interplay between sociocultural stressors and individual psychological vulnerabilities. Despite existing research examining the impact of restrictive eating and weight perception on adolescent psychological health, most studies have tended to explore single risk factors in isolation, without adequately considering the coexistence and interactive effects of multiple risk factors. In real life, university students may face a variety of weight and appearance-related challenges simultaneously, and the cumulative effects and interactions of these challenges may have more complex impacts on their psychological health. Moreover, most studies categorizing weight and appearance risk factors rely on cross-sectional data, limiting researchers' understanding of the developmental trajectory and dynamic changes of risk factors. The lack of longitudinal study designs makes it challenging to uncover patterns of these risk factors over time and their long-term impact on mental health.

The present study used latent profile analysis to classify adolescent weight and appearance risk factors more accurately to address research gaps. This study aims to explore and analyze the impact of different latent profiles of weight and appearance risk factors, as well as their combined patterns with ARFID, on NSSI behaviors among university study. Integrating the aforementioned theoretical perspectives and empirical research, the research hypotheses are proposed as follows: (1) There may be three profiles of weight appearance risk factors, categorized as low, medium, and high; (2) There may be joint profiles between weight risk and appearance risk, categorized as low, medium, and high; (3) Possible joint profiles of weight-appearance risk factors on NSSI.

2 Methods

2.1 Participants and procedure

For this study, data was collected from China Three Gorges University by employing cluster sampling methodology. We made use of a well-known digital survey tool in China called "Wenjuanxing". The questionnaires were distributed to students by their university advisors and handed out. Participants were assured of the confidentiality of the survey and their right to withdraw at any time. The survey was crafted to ensure that respondents had to answer all questions before they could proceed or submit their forms, thereby eliminating the chance of missing data.

Summing up 4,000 electronic questionnaires were distributed by grade, with 35 invalid questionnaires excluded,

resulting in 3,812 responses collected. After data cleaning, we conducted a detailed analysis of the sample, which included 1,645 males (43.15%) and 2,167 females (56.85%). The distribution by academic year was as follows: first-year students, 102 (2.68%); second-year students, 2,246 (58.92%); third-year students, 974 (25.55%); and fourth-year students, 490 (12.85%). Among the participants, there were 1,354 only children (35.52%) and 2,458 non-only children (64.48%). For further demographic information about these participants, please refer to Table 1.

Table 1 Descriptive statistical information on participant demographics

Variables	N/M	SD/%
Gender		
Male	1 645	43.15%
Female	2 167	56.85%
Only child		
Yes	1 354	35.52%
No	2 458	64.48%
Family structure		
Intactness	3 315	86.96%
Non-intactness	497	13.04%
Left-behind experience		
Yes	1 512	39.66%
No	2 300	60.34%

2.2 Instruments

2.2.1 Weight Discrimination

The Hunger and Major (H&M) scale, developed in 2015, is a concise tool designed to evaluate the psychological and behavioral impacts of hunger in significant life contexts. The original scale comprises multiple items addressing hunger-related emotional responses, cognitive functioning, and decision-making under stress. For this study, four representative items were selected from the scale. Each item was rated on a 5-point Likert scale (1 = "Strongly Disagree", 5 = "Strongly Agree"), with participants assessing their experiences over the past week. The total score was calculated by summing the scores of all items, yielding a range from 4 to 20. Higher scores indicate a stronger influence of hunger on psychological and behavioral outcomes. In the sample of this study, Cronbach's alpha coefficient for this scale was 0.96.

2.2.2 Stigma Assessment

The WSC (Hunger and Significance, 2015) scale is a brief instrument designed to evaluate the relationship between hunger and its psychological and behavioral impacts. The 4-item scale assesses key dimensions including emotional response to hunger, decision-making under hunger, and hunger-induced behavioral changes. For this study, four representative items were selected from the original scale. Each item was rated on a 7-point Likert scale (1 = "Strongly Disagree", 7 = "Strongly Agree"), with participants evaluating their experiences over the past week. The total score was calculated by summing the ratings of all items, resulting in a score range of 4 to 28. Higher scores indicate a greater psychological or behavioral impact of hunger. In the sample of this study, Cronbach's alpha coefficient for this scale was 0.97.

