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移民身分與飲食行為：自尊做為中介因子

Immigrant Status and Eating Behaviors: The Mediating Role
of Self-Esteem

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移民身分與飲食行為：自尊做為中介因子

(Thesis Chinese Title)

Immigrant Status and Eating Behaviors: The Mediating
Role of Self-Esteem

(Thesis English Title)

本論文係 陳冠偉 君 (學號 **R11853013**) 在國立臺灣大學全球衛生碩士學位學程完成之碩士學位論文，於民國 年 月 日承下列考試委員審查通過及口試及格，特此證明。

This Thesis is written by Shawn Tran (R11853013) studying in the graduate program in the Global Health Program. The author of this thesis is qualified for a master's degree through the verification of the committee.

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摘要



緒論：自尊與青少年的飲食行為障礙密切相關。然而，有關移民身份與台灣飲食行為之間相互作用的研究仍然稀少，特別是針對第二代移民。本研究旨在探討台灣移民與非移民青少年中移民身份與飲食行為之間的關聯，並研究自尊的中介作用。

研究方法：本研究數據來源於 2023 年進行的一項橫斷面調查。最終分析包括新北市某高中的 27 個班級共 786 名 15 至 18 歲的青少年。採用飲食態度測驗 (Eating Attitudes Test, EAT-26) 和三因子飲食問卷-R18 (Three-Factor Eating Questionnaire, TFEQ-R18) 評估青少年的飲食行為，並使用羅森伯格自尊量表 (Rosenberg Self-Esteem Scale, RSES) 評估自尊。數據分析使用 STATA 進行，並通過路徑分析探討移民與非移民青少年的飲食行為途徑。

結果：在所有路徑分析模型中，移民身份與自尊之間均呈顯著負相關 ($\beta = -1.395$, $p = 0.030$)。自尊與除認知控制以外的所有飲食行為均呈顯著相關。其中，飲食紊亂表現出最大的間接效應值 ($\beta = 0.095$ ，未控制變量； $\beta = 0.288$ ，控制變量)，其次是無節制飲食 ($\beta = 0.125$ ，未控制變量； $\beta = 0.118$ ，控制變量)，以及情緒性飲食 ($\beta = 0.095$ ，未控制變量； $\beta = 0.087$ ，控制變量)。值得注意的是，移民身份對飲食行為的直接影響在所有模型中均不顯著。

討論：本研究提供了證據表明，移民身份並不直接影響飲食行為，而是可能通過低自尊等因素間接影響飲食行為。公共衛生從業者應實施針對父母和學校的教育計劃，以促進健康素養、文化包容性、身體自信和自尊。未來研究應探討低自尊的深層原因，以揭示移民與非移民青少年異常飲食行為的其他影響途徑。

關鍵字：移民、自尊、飲食行為、青少年

Abstract



Introduction: Self-esteem has been linked to eating behavior disturbances in adolescents. However, there is sparse research on the interaction between immigrant status and eating behaviors in Taiwan, especially for second-generation immigrants.

This study examines the association between immigrant status and eating behaviors in immigrant and non-immigrant adolescents in Taiwan, exploring the mediating role of self-esteem.

Methods: The data derived from a cross-sectional survey conducted in 2023. Seven hundred eighty-six adolescents aged 15 to 18 years from 27 classes in a senior high school in New Taipei City were included in the final analysis. The Eating Attitudes Test (EAT-26) and the Three Factor Eating Questionnaire-R18 (TFEQ-R18) were used to assess adolescents' eating behaviors. Self-esteem was evaluated using the Rosenberg's Self-Esteem Scale (RSES). STATA was employed for statistical analysis, and path analyses were conducted to explore the eating behavior pathways for immigrant and non-immigrant adolescents.

Results: Across all path analysis models, there was a negative association between immigrant status and self-esteem ($\beta = -1.395$, $p = 0.030$). Self-esteem was significantly associated with all eating behaviors except cognitive restraint. Notably, disordered eating showed the largest indirect effect sizes ($\beta = 0.095$ without controls; $\beta = 0.288$ with controls), followed by uncontrolled eating ($\beta = 0.125$ without controls; $\beta = 0.118$ with controls) and then emotional eating ($\beta = 0.095$ without controls; $\beta = 0.087$ with controls). Importantly, the direct effect of immigrant status on eating behaviors was not significant in any model.

Discussion: This study provides evidence that immigrant status does not directly affect eating behaviors but rather may influence them indirectly through factors such as low

self-esteem. Public health practitioners should implement parental and school-based education programs to promote health literacy, cultural inclusivity, body confidence, and self-esteem. Future research should investigate the underlying causes of low self-esteem to determine other pathways to abnormal eating behaviors for immigrant and non-immigrant adolescents.

Keywords: immigration, self-esteem, eating behaviors, adolescents

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1. Introduction

1.1 Immigrants in Taiwan

Throughout Taiwanese history, two notable policies were established to promote business expansion between Taiwan and countries in the Association of Southeast Asian Nations. One was the Go South policy introduced in 1994 and the second one being the New Southbound Policy in 2016.

The Go South policy was aimed at redirecting Taiwanese investments from China to Southeast Asia, enhancing economic ties, and fostering political relations with target countries (Hsu, 2017). Introduced by Taiwan's Ministry of Economic Affairs in 1994, this policy covered seven Southeast Asian countries, including Vietnam, Thailand, Philippines, Malaysia, Indonesia, Brunei, and Malaysia. This later expanded to include other Southeast Asian countries like Cambodia, Laos, Myanmar, and India, and extended beyond Southeast Asia to Australia and New Zealand (Hsu, 2017). Despite initial success, investments shifted to China in the 2000s due to various barriers and the growing appeal of the Chinese market (Hsu, 2017).

The New Southbound policy was announced in 2016. Regarded as a renewal of the Go South policy but with a broader geographic scope, the New Southbound policy expanded the target countries to include five South Asian countries—Pakistan, Bangladesh, Nepal, Sri Lanka, and Bhutan—along with ASEAN countries, India, Australia, and New Zealand (Hsu, 2017). Along with aiming to enhance economic cooperation with target countries, the policy also seeks to foster more educational and people-to-people exchanges to create a mutually beneficial cooperation model (Hsu, 2017).

These policies not only contributed to increased international cooperation and exchange but also contributed to a substantial increase in transnational marriages. From



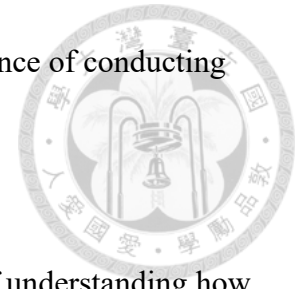
2010 to 2020, there has been an increase in transnational marriages in Taiwan.

According to the latest summary report from the 2020 Population and Housing Census, Southeast Asian marriage migrants saw the largest increase, with their numbers rising from 115,947 to 134,705 (National Statistics Bureau, the Republic of China, 2020).