2.2.3 Body Shame Assessment

The Obesity Bias and Stigma Scale (OBCS) was developed by Puhl et al. in 2013 and consists of 8 items designed to measure participants' negative perceptions of and emotional reactions to people with obesity, highlighting the potential impact of obesity stigma on social interactions, emotions, and self-perceptions. Each item is rated on a 7-point Likert scale (1 = "strongly disagree", 7 = "strongly agree"), and participants score the items according to how they feel about obese people. The total score was calculated by adding the scores of all 8 items and ranged from 8 to 56. Higher scores indicate greater prejudice and stigmatization of people with obesity. The Cronbach's alpha coefficient for the OBCS was 0.85, indicating high internal consistency.

2.2.4 Screening for Avoidant and Restrictive Eating Disorders

The nine-item Avoidant/Restrictive Food Intake Disorder Screening Scale (NIAS) was developed by American researchers Zickgraf et al. (2017) as a self-report scale, and Chinese researchers He et al. (2021) translated and adapted the NIAS into Chinese (C-NIAS), and tested the reliability and validity of the NIAS in a population of college students to

measure the potential risk of developing ARFID in individuals aged 18 to 65 years. The C-NIAS was translated and adapted from the NIAS into Chinese (C-NIAS) and tested for reliability and validity in a college population to measure the potential risk of ARFID in individuals aged 18 to 65 years. The scale consists of nine items with three subscales: eating disorders, appetite, and fear of eating, on a 6-point Likert scale ("Strongly Disagree" = 1, "Strongly Agree" = 6), with a total score ranging from 9 to 54, with higher scores indicating an eating disorder, the higher the risk. In the sample of this study, Cronbach's alpha coefficient for this scale was 0.91.

2.2.5 Assessment of NSSI

The 7-item Deliberate Self-Harm Inventory (DSHI-7) is a simplified version of the original Deliberate Self-Harm Inventory (DSHI), which was modified in 2012 by Nock et al. The DSHI-7 consists of 7 items assessing the frequency of self-harming behaviors, motivation, and any suicidal ideation. The scale is based on a four-point Likert scale (1 = "never", 4 = "always"), and participants rate each item based on their own experiences in the past year. The total score was calculated by adding the scores of all seven items, ranging from 7 to 28. Higher scores indicate more frequent self-harming behaviors and higher mental health risks.

2.2.6 Statistical analysis

In our research, we utilized a dual-method strategy to validate our theoretical assumptions. First, we performed Latent Profile Analysis (LPA) with the aid of Mplus 8.11 to uncover prevalent trends among university students concerning weight-related and appearance-related risk factors, as well as behaviors associated with food avoidance and restriction. To ascertain the most suitable number of latent classes, we assessed models that spanned from one to six classes, scrutinizing them using fit indices, interpretative clarity, and theoretical insights.

Building on academic research, we understood that elevated entropy values alongside reduced Bayesian Information Criterion (BIC), Adjusted Bayesian Information Criterion (ABIC), and Akaike Information Criterion (AIC) scores, along with the statistical significance of the Lo-Mendell-Rubin Likelihood Ratio Test (LMR-LRT), Adjusted Lo-Mendell-Rubin Likelihood Ratio Test (ALMR-LRT), and Bootstrap Likelihood Ratio Test (BLRT), suggest a stronger model fit. Following this, we conducted multinomial logistic regression analysis utilizing the R3STEP command in Mplus 8.11 to determine if demographic factors like gender and grade level are associated with a higher probability of individuals being assigned to certain groups.

All predictor variables, including weight discrimination, weight stigma, body shame, and latent classes of avoidant and restrictive food intake disorders, along with covariates like gender and grade level, were simultaneously entered into the multinomial logistic regression model, thereby controlling for the influence of other predictor variables. We used Odds Ratios to gauge the probability of the relationship between covariates and the reference group as well as the target group. This method allowed us to assess the correlation between weight and appearance risk factors and the individuals classified within the avoidant and restrictive food intake disorder categories.

3 Latent Profile Analysis on Weight and Appearance Dimensions

Initially, we conducted a LPA starting from a one-class model and sequentially moving to models with more classes, using weight and appearance risk factors as observed variables. We established unconditional Latent Profile Analysis models (LAP) for weight discrimination (weight), weight stigma (stigma), and body shame (hral) to identify the optimal number of profiles for these dimensions.

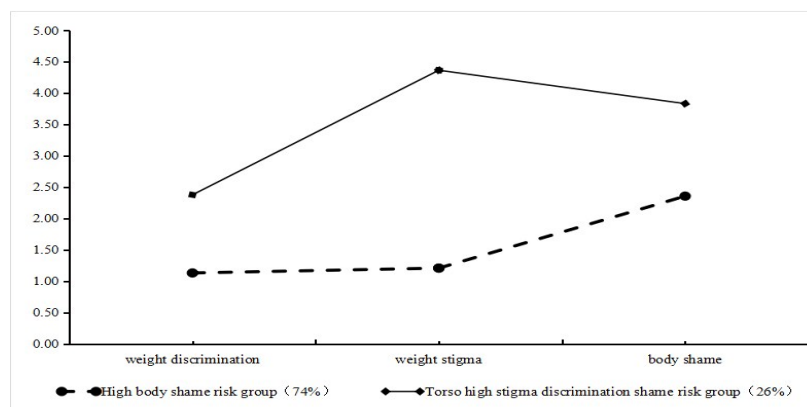
The fitting indices for the weight and appearance dimensions are presented in Table 2. As we expanded the number of trajectory classes, there was a steady decline in the values of the AIC, BIC, and ABIC. All model entropy values surpassed the threshold of 0.8, signifying a high level of accurate classification. The Bootstrap Likelihood Ratio Test (BLRT) results pointed towards a progressive model optimization with an increase in class numbers. However, the Lo-Mendell-Rubin Likelihood Ratio Test (LMR-LRT) findings suggested that only the two-class model met the criteria for acceptability at a significance level of $p < 0.05$. In contrast, the three-class, four-class, five-class, and six-class models each contained subgroup proportions that constituted less than 5% of the overall sample size. Consequently, the two-class model emerged as the most advantageous when compared to the more complex three-class, four-class, five-class, and six-class models. Considering the practical implications of weight and appearance dimensions, the two-class model is ultimately determined to be the optimal model for weight and appearance profiles.

In this model, Profile 1, characterized by low levels of weight discrimination and weight stigma but high levels of body shame, is named the "High Body Shame Risk Group (74%)." Profile 2, characterized by high levels of weight discrimination, weight stigma, and body shame, is named the "Physical High Stigma and Shame Risk Group (26%)."

Table 2 Indicators of potential profile analysis model fit at the level of body weight and appearance

form	AIC	BIC	ABIC	entropy	LMR-LRT	BLRT	Proportion of potential categories
1	33628.14	33665.62	33646.55				
2	26433.39	26495.85	26464.07	0.972	0	p<0.001	2806(0.74)/1006(0.26)
3	24728.42	24815.86	24771.38	0.981	0	p<0.001	2760(0.72)/911(0.24)/141(0.04)
4	23654.95	23767.38	23710.18	0.966	0.1158	p<0.001	537(0.14)/439(0.12)/2751(0.72)/85(0.02)
5	21733.73	21871.14	21801.24	0.979	0.0031	p<0.001	2509(0.66)/441(0.12)/368(0.10)/67(0.02)/427(0.11)
6	19662.19	19824.58	19741.96	0.984	0	p<0.001	231(0.06)/359(0.09)/2471(0.65)/411(0.11)/271(0.07)/69(0.02)

Note: Bold indicates the best-fitting model.

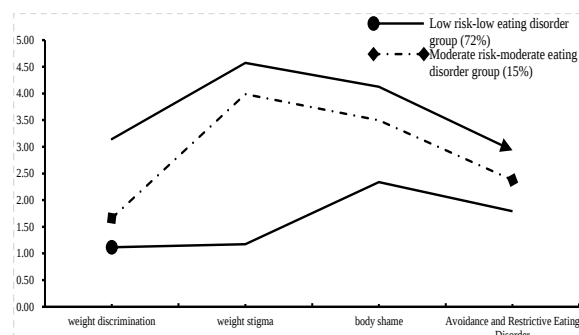
**Figure 1** Potential profiles at the weight and appearance level