Meanwhile, China marriage migrants, including migrants from Hong Kong and Macau, experienced a marginal increase from 159,730 to 161,241, while foreign spouses from other countries rose from 10,381 to 16,814 (National Statistics Bureau, the Republic of China, 2020). This amounts to a total of 312,760 transnational marriages, of which 51.6% come from Mainland China and 43.1% from Southeast Asia. Foreign brides accounted for 283,136 (90.5%) of transnational marriages, compared to 29,624 (9.5%) for males (National Statistics Bureau, the Republic of China, 2020). Notably, the number of males increased by 31% from 2010 to 2020 (National Statistics Bureau, the Republic of China, 2020). Immigrant mothers from China and Southeast Asia had significantly lower educational attainment and socioeconomic status compared to local Taiwanese mothers (Wu et al., 2015). These trends were also reflected in their households, with Taiwanese families exhibiting higher educational levels and monthly incomes (Wu et al., 2015).

The challenges experienced by first-generation immigrants trickle down to their children, adding a unique cultural dimension to the upbringing of second-generation immigrants. The biculturative stress they experience from having to manage both original and new cultural identities serves as a potential risk factor for a number of health issues, such as higher rates of depression, psychosomatic symptoms, and unhealthy eating behaviors compared to their native counterparts (Pagan Rivera, 2015; Simmons & Limbers, 2018; Stevens et al., 2015; Tsong & Smart, 2015). Overall, these trends underscore the continuing growth and disparity in immigrant communities in

Taiwan, particularly second-generation immigrants, and the importance of conducting research on this evolving demographic.



1.2 Disordered Eating Among Adolescents in Taiwan

The growing diversity in Taiwan highlight the importance of understanding how cultural norms and perceptions shape health behaviors and outcomes. Over the years, Taiwan has become more westernized, adopting western values and norms (L.-J. Chen et al., 2010). Similarly, beauty standards reflect a convergence of both traditional Chinese and Western beauty ideals. In traditional Chinese culture, the criterion of beauty is associated with fair skin and slender body (Huang & Chiang, 2013). Western cultures have also introduced the image of thinness as a standard of attractiveness (L.-J. Chen et al., 2010). While the cultural underpinnings differ slightly, both promote extremely thin body ideals, which can contribute to body image issues.

These issues are exacerbated among immigrants who, given their minority status and desire for peer acceptance, may be at a higher risk for experiencing body image concerns and eating behavior disturbances (D.-R. Chen, Lin, & Hsiao, 2023). Body image concerns have been shown to be negatively associated with self-esteem, with adolescents who perceive their bodies unfavorably often experiencing lower self-esteem (Jankauskiene & Baceviciene, 2019; L.-J. Chen et al., 2010; Ruggiero et al., 2003; Tiggemann, 2005). However, research on the effects of immigration and acculturation on stress-externalizing behaviors such as disordered eating has been limited. One study investigating Taiwanese adolescents found immigrant status to be directly associated with disordered eating (Chen, Lin, & Levin, 2023). Therefore, this study builds on the current literature by examining the pathway through which self-esteem in immigrant and non-immigrant adolescents may be impacted by social and cultural pressures, and their potential influence on eating behavior.

1.3 Self-Esteem and Abnormal Eating Behaviors in Adolescents

Body image plays a pivotal role in how individuals perceive themselves, and this perception is deeply associated with self-esteem (L.-J. Chen et al., 2010; Claudat et al., 2015; Noh et al., 2018). Body overestimation, defined as perceiving oneself as overweight despite being within normal or underweight range, is more prevalent than body underestimation, which is perceiving oneself as underweight despite being within normal or overweight range (Jiang et al., 2023). In particular, adolescents who overestimate their body weight exhibit higher body dissatisfaction, lower self-esteem, and unhealthy eating behaviors (Jankauskiene & Baceviciene, 2019; Jiang et al., 2023, Kim et al., 2023). Many individuals—especially adolescents—struggle with concerns over their body image, which can lead to low self-esteem, depression, anxiety, and eating behavior disturbances (L.-J. Chen et al., 2010; Noh et al., 2018; Puhl & Heuer, 2009).

Adolescence is a particularly vulnerable period for body image issues, as young people undergo rapid physical development and begin to form self-conceptions of their own body image (H. Chen & Jackson, 2009; L.-J. Chen et al., 2010; Claudat et al., 2015). During this period, adolescents are influenced not only by societal standards of beauty portrayed through media representations but also by the social pressures of family and peers, which may lead to heightened appearance-related stress and low self-esteem.

Self-esteem, in particular, plays a pivotal role in shaping adolescents' eating behaviors, as shown in literature. Multiple studies across various contexts have shown that lower self-esteem can increase the risk of disordered eating behaviors, often mediated by factors like body dissatisfaction and depression (Brechan & Kvalem, 2019; Krauss et al., 2023; Malik et al., 2024; Mallaram et al., 2023; Pelc et al., 2023;

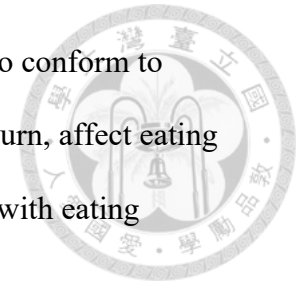
Silverstone, 1992). One study found that low self-esteem led to higher disordered eating tendencies in young adults, particularly among females (Sanlier et al., 2017). Another study, conducted among college students in Norway, revealed how the effect of body dissatisfaction on disordered eating was fully mediated by self-esteem and depression (Brechan & Kvaem, 2019). Furthermore, a meta-analysis of longitudinal studies concluded that low self-esteem and eating pathology mutually reinforce one another, suggesting a reciprocal relations model of low self-esteem and eating disorders (Krauss et al., 2023).

While prior studies have highlighted the critical role of self-esteem in shaping eating behavior, little is known about how this factor interacts within immigrant populations, especially in non-Western contexts. Furthermore, few studies look at children of immigrants, who, despite sharing a similar appearance and language to locals, can still face acculturative stress and discrimination, which has been associated with higher levels of emotional eating among Latino adolescents (Berry & Hou, 2017; Simmons & Limbers, 2018). In another study, second-generation Asian American women reported substantially more disordered eating than their first- and third-generation counterparts (Tsong & Smart, 2015). As such, the current study seeks to expand on the existing body of literature by examining the relationship between immigrant status, self-esteem, and eating behavior among adolescents in Taiwan. Focusing on self-esteem as a mediating factor could shed light on the psychological mechanisms that contribute to unhealthy eating patterns in the immigrant population.

1.4 Conceptual Model

As shown in Figure 1, this study hypothesizes that eating behavior disturbances in immigrant and non-immigrant adolescents are influenced by a dual pathway model mediated by self-esteem. In one pathway, immigrant status impacts self-esteem due to

sociocultural factors such as perceived discrimination and pressure to conform to mainstream beauty standards, which may lower self-esteem and, in turn, affect eating behaviors. In the second pathway, self-esteem is directly associated with eating behaviors.