Secondly, we conducted a joint Latent Profile Analysis using the aforementioned weight and appearance risk factors along with individual risk factors, specifically avoidant and restrictive food intake disorders (eat), as observed variables. When analyzing the fitting indices of the various classification models, we notice that: as the number of classifications increases, AIC, BIC, and aBIC all show a tendency to decrease with the increase of trajectory categories. At the same time, the entropy value always remains at a high level, above the 0.8 critical value. Considering the balance between model complexity and goodness of fit, the three-classification model was identified as the best solution. In this model: Profile 1, characterized by low levels of weight and appearance risk factors and low levels of ARFID risk, is named the "Low-Risk-Low Eating Disorder Group" (72%). Profile 2, characterized by moderate levels of weight and appearance risk factors and moderate levels of avoidant and restrictive food intake disorder risk, is named the "Medium-Risk-Medium Eating Disorder Group" (15%). Profile 3, characterized by high levels of weight and appearance risk factors and high levels of ARFID risk, is named the "High-Risk-High Eating Disorder Group" (13%).

Table 3 Weight and Appearance Risk Factors and Avoidance and Restrictive Eating Disorder in Profile Analysis Fit Indicators

Style	AIC	BIC	ABIC	entropy	LMR-LRT	BLRT	Proportion of potential categories
1	44327.37	44377.34	44351.92				
2	36535.71	36616.91	36575.60	0.973	0.0000	p<0.001	2803(0.74)/1009(0.26)
3	34808.114	34920.46	34863.27	0.961	0.0000	p<0.001	2747(0.72)/581(0.15)/484(0.13)
4	33686.92	33830.57	33757.49	0.966	0.2669	p<0.001	2751(0.72)/83(0.02)/435(0.11)/543(0.14)
5	31732.45	31907.33	31818.36	0.979	0.0010	p<0.001	368(0.10)/2504(0.66)/440(0.12)/66(0.02)/434(0.11)
6	29628.86	29834.98	29730.12	0.984	0.0001	p<0.001	362(0.09)/2470(0.65)/409(0.11)/274(0.07)/228(0.06)/69(0.02)

Note: Bold indicates the best-fitting model.

**Figure 2** Weight and appearance risk factors and joint profiles of avoidance and restrictive eating disorders

Cross-tabulation analysis of demographic variables (gender, grade) with weight- and appearance-level risk factors and individual risk factors (avoidance vs. restrictive eating disorder).

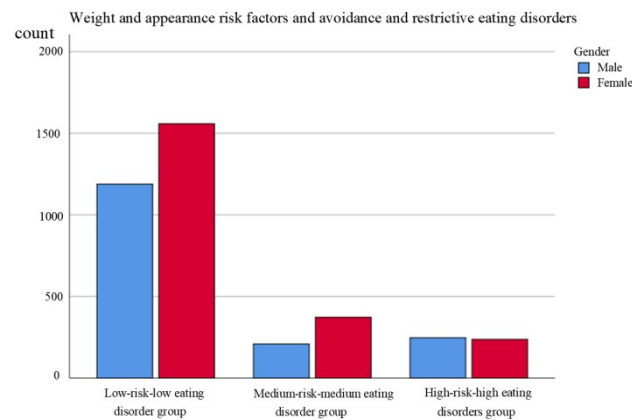


Figure 3 Gender Differences in Weight and Appearance Risk Factors and Joint Profiles of Avoidance and Restrictive Eating Disorders

Risk Factors for Body Weight and Appearance and Analysis of Covariance for the Joint Profile of Avoidance and Restrictive Eating Disorder.

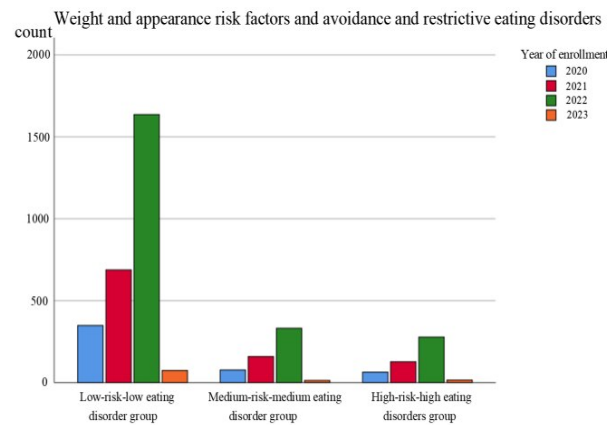


Figure 4 Grade-Level Differences in Weight and Appearance Risk Factors and Joint Profiles of Avoidance and Restrictive Eating Disorders

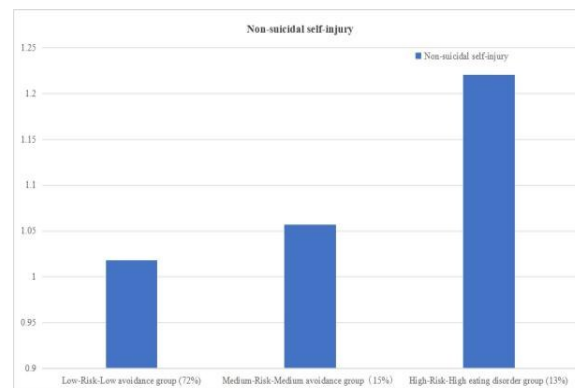


Figure 5 Differences in Non-Suicidal Self-Injury Scores Between Weight and Appearance Risk Factors and the Combined Category of Avoidance and Restrictive Eating Disorder

Multivariate Linear Regression of Body Weight and Appearance Risk Factors in Combination with Avoidant and Restrictive Eating Disorder Categories on Nonsuicidal Self-Injury

Since the dependent variable is continuous and the independent variables are categorical, we used dummy variables to construct a multiple linear regression model for analysis. The results indicate that compared to the low-risk-low eating disorder group, the incidence of NSSI is higher in the medium-risk-medium eating disorder group ($B=0.04$, $p < 0.001$), with a 0.04 increase in the rate of nonsuicidal self-injury compared to the low-risk-low eating disorder group. Additionally, compared to the low-risk-low eating disorder group, the incidence of NSSI is higher in the high-risk-high eating disorder group ($B=0.20$, $p < 0.01$), with a 0.20 increase in the rate of NSSI compared to the low-risk-low avoidance group.

Table 4 Tests of Difference in Non-Suicidal Self-Injury Scores for Weight and Appearance Risk Factors and the Combined Categories of Avoidance and Restrictive Eating Disorder

model	Unstandardized co-	standard error	Standardized coef-	t	significance
	efficient B		ficient Beta		
(Constant)	1.018	0.005		210.127	0.000
Medium-risk-medium eating disorder group	0.037	0.012	0.051	3.217	0.001
High-risk-high eating disorder group	0.204	0.013	0.259	16.338	0.000
Low-risk-low eating disorder group	0				

a Dependent variable: non-suicidal self-injury

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$;

4 Discussion

Latent profile analysis (LPA) results reveal significant heterogeneity among university students in weight and appearance risk factors. Using weight discrimination, weight stigma, and body shame as observed variables, comparisons across models with 1 to 6 classifications showed that the 2-class model provided the best fit (lowest AIC, BIC, and aBIC values, with entropy exceeding 0.8). The two classes were identified as the High Body Shame Risk Group (74%) and the High Stigma and Discrimination Risk Group (26%).

University students in the High Body Shame Risk Group exhibited lower levels of weight discrimination and weight stigma but reported higher body shame. Previous studies have shown that body shame is strongly linked to body image anxiety. This connection may lead university students to adopt avoidant behaviors or experience adverse psychological states, such as depression or anxiety (Voelker et al., 2015). University students in the High Stigma and Discrimination Risk Group scored high on all three indicators: weight discrimination, weight stigma, and body shame. Social pressures, including media influence and peer ridicule, are likely the primary external risk factors faced by this group (Lieberman et al., 2001).

The absence of a distinct moderate-risk category may be attributed to the sample distribution, with most individuals clustered at the extremes—either in the "low-risk" group (74%) or the "high-risk" group (26%). University students exhibiting moderate-risk traits may have been too few to form an independent profile or were absorbed into the high- and low-risk categories. Additionally, body shame emerged as a significant factor across all classifications, whereas weight discrimination and weight stigma were prominent only in the "high-risk" group. This disparity likely diluted the visibility of a distinct moderate-risk group. Moreover, the cultural context in China, where media and societal norms heavily emphasize "thinness as beauty," might contribute to pervasive body shame, even among university students in the "low-risk" category. This cultural backdrop blurs the boundaries between low-, moderate-, and high-risk classifications (Coughlin et al., 2006).