The theoretical model is based on the minority stress framework, which posits that members of disadvantaged social groups experience unique stressors related to their minority identity (Valentín-Cortés et al., 2020). Immigrants, specifically, are exposed to stressors related to acculturation, which is defined as the process by which individuals adopt the beliefs and behaviors of another cultural group (Balidemaj & Small, 2019). Over the years, the concept of acculturation has evolved, especially regarding its directionality and dimensionality. There was an assumption that all immigrants move in a linear process from their heritage culture to the mainstream culture. However, Berry (1997) expanded this concept by proposing the bidimensional acculturation theory, which suggests four acculturation strategies: assimilation, integration, separation, and marginalization. These strategies highlight how acculturation proceeds in diverse ways and contributes to the development of different identities in society.

The minority stress model offers a framework for understanding how stressors related to marginalized group membership, such as immigrant status, can compound these challenges (Pittman et al., 2017). Minority stress can manifest in the form of external stresses, such as perceived discrimination and pressures to assimilate, as well as internal stressors, like internalized anti-immigrant sentiment and low self-esteem (Berry & Hou, 2016; Dentato et al., 2013; Garbade et al., 2023; Phinney et al., 2006; Valentín-Cortés et al., 2020). In the case of second-generation immigrants, who are born in the host country and have at least one foreign-born parent, these stressors are slightly different as they navigate simultaneous acculturation to two cultures, their

heritage and host culture (Schwarz & Pfammatter, 2024). Although they may be perceived as fully integrated due to their resemblance with locals in terms of appearance and language, second-generation immigrants may still face discrimination if their immigrant background is known or internalize the stigma faced by their immigrant parents. These unique socially-based stressors add to general life stress and adversely affect health behavior and outcomes, like eating behaviors, in this group. For adolescents, who are in the process of forming their cultural identities, these stressors can be particularly impactful.

Perceived discrimination, the awareness of having received negative treatment due to being a member of a certain group, is a well-known social stressor that affects many marginalized groups, including second-generation immigrants (Espinosa, 2020). A common form of discrimination involves actions or comments that reinforce cultural stereotypes. Adolescents are most likely to experience discrimination at school, where they spend a majority of their time, but they can also encounter discrimination in other settings, such as in family environments and online interactions (Brown, 2015). They also encounter other forms of perceived discrimination at the intersection of marginalized identities (e.g., gender, religion, disability, sexual identity, education level, socioeconomic status). Additionally, observing their parents experience being discriminated can lead these adolescents to internalize their parents' struggles. Any form of perceived discrimination, especially culture-based, can interfere with the identity formation process and affect their sense of belonging to their social environment. In turn, feeling less valued or important within their social environment leads to lower self-esteem, depression, anxiety, and other mental health difficulties (Espinosa, 2020). As such, second-generation immigrants, who are more susceptible to

perceived discrimination, face a higher risk of lower self-esteem, which can lead to eating behavior disturbances.

Immigrant adolescents are especially vulnerable and may experience a lack of belonging because their cultural identities are still in the process of forming. Many have reported confusion in their cultural identities, such as a lack of belonging and a feeling of being unwelcome (Kayama & Yamakawa, 2020). This time of their lives is a critical development stage in which children become deeply involved in learning about their ethnicity, potentially leading to constructive behaviors that reaffirm the legitimacy and value of their group or to feelings of insecurity, confusion, or resentment (Phinney et al., 2006). The extent to which individuals are able to reconcile their cultural identities is predictive of their psychological well-being. Those who perceive their cultural identities as compatible tend to experience higher self-esteem and fewer mental health problems than adolescents who view their identities as conflicting (Espinosa, 2020).

The minority stress framework provides valuable insight into how marginalized identities, such as immigrant status, contribute to adverse health behaviors. Minority stress paradigms are crucial because they recognize that the stressors experienced by marginalized individuals stem from social, cultural, and structural systems that reinforce their minority status (Pittman et al., 2017). In the context of immigrant adolescents, minority stress can manifest through disruptions in self-esteem and consequently result in unhealthy coping mechanisms such as unhealthy eating behaviors.

The study examines the indirect effects of immigrant status on eating behavior through self-esteem, proposing that being an immigrant does not inherently affect eating behaviors. Rather, this risk is mediated by self-esteem and cultural stressors. By testing these pathways, this study aims to understand how social and cultural factors contribute to health disparities among immigrant adolescents in Taiwan.

1.5 Study Aim

This study aims to assess potential health disparities in eating behaviors among immigrant and non-immigrant adolescents from 15 to 18 years old in a senior high school in New Taipei City. By examining the mediating role of self-esteem on immigrant status and eating behavior, this study also aims to highlight the unique factors that contribute to the development of eating behavior disturbances in Taiwanese adolescents. Ultimately, this study will hopefully inform future research on risk and protective factors pertaining to immigrant adolescents in Taiwan, thereby contributing to the development of targeted interventions and support systems for this vulnerable population.

1.6 Hypotheses

The study tests the following hypotheses regarding the relationship between immigrant status, self-esteem, and eating behavior:

Hypothesis 1. Immigrant status is negatively associated with self-esteem in adolescents.

Hypothesis 2. Self-esteem is negatively associated with eating behavior disturbances as measured by the EAT-26 and TFEQ-R18 scales.

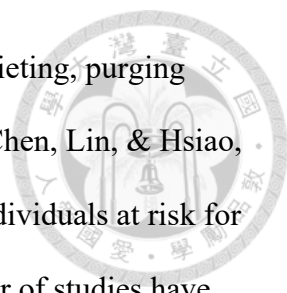
Hypothesis 3. Immigrant status will indirectly affect eating behavior through the mediating role of self-esteem.

2. Literature Review

2.1 Definitions and Measurements

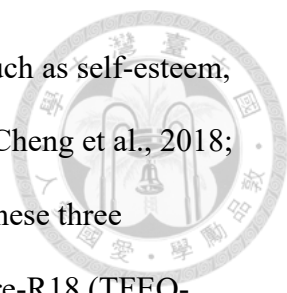
Eating behavior encompasses a range of attitudes and practices related to food intake. This study looks at four dimensions of eating behavior—disordered eating, uncontrolled eating, emotional eating, and cognitive restraint.

Disordered eating are attitudes and behaviors linked to clinical eating disorders such as bulimia nervosa, anorexia nervosa, and binge eating disorder (Mortaş et al.,



2023). They capture a wide range of symptoms, including frequent dieting, purging behaviors, skipped meals, body image concerns, and fasting (D.-R. Chen, Lin, & Hsiao, 2023). Its comprehensive nature makes it effective for identifying individuals at risk for other health complications, especially mental health issues. A number of studies have proven the association between disordered eating and mental health symptoms like anxiety, depression, body dissatisfaction, psychological distress, and low self-esteem (Brechan et al., 2015; D.-R. Chen et al., 2022; D.-R. Chen, Lin, & Levin, 2023; Claudat et al., 2015; Krauss et al., 2023; Malik et al., 2024; Mumtaz et al., 2024; Pelc et al., 2023; Petisco-Rodríguez et al., 2020). The current study uses the Eating Attitudes Test (EAT-26) to assess disordered eating, which has been widely used to screen for disordered eating among adolescents in both Western and non-Western contexts, including Taiwan (Al Banna et al., 2021; Fadipe et al., 2017; Montoro-Pérez et al. 2024; Nunes et al., 2006; O'Hara et al., 2016; Sim et al., 2024; Tsai et al., 2011; Yu et al., 2015; Wong et al., 2014). Previous studies using the EAT-26 to measure disordered eating have reported good internal reliability (Chen et al., 2022; Swarnameenaa et al., 2023; Tseng et al., 2014).