Future research should further explore the protective roles of internal psychological resources, such as self-esteem, and external environmental factors, like family support, in mitigating weight and appearance-related risks among university students.

When weight and appearance risk factors were combined with individual risk variables, such as ARFID, the model captured more nuanced differences, resulting in a more balanced sample distribution. Latent profile analysis revealed that a three-class model best fit the data, validating the dynamic structure of joint profiles and supporting Hypothesis Two. The three identified groups included: the Low-Risk-Low ARFID group (72%), the Medium-Risk-Medium ARFID group (15%), and the High-Risk-High ARFID group (13%).

University students in the Low-Risk-Low ARFID group showed minimal weight and appearance risk factors, alongside low levels of ARFID risk. By contrast, the Moderate Risk–Moderate ARFID group displayed mid-levels across all observed variables, serving as a transitional group between the two extremes. This intermediate status reflects how individuals may shift toward higher or lower risk based on environmental influences or internal psychological factors. Negative emotions such as anxiety and depression may play a pivotal role in this group. Previous studies have shown that mental health issues often emerge first in moderate-risk individuals, potentially signaling the onset of high-risk conditions (Auerbach et al., 2023; Edington et al., 2001). The High-Risk-High ARFID group exhibited elevated levels of weight and appearance risk factors, along with high ARFID risk. This stratification suggests that individuals' responses to external discrimination, stigmatization, and internalized body shame significantly distinguish these categories (Solomon-Kraku et al., 2022). Notably, body shame emerged as a critical predictor, especially within the High Risk group. This finding aligns with Zhao et al. (2024), who highlighted the close association between body shame and restrictive eating behaviors, as well as related psychological issues such as non-suicidal self-injury (NSSI).

Targeted interventions should prioritize university students in the High Risk – High ARFID group and those with heightened body shame. Schools and families can play a pivotal role by promoting body positivity, reducing weight-related discrimination, and offering psychological support to enhance self-esteem and encourage healthy behaviors.

Further analysis revealed a significant association between weight and appearance risk factors and non-suicidal self-injury (NSSI) behaviors among university students. Findings indicate that the NSSI scores in the high-risk group were significantly higher than those in other groups. This suggests that individuals in the High Risk group not only endure intense societal pressures related to weight issues but also lack effective emotion regulation strategies. Consequently, they may adopt NSSI as a coping mechanism to alleviate internal distress caused by shame, anxiety, or depression. These findings align with Hack et al. (2018), who noted that NSSI behaviors are often used to manage negative emotions, particularly when individuals feel helpless or ashamed.

The Moderate Risk group demonstrated NSSI scores lower than the High Risk group but higher than the Low Risk group, highlighting their psychological vulnerability. Although their emotional distress has not yet escalated into severe behavioral problems, these university students are accumulating risk over time. Without effective intervention, they may progress toward higher-risk statuses. Moderate-risk individuals represent a critical target for early intervention. This pattern is consistent with the cultural dynamics of appearance-related pressure.

University students in the Low Risk group exhibited the lowest NSSI risk due to minimal external pressures and robust family and social support systems. These individuals often possess strong psychological resilience, enabling them to navigate life challenges effectively. Protective factors such as a positive body image and high self-esteem are pivotal in reducing NSSI risk (Qin et al., 2024).

4.1 Advantages and Insights

The strength of this study lies in its use of latent profile analysis, an advanced statistical method, which has successfully revealed the latent classifications of university students in multiple risk factors such as weight discrimination, weight stigma, body shame, and avoidant and restrictive eating disorders. This approach allows the study to identify groups with different levels of risk, which is crucial for developing targeted intervention measures. Specifically, the two main latent profiles identified in the study—"High Body Shame Risk Group" and "Physical High Stigma and Shame Risk Group"—provide new perspectives on how university students exhibit heterogeneity in these risk factors. The data show that 74% of the sample belongs to the "High Body Shame Risk Group," while 26% belong to the "Physical High Stigma and Shame Risk Group." This distribution characteristic has significant guidance value for the design of mental health intervention strategies. For instance, university students in the "Physical High Stigma and Shame Risk Group" may require more attention to building their self-esteem and self-image, as well as education on anti-discrimination and anti-stigma.