Uncontrolled eating, emotional eating, and cognitive restraint can be associated with disordered eating. Uncontrolled eating is the tendency to overeat, with the feeling of being out of control. Emotional eating is the tendency to eat in response to negative emotions. Cognitive restraint is the tendency to consume less food than one would like to eat. However, unlike disordered eating, they represent distinct dimensions of eating behavior that can occur in both healthy and unhealthy contexts. For instance, cognitive restraint reflects the intentional regulation of food intake, which in moderation could be part of healthy dieting or, in excess, could lead to disordered eating behaviors. As such, they offer a more nuanced look into the spectrum of eating behaviors. Similarly, they



also offer insight into various aspects of psychological well-being, such as self-esteem, body dissatisfaction, emotional distress, and psychological distress (Cheng et al., 2018; C.-Y. Lin et al., 2020; P. Wang et al., 2022; Z. Wang et al., 2020). These three dimensions are measured using the Three Factor Eating Questionnaire-R18 (TFEQ-R18), another extensively utilized tool to assess eating behavior in both Western and non-Western contexts (Anglé et al., 2009; Bonn et al., 2022; Chong et al., 2016; De Lauzon et al., 2004; Lin, Wei & Yi-Chin Lin, 2004; O'Brien et al., 2016; Ruckwongpatr et al., 2022). Previous validations of the TFEQ-R18 from studies conducted in Taiwan, China, and Hong Kong have demonstrated good internal reliability (Kong et al., 2013; Cheng et al., 2018; Ruckwongpatr et al., 2022).

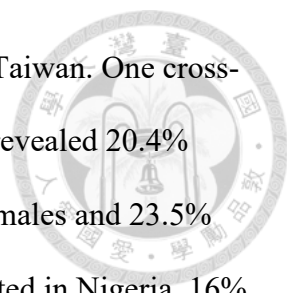
Self-esteem, according to the Evolutionary Psychology Theory, is defined as a psychological estimate of the extent to which individuals are valued by their family, peers, and society (Espinosa, 2020). Several studies conducted in diverse cultural contexts have noted that low self-esteem is linked to eating behavior disturbances (Brechan & Kvaem, 2015; Kong et al., 2013; Krauss et al., 2023; Malik et al., 2024; Mallaram et al., 2023; Pelc et al., 2015). There are several reasons why self-esteem is a relevant factor to look at when studying immigrant adolescents in Taiwan. Firstly, adolescence is a period where individuals undergo identity formation and are heavily influenced by the perceptions of their peers and society (Espinosa, 2020). This is even more so the case for immigrants in Taiwan, where they are a minority in an otherwise homogeneous society, making them more susceptible to perceived discrimination in the school environment (Espinosa, 2020). In this study, immigrants are defined as individuals whose parent(s) are classified as foreign. As such, research on self-esteem is relevant to this thesis. To measure levels of self-esteem, the present study uses Rosenberg's Self-Esteem scale, which has been commonly used among adolescent

populations all over the world (C.-Y. Lin et al., 2019; Frierio et al., 2021; Petisco-Rodríguez et al., 2020). The internal reliability has been validated in other studies (Ko et al., 2005; Yen et al., 2013).



2.2 Prevalence of Disordered Eating in Developed and Developing Countries

Studies examining disordered eating among Taiwanese adolescents frequently use the EAT-26 to assess its prevalence, with scores of 20 or above indicating disordered eating. Focusing specifically on female junior high school students, one study involving 835 participants in Taiwan found that 10.4% exhibited disturbed eating attitudes/behaviors (Tsai et al., 2011). Looking at an older population, a survey of senior high school students in Taiwan reported a lower prevalence of disordered eating, 8.6% (Wong et al., 2014). The difference in prevalence rates may be due to age and sex differences in the two study populations. A study further examined the role gender plays in disordered eating and found that while there was no difference in prevalence rate, there were gender-specific patterns noticed in their eating behaviors (D.-R. Chen et al., 2022). Adolescent girls expressed a strong preoccupation with thinness, whereas boys were more likely to exhibit extreme behaviors such as vomiting, fasting, and avoiding sweets. Similar to Tsai et al. (2011), another study involving junior high school students in New Taipei City reported an overall prevalence of disordered eating was 11.4% (D.-R. Chen, Lin, & Levin, 2023). There was a notable difference based on immigrant status, with 16.9% of immigrant adolescents and 9.6% of native adolescents exhibiting disordered eating behaviors (D.-R. Chen, Lin, & Levin, 2023). This variation indicates that immigrant adolescents might face unique stressors contributing to disordered eating, highlighting the need for further research investigating these stressors and understanding immigrant adolescents' mental health.



The EAT-26 has also been applied to populations outside of Taiwan. One cross-sectional study conducted among university students in Bangladesh revealed 20.4% students in the sample had EAT-scores 20 or above—17.2% among males and 23.5% among females (Al Banna et al., 2021). According to a study conducted in Nigeria, 16% of Nigerian adolescents and young people displayed abnormal eating attitudes, with a higher prevalence among females (21.9%) than males (11.6%) (Fadipe et al., 2017). This gender difference was also evident in a sample of adolescents in the Northwest of Iran, in which 24.2% of students were at risk of eating disorders, as well as in a sample of adolescents in Brazil, in which 13.3% of students were at risk of eating disorders (Rauof et al., 2015; Vilela et al., 2004). In Western contexts, a similar trend was observed, with 8.3% of males and 17.3% of females attending Canadian high schools scoring 20 or above on the EAT-26 and 4% of males and 14% of females attending the American high schools (Haines et al., 2011; Jonat & Birmingham, 2004). While a substantial body of literature has examined gender differences in the prevalence of disordered eating, there has been less focus on the prevalence of disordered eating among immigrant populations. In particular, there is a gap in the literature on disordered eating disparities for immigrant populations living in non-Western contexts, such as Taiwan.

2.3 Factors Associated with Eating Behaviors

Numerous studies have analyzed the impact of gender on eating behavior, with adolescent girls reporting a higher prevalence of disordered eating than adolescent boys (Al Banna et al., 2021; D.-R. Chen et al., 2022; Fadipe et al., 2017; Haines et al., 2011; Jonat & Birmingham, 2004; Rauof et al., 2015; Vilela et al., 2004). The sex disparity could be attributed to higher rates of body dissatisfaction among girls, which is a recognized risk factor for eating behavior disturbances (Brechan & Kvaalem, 2015; Chen

& Jackson, 2009; Ruggiero et al., 2002; Tiggemann, 2015). This trend has been observed in research conducted among Taiwanese adolescents, with girls showing higher levels of body dissatisfaction compared to boys (Chang et al., 2013; L.-J. Chen et al., 2010; Wong et al., 2014). These studies found that girls are more susceptible to body dissatisfaction, largely due to higher media exposure to thin ideals, greater media pressure, and stronger internalization of these ideals (Chang et al., 2013; L.-J. Chen et al., 2010).

Age is another demographic variable that has been analyzed in many studies concerning eating behavior among adolescents (Fadipe et al., 2017; O'Brien et al., 2015; Pelc et al., 2023; Vilela et al., 2004). Some studies show that disordered eating behaviors peak during early adolescence, specifically between the ages of 11 and 16 (Pelc et al., 2023; Vilela et al., 2004). This period aligns with developmental transitions and the beginning of secondary education in which adolescents, particularly girls, are navigating changes in social and academic environments. Another study conducted among Nigerian undergraduate students found that older respondents were more likely to experience abnormal eating attitudes, which could be attributed to a desire for older students to fit in with their younger peers (Fadipe et al., 2017). These studies consistently highlight the role of demographic and social factors such as age, peer influence, and group identification. These findings are further supported by studies conducted in Taiwan showing gender and immigrant status to be key factors linked to disordered eating behaviors (D.-R. Chen et al., 2022; D.-R. Chen et al., 2023). Specifically, immigrant adolescents reported a higher prevalence of disordered eating than their native counterparts, influenced by distinct social stressors such as friend weight teasing and weight overestimation whereas family weight teasing influenced eating behavior for native adolescents (D.-R. Chen et al., 2023). Therefore, immigrant

status as well as family and school environments play an important role in shaping overall adolescent well-being.

Various versions of the TFEQ have been applied to the adolescent population in Taiwan (Lin, Wei & Yi-Chin Lin, 2004; Y.-W. Lin et al., 2021; Ruckwongpatr et al., 2022). Unlike the EAT-26, the TFEQ does not have a set cutoff to define disordered eating, rather, the higher the score indicates a greater degree of unhealthy eating behavior. The TFEQ-R18 was used in a cross-regional study of Taiwanese and Hong Kongese university students and found perceived weight stigma to be a significant predictor of eating disturbances across all three TFEQ domains (uncontrolled eating, emotional eating, and cognitive restraint) for both genders (Ruckwongpatr et al., 2022). Using the TFEQ-R18, another study looked specifically at emotional eating among parents and children in Taiwan and revealed significant correlation between parents' and childrens' emotional eating (Li, 2023).

The TFEQ-R18 has also been extensively used outside of Taiwan. Investigating the relationship between body dissatisfaction and cognitive restraint among Chinese female college students, one study employed the TFEQ-R18 and found that the two variables were directly and indirectly affected through the mediation of self-esteem (Kong et al., 2013). In a study involving undergraduate students in Hong Kong, weight bias proved to be significantly associated with dimensions of TFEQ-R18, where emotional eating was observed in self-perceived overweight individuals and cognitive restraint was observed in self-perceived non-overweight individuals (Cheng et al., 2018).

Furthermore, a cross-sectional study in a French population distinguished various eating patterns among teenagers and young adults, with different levels of energy intake influencing different eating behaviors among females and males (De

Lauzon, et al., 2004). For girls, lower energy intake was associated with higher cognitive restraint, whereas for boys, higher energy intake was associated with uncontrolled eating (De Lauzon, et al., 2004). Using the TFEQ-R18, other observations on eating behaviors were made, such as higher snack food intake and lower energy-dense food intake being associated with cognitive restraint (De Lauzon, et al., 2004). By incorporating both EAT-26 and TFEQ-R18 into this research, it will provide a more comprehensive understanding of eating behaviors. This will add to the current literature on eating behaviors among adolescents in Taiwan, which has primarily relied on EAT-26 to assess eating behavior.

2.4 Self-Esteem and Eating Behavior

A number of studies conducted in Western and Eastern settings measure the effect of self-esteem on eating behaviors. Meta-analytical evidence highlights a reciprocal relationship between low self-esteem and various forms of eating pathology, including restrained eating, bulimic behavior, and binge eating (Krauss et al., 2023). Self-esteem also interacts with other factors such as depressive symptoms and body dissatisfaction to influence bulimic behavior and restrictive eating (Brechan & Kvaalem, 2015). Furthermore, mechanisms like body disinvestment and internalization of appearance ideals have been found to mediate the relationship between self-esteem and disordered eating (Cella et al., 2021; Malik et al., 2024). One study conducted among primary and secondary school students in the Subcarpathian region found that females, compared to males, reported lower levels of self-esteem and higher dissatisfaction with their appearance, which is associated with higher risks of engaging in uncontrolled binge eating and excessive exercising (Pelc et al., 2023).

In Taiwan, there is a lack of English-language studies measuring the effect of self-esteem on eating behaviors. A 2010 study sampling Taiwanese adolescents aged

12-16 found that the effect of self-esteem diminished when factoring other predictors like BMI and the internalization of socio-cultural appearance ideals (L.-J. Chen et al., 2010). The limited research on self-esteem and eating behavior in Taiwan highlights the need for further research on the complex interplay of socio-cultural factors and self-esteem in influencing eating behaviors among Taiwanese adolescents.

2.5 Acculturation, Acculturative Stress and Eating Behavior

Acculturation is defined as the process by which individuals adopt the beliefs and behaviors of another cultural group (Balidemaj & Small, 2019). This is commonly experienced by minority groups, who often feel pressured to adjust to mainstream cultural norms, behaviors, and societal expectations. The stress of navigating unfamiliar social and cultural environments can trigger acculturative stress, a form of psychological stress, which has been linked to maladaptive coping mechanisms such as eating disinhibition (uncontrolled eating and emotional eating) and disordered eating (D.-R. Chen et al., 2023; Claudat et al., 2016; Kalantzis et al., 2023; P. Wang et al., 2022; Warren & Akoury, 2020).

Few studies in Taiwan examine the impact of acculturation on eating behaviors, but studies conducted from other contexts offer insight into the potential mechanisms for the present study. A systematic review of research on thin-ideal internalization, acculturation, and eating pathology found positive correlational relationships between the three constructs (Warren & Akoury, 2020). This may be particularly relevant for second-generation immigrants in Taiwan, whose exposure to Western and East Asian beauty standards might amplify the pressure to conform to thin ideals, potentially heightening the risk of eating behavior disturbances. Another study conducted among Asian young adults found acculturative stress and eating disinhibition to be indirectly associated via depressive symptoms (P. Wang et al., 2022). These studies provide a

framework for understanding the potential pathways through which acculturation influences eating behavior in Taiwanese adolescents.



3. Data and Methods

3.1 Study participants

The study analyzes data from “A Study on Risk Factors of Disordered Eating in a Sample of High School Students in Taiwan,” designed and conducted by Professor Duan-Rung Chen in 2023. This project consisted of a cross-sectional, structured survey questionnaire written and administered in Mandarin. Study participants and their legal guardians gave written informed consent before responding to the survey questionnaire. 957 adolescents from 27 classes across grades 1, 2, and 3 in a senior high school in New Taipei City were recruited through convenience sampling for participation in this study. Of these, 171 participants were excluded from the study due to either incomplete information regarding their parents’ informed consent or insufficient data on variables of interest. The overall response rate was 82.13%, resulting in a total of 786 senior high school students being included for data analysis. Within this sample of 786, there were no missing values across all variables in the dataset. Specifically, response rates were relatively consistent across grades: 79.75% for grade 1, 86.69% for grade 2, and 79.87% for grade 3. The study participants were between 15 to 18 years old, with a mean age of 16.54 years old (standard deviation = 0.95). The study was approved by Taiwan’s Research Ethics Committee (NTU NO. 202310HM036).

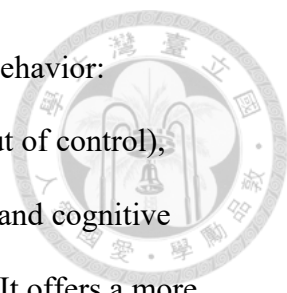
3.2 Measures

Main variables

Using standardized tests, this study assesses two variables, self-esteem and eating behaviors. Self-esteem was measured using the Rosenberg Self-Esteem Scale Eating (RSSE). Eating behaviors were measured using the Eating Attitudes Test (EAT-

26) and the Three Factor Eating Questionnaire-R18 (TFEQ-R18). By doing so, the study was able to examine multiple dimensions of eating behaviors—disordered eating, uncontrolled eating, emotional eating, and cognitive restraint. Students self-reported other variables, including friend and family support, demographic data, exercise behavior, and perceived body size.

The EAT-26 is used to assess symptoms and characteristics of disordered eating. It is widely used to screen for disordered eating among adolescents from different cultural contexts, making it suitable to measure disordered eating among the study participants (Al Banna et al., 2021; Fadipe et al., 2017; Montoro-Pérez et al. 2024; Mumtaz et al., 2024; Nunes et al., 2006; O'Hara et al., 2016; Sim et al., 2024; Swarnameenaa et al., 2023; Yu et al., 2015). Literature on disordered eating among adolescents in Taiwan also uses the EAT-26 to measure eating behaviors (Tsai et al., 2011; Tseng et al., 2014; Wong et al., 2014). Thus, this allows for meaningful comparisons between this study's results and those of previous studies conducted in both Taiwan and globally, facilitating a broader understanding of disordered eating behaviors among adolescents. Consisting of 26 questions, the items are answered using a Likert-type scale, where 0=never, rarely, or sometimes; 1=often; 2=usually; and 3=always. Using the EAT-26, two variables are examined in this study: disordered eating and high-risk disordered eating. Disordered eating is examined as a continuous variable, calculated by summing the scores of all 26 items. This allows for a more nuanced analysis of disordered eating, capturing the full spectrum of symptom severity. High-risk disordered eating is operationalized as a binary variable, with a score of 20 or higher indicating the presence of eating disorder symptomatology (O'Hara et al., 2016). Cronbach's alpha in this study's sample was 0.84, indicating good internal consistency.



The TFEQ-R18 is used to assess three dimensions of eating behavior: uncontrolled eating (tendency to overeat, with the feeling of being out of control), emotional eating (tendency to eat in response to negative emotions), and cognitive restraint (tendency to consume less food than one would like to eat). It offers a more detailed look into the psychological factors influencing eating behaviors, including stress, self-regulation, and emotional state. Similarly, it has also been extensively used in much of the existing literature on adolescent eating behavior in both Western and non-Western contexts (Anglé et al., 2009; Bonn et al., 2022; Cheng et al., 2018; Chong et al., 2016; De Lauzon et al., 2004; C.-Y. Lin et al., 2020; O'Brien et al., 2016; Ruckwongpatr et al., 2022; P. Wang et al., 2022; Z. Wang et al., 2020). Consisting of 18 items, 9 concern uncontrolled eating, 3 emotional eating, and 6 cognitive restraint. The items are answered on a four-point response scale, where 0=definitely false; 1=mostly false; 2=mostly true; 3=definitely true. These scores are then summated into total scores for uncontrolled eating, emotional eating, and cognitive restraint. The last question of the survey belongs to cognitive restraint and is answered on a scale of 1 to 8. Scores of 1-2 were coded 0; scores of 3-4 were coded 1; scores of 5-6 were coded 2; 7-8 were coded 3 (De Lauzon et al., 2004). The higher the score, the stronger the tendency of eating behavior disturbance (Z. Wang et al., 2020). Cronbach's alpha in this study's sample was 0.78 for uncontrolled eating, 0.80 for emotional eating, and 0.75 for cognitive restraint, indicating good internal consistency across all dimensions.

Self-esteem was measured using the RSES, which consists of 10 items based on positive and negative beliefs and perceptions about oneself. It is a well-established tool for evaluating levels of self-esteem, widely utilized among adolescent populations globally (C.-Y. Lin et al., 2019; Friero et al., 2021; Petisco-Rodríguez et al., 2020). Additionally, this scale has been previously used to evaluate the levels of self-esteem

among Taiwanese adolescents, showing good reliability and construct validity in those studies (Ko et al et al., 2005; Yen et al., 2013). The Cronbach's alpha in the present study was 0.89, indicating good internal consistency. Each item is paired with four response choices where 1=strongly disagree, 2=disagree, 3=agree, and 4=strongly agree. The scale ranges from 10 to 40, with a score of 20 to 30 indicating normal self-esteem while a score of less than 20 suggesting low self-esteem and scores higher than 30 suggesting high self-esteem (Petisco-Rodríguez et al., 2020).

Immigrant status was determined by whether the respondent's parent(s) are classified as foreign. Respondents with neither parents who are foreign are classified as native adolescents, coded as 0. Respondents with one or more parents who are foreign are classified as immigrant adolescents, coded as 1.

Controls

Grade represented the academic year of the senior high school students, with 1 for first-year students, 2 for second-year students, and 3 for third-year students. Literature indicates that disordered eating behaviors peak between the ages of 11 and 16, which aligns with a developmental period of identity formation and sensitivity to social acceptance (Breton et al., 2022; Pelc et al., 2023).

Sex referred to the biological distinction between male and female, coded as 1 for male and 2 for female. We controlled for sex in the model, given the gender differences in the prevalence of disordered eating. Numerous studies have shown that adolescent girls report a higher prevalence of disordered eating than adolescent boys (Al Banna et al., 2021; D.-R. Chen et al., 2022; Fadipe et al., 2017; Haines et al., 2011; Jonat & Birmingham, 2004; Rauof et al., 2015; Vilela et al., 2004).

Body overestimation was determined by comparing participants' perceived body size to their actual body mass index (BMI). First, BMI was calculated using the

standard formula: weight in kilograms divided by height in meters squared. Next, participants' BMI was compared to age- and gender-specific BMI ranges according to a BMI reference chart from the Ministry of Health and Welfare (2013). Based on age and gender, the chart categorizes individuals as underweight, normal weight, overweight, and obese. Participants who were normal or underweight but considered themselves overweight or obese were classified as having body overestimation. Literature indicates that body overestimation is closely linked to disordered eating behaviors and, thus, should be controlled for in this study (D.-R. Chen, Lin, & Levin, 2023; Conley & Boardman, 2007).

Exercise behavior was considered a continuous variable. Participants were asked how many days in the past week they engaged in at least 30 minutes of physical activity that increased their heart rate and caused them to sweat. The responses were recorded on a scale of 0 to 7, with indicating no days of exercise and 7 indicating daily exercise. Literature indicates that those who engage in compulsive exercise, especially girls, are more likely to engage in disordered eating (D.-R. Chen, Lin, & Levin, 2023; Meyer et al., 2011). Based on this association, exercise behavior was controlled for in the model.

Father with high education was coded as having a father with a college degree or above. Father's education is especially important in this context given that Taiwanese men who marry foreign-born women from Southeastern countries typically have low education levels and socioeconomic status, a majority of whom are low-level farmers, fishermen, or workers residing in rural areas (Hsiao, 2000). Mother's education was excluded due to avoid collinearity issues.

Family pressure to control weight was measured by three items: (1) whether family members urged them to eat less; (2) whether family members suggested that they should refrain from eating snacks; and (3) whether family members suggested that they

should control their weight. Participants replied to each item with a *Yes* or *No*. Cronbach's alpha was 0.70, and the three items were summed. Literature shows a higher risk of developing unhealthy eating behaviors among those who experience family pressure to weight control (D.-R. Chen, Lin, & Levin, 2023; Makki et al., 2023).

Family type was categorized based on the respondents' living arrangements. The options included: 1=two-parent family, 2=three-generation family (living with grandparents), 3=single-parent, living with father, 4=single-parent, living with mother, 5=other. According to literature, family environment is also associated with disordered eating, with adolescents in nontraditional family households (i.e., those with single parents or extended family) engaging more likely to engage in unhealthy eating behaviors (D.-R. Chen, Lin, & Levin, 2023; Kamody & Lydecker, 2021). Given this association, family type was controlled for in the model.

Perceived family support was measured through student ratings of various types of support received from family members. Participants were asked four questions: whether they felt close to family members (emotional support), whether family members assisted when they were in need (instrumental support), whether family members provided them advice when they were in need (informational support), and whether family members appreciated their thoughts and behaviors (appraisal support). Each question was scored on a 4-point Likert scale from 1 (*strongly disagree*) to 4 (*strongly agree*). Cronbach's alpha for this scale was 0.88, and the four items were summed. Social support was also controlled in the model. An important source of social support is from family, which has shown to be a protective factor against abnormal eating behaviors (Erriu et al., 2020; Langdon-Daly & Serpell, 2017).

Peer pressure to control weight was measured by three items: (1) whether friends urged them to eat less; (2) whether friends suggested that they should refrain

from eating snacks; and (3) whether friends suggested that they should control their weight. Participants replied to each item with a *Yes* or *No*. Cronbach's alpha was 0.74, and the three items were summed. Peer pressure to control weight also showed higher incidences among those engaging in unhealthy eating behaviors (D.-R. Chen, Lin, & Levin, 2023; Makki et al., 2023).

Perceived friend support was measured through student ratings of various types of support received from friends. Participants were asked four questions: whether they felt close with friends (emotional support), whether friends assisted when they were in need (instrumental support), whether friends provided them advice when they were in need (informational support), and whether friends appreciated their thoughts and behaviors (appraisal support). Each question was scored on a 4-point Likert scale from 1 (*strongly disagree*) to 4 (*strongly agree*). Cronbach's alpha for this scale was 0.86, and the four items were summed. Friends are another source of social support, and this has also been shown to be associated with eating behavior disturbances (D.-R. Chen, Lin, & Levin, 2023; Makki et al., 2023).

3.3 Data analysis

Statistical analysis was performed using Stata, a general-purpose statistical software package developed by Stata Corp for data manipulation, visualization, statistics, and automated reporting. A bivariate analysis was conducted to examine the relationships between immigrant status and various factors such as demographic information, eating behaviors, and factors associated with eating behaviors. The distributions of these factors were measured using frequency and percentage for categorical variables and mean and standard deviation for continuous variables. Chi-squared tests and t-tests were used to determine the statistical significance of differences

between native adolescents and immigrant adolescents, with chi-squared tests being used for categorical variables and t-tests being used for continuous variables.

A series of path analyses were conducted using structural equation modeling (SEM) to explore the relationship between the independent, dependent, and mediating variables. Coefficients with 95% confidence intervals were reported for each path. The indirect effect size of immigrant status on eating behaviors through self-esteem was calculated by multiplying the coefficient of the path from immigrant status to self-esteem (β_A) by the coefficient of the path from self-esteem to eating behavior (β_B).

4. Results

4.1 Bivariate analysis

Characteristics of the study sample are presented in Table 1. Participants consisted of 786 adolescents, of which 89.06% ($n = 700$) were native and 10.94% ($n = 86$) were immigrants. The distribution across grades was relatively balanced, with no significant difference between the two groups: 32.71% of natives and 31.40% of immigrants were in Grade 1, 36.29% of natives and 30.23% of immigrants were in Grade 2, and 31.00% of natives and 38.37% of immigrants were in Grade 3 ($p = 0.33$).

The EAT-26 results revealed a marginal significance, with a higher percentage of immigrant adolescents (16.28%) than native adolescents (9.57%) engaging in disordered eating attitudes and behaviors ($p = 0.05$). However, no significant differences were found in the TFEQ-R18 results between the two groups for uncontrolled eating, emotional eating, cognitive restraint, and TFEQ total scores.

A significantly larger proportion of native adolescents (72.14%) than immigrant adolescents (53.49%) lived in two-parent families ($p < 0.001$). Immigrant adolescents were more likely to live in single-parent families, particularly with their mother (immigrants: 22.09%; natives: 5.71%, $p < 0.001$).

In terms of social support, native adolescents (mean = 13.67) than immigrant adolescents (mean = 15.15) reported higher mean family support ($p < 0.001$). There was also a significant difference between the two groups for friend pressure, with immigrant adolescents (mean = 0.51) reporting a higher level compared to native adolescents (mean = 0.36, $p < 0.05$). However, friend support did not significantly differ between groups.

Parental education levels also showed significant differences, with a higher proportion of native adolescents (41.86%) having fathers with a college degree or above compared to immigrant adolescents (20.93%, $p < 0.001$). There was no significant difference in the proportion of immigrants and natives who overestimated their body size. Lastly, exercise behavior was similar across both groups, with no significant difference in mean scores.

4.2 Path Analysis Models

Across all models, the association between immigrant status and self-esteem showed a negative association between immigrant status and self-esteem ($\beta = -1.395$, $p = 0.030$). Additionally, the relationships between self-esteem and eating behaviors, except for cognitive restraint, remained significant and consistent with and without controls. Notably, there was a strong negative association between self-esteem and disordered eating with ($\beta = -0.206$, $p < 0.001$) and without control ($\beta = -0.239$, $p < 0.001$), as shown in Figure 2.2. Meanwhile, the association between self-esteem and uncontrolled eating was relatively weaker with ($\beta = -0.084$, $p = 0.004$) and without controls ($\beta = -0.090$, $p = 0.001$), as shown in Figure 2.3. Similarly, disordered eating showed the largest indirect effect sizes ($\beta = 0.095$ without controls; $\beta = 0.288$ with controls). Uncontrolled eating followed a similar pattern, with a slight decrease in indirect effect size when controls are introduced ($\beta = 0.125$ without controls; $\beta = 0.118$

with controls). The direct effect of immigrant status on eating behaviors was not significant in any model.



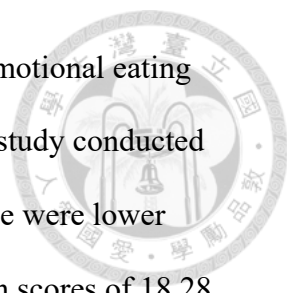
5. Discussion

5.1 Descriptive Summary

The total sample included 786 high school students in Taiwan. The distribution across the three grade levels was relatively balanced: 32.57% in Grade 1, 35.62% in Grade 2, and 31.81% in Grade 3. Similarly, the distribution across gender was also relatively balanced, consisting of 52.04% males and 47.96% females. The balanced distributions ensure that the sample is representative and the findings are not disproportionately influenced by any particular grade or gender.

In this study, the EAT-26 was used to measure the prevalence and severity of disordered eating. The prevalence of adolescents with disordered eating attitudes and behaviors was 10.31%. Similar rates were observed in other studies examining adolescents in Taiwan, with Tsai et al. (2011) reporting a prevalence of 10.4% and D.-R. Chen, Lin, & Hsiao (2023) reporting a prevalence of 10.5%. In Western contexts, rates were significantly higher. In a sample of high school students from the United States, prevalence was found to be 14.4% (Haines et al., 2011). In a sample of high school students from Canada, prevalence was found to be 13.44% (Jonat & Birmingham, 2004). However, in a study of high school students in Italy, the prevalence was observed to be 7.34% (Ampollini et al., 1999). The mean EAT-26 score among adolescents for this study was 9.55 (SD $\pm$ 8.59), which is similar to 9.6 (SD $\pm$ 9.5) in the United States and 8.51 (SD $\pm$ 9.91) in Canada (Haines et al., 2011; Jonat & Birmingham, 2004).

Three other dimensions of eating behavior were examined using the TFEQ-R18. Uncontrolled eating (UE) had the highest mean at 14.51 (SD $\pm$ 4.35), followed by



cognitive restraint (CR) with a mean of 8.51 ($SD \pm 3.61$), and then emotional eating (EE) with a mean of 4.59 ($SD \pm 2.43$). Compared to findings from a study conducted among Chinese undergraduate women, the mean scores in this sample were lower across all dimensions. In that study, Kong et al. (2020) reported mean scores of 18.28 ($SD \pm 4.97$) for UE, 12.40 ($SD \pm 3.65$) for CR, and 5.71 ($SD \pm 2.11$) for EE. In another study conducted among undergraduate students in Hong Kong, a mean score of 21.47 ($SD \pm 4.72$) was reported for uncontrolled eating, 13.86 ($SD \pm 3.28$) for cognitive restraint, and 7.12 ($SD \pm 2.04$) for emotional eating (Cheng et al., 2018). Mean scores were also larger in studies conducted outside of Asia. A sample of adolescents in South England scored 19.62 ($SD \pm 5.83$) in UE, 13.51 ($SD \pm 4.31$) in CR, and 5.33 ($SD \pm 2.51$) in EE (Booth et al., 2018). In a sample of French adolescents, mean scores were 20.37 ($SD \pm 5.72$) for UE, 12.03 ($SD \pm 3.66$) for CR, and 12.18 ($SD \pm 4.57$) for EE (Megalakaki et al., 2013).

Much of the existing research on disordered eating measured by the EAT-26 has focused on gender differences (Ampollini et al., 1999; D.-R. Chen, Lin, & Levin, 2023; Jonat & Birmingham, 2004; Tsai et al., 2011). The results revealed that disturbed eating behaviors particularly affected females, who consistently show a higher prevalence of disordered eating attitudes and behaviors compared to males (Ampollini et al., 1999; Chen, Lin, & Levin, 2023; Jonat & Birmingham, 2004). On the other hand, much of the existing research on the three dimensions of eating behavior measured by the TFEQ-R18 has focused on weight status (Anglé et al., 2009; Cheng et al., 2018; Masterson et al., 2019; Ruckwongpatr et al., 2022). From these findings, higher BMI was found to be associated with higher levels of eating behavior disturbances (Anglé et al., 2009; Cheng et al., 2018; Ruckwongpatr et al., 2022). However, there has been limited research using

the EAT-26 and TFEQ-R18 that examines eating behaviors in relation to immigrant status.

Adolescents are particularly vulnerable to experiencing eating behavior disturbances due to the unique challenges associated with this developmental stage. During adolescence, individuals undergo rapid physical changes and heightened sensitivity to social pressures, such as beauty standards and peer expectations (Espinosa, 2020). In an effort to fit in, adolescents may adopt unhealthy eating behaviors. Conversely, those who fail to fit in may experience feelings of inadequacy and isolation, which can negatively impact their self-esteem and lead them to adopt unhealthy behaviors as coping mechanisms. But on top of the challenges associated with adolescence, immigrant adolescents face the added pressures of acculturation and perceived discrimination, which can further exacerbate low self-esteem (Espinosa, 2020). As such, understanding how these factors interact with immigrant status is crucial for gaining a comprehensive view of the risk factors contributing to eating behavior disturbances and improving immigrant health.

5.2 Hypotheses Testing

The path analysis models identified significant relationships between immigrant status, self-esteem, and various eating behaviors among adolescents in Taiwan. The results strongly support hypothesis 1. Across all models, there was a negative association between immigrant status and self-esteem, indicating that immigrants reported lower self-esteem compared to their native counterparts. This finding is consistent with the minority stress framework, which posits that immigrant adolescents face unique challenges, such as perceived discrimination and pressures to assimilate, that can diminish self-esteem (Pittman et al., 2017; Valentín-Cortés et al., 2020). As such, educational institutions should integrate mental health support into school-based

programs, especially for immigrant adolescents given their vulnerability to lower self-esteem. These programs should focus on strategies to foster self-esteem, body confidence, and eliminate body stigma. Additionally, culturally-tailored initiatives should be made to address issues of perceived discrimination and societal pressures by promoting a supportive environment that embraces cultural and body diversity.

The results partially align with hypothesis 2. The negative associations between self-esteem and disordered eating were significant across both models with and without controls. For the TFEQ-R18 dimensions, self-esteem also demonstrated significant negative associations with uncontrolled eating and emotional eating. But compared to the relationship between self-esteem and disordered eating, these relationships were significantly weaker. This suggests that while self-esteem plays a role in reducing uncontrolled and emotional eating, its influence is more substantial for disordered eating.

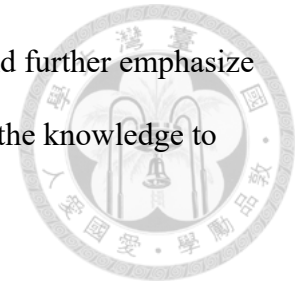