The innovative aspect of this study is its combination of weight and appearance risk factors with individual behavioral risk factors to explore how these factors collectively impact the level of psychological crisis in university students. Through joint latent profile analysis, the study identified three statistically significant latent categories: "Low-Risk-Low Eating Disorder Group," "Moderate Risk-Moderate Eating Disorder Group," and "High-Risk-High Eating Disorder Group." The discovery of these categories not only enriches our understanding of the factors influencing psychological crises in university students but also provides possibilities for more precise mental health assessment and intervention. The data show significant differences in NSSI behaviors among different categories of university students, emphasizing the cumulative effect of environmental risk factors and individual behavioral risk factors in predicting psychological crises in university students. Given the cumulative effect of these factors, comprehensive intervention programs that include family, school, and community levels can be designed. For example, strengthening family support systems, improving school environments, and increasing positive community activities can collectively promote the mental health of university students.

Based on the data analysis results, diversified, personalized, and comprehensive intervention measures can be taken for adolescent mental health issues. For university students in the "Moderate Risk-Moderate Eating Disorder Group" and "High Risk-High Eating Disorder Group," psychological education and counseling can be provided to help them establish a healthy self-perception, learn effective coping strategies, and increase their awareness of risk factors for eating disorders. Given the impact of weight discrimination, weight stigma, and body shame on adolescent mental health, anti-discrimination, and anti-stigmatization educational activities should be carried out to raise public awareness of these issues and reduce the negative social impact on university students. By cultivating positive developmental qualities in university students, such as self-efficacy, resilience, and social skills, they can better cope with stress and challenges, reducing the occurrence of psychological crises. Using latent profile analysis, regular mental health assessments and monitoring of adolescent groups can be conducted to identify new risk groups and trends promptly, providing a basis for adjusting intervention measures.

In summary, this study provides new insights into the complexity of adolescent psychological crises and their influencing factors by applying advanced statistical methods and conducting in-depth data analysis. It also offers valuable directions for future mental health intervention research and practice.

4.2 Limitations and prospects

This research offers a significant understanding of how adolescent weight and appearance risks are linked to ARFID and NSSI. However, it is not without its limitations, which should be addressed. Firstly, the data primarily relies on self-reported responses from participants, which may not accurately reflect their actual psychological states and behavioral patterns. Although self-reporting is a common method for data collection, it is susceptible to individual cognitive biases and memory errors. For instance, participants might not accurately recall past eating behaviors or their feelings about their weight and appearance, which could be influenced by their current emotional state.

Secondly, in addition to weight and appearance risk factors, other variables not considered in this study may also impact eating disorders and NSSI. For example, individual coping strategies, social support, and genetic factors may play a significant role in the development of these behaviors. Future research should consider including these potential moderating or mediating variables to more comprehensively understand the complexity of the issues.

Lastly, while this study identified distinct risk profiles, there is a lack of discussion on how these profiles respond to different intervention strategies. Understanding the response of different risk profiles to interventions could help develop more personalized and effective prevention and intervention measures. Future research could explore how to tailor intervention plans based on individuals' risk profiles.

In summary, despite these limitations, this study provides an in-depth understanding of the relationships between adolescent weight and appearance risk factors, eating disorders, and non-suicidal self-injury behaviors, and offers valuable directions for future research and practice.

5 Conclusion

This study explores the relationship between weight-appearance risk factors, avoidant/restrictive food intake disorders (ARFID), and non-suicidal self-injury (NSSI) behaviors in university students. Through latent profile analysis, two primary risk groups and three combined profiles were identified, illustrating diverse psychological challenges within the population. The findings emphasize body shame as a critical factor influencing NSSI, particularly in high-risk individuals, reflecting the combined impact of societal pressures and personal vulnerabilities. These results underscore the importance of tailored interventions, such as promoting healthy body image, reducing stigma, and providing timely support to at-risk groups, to improve mental health outcomes for university students.

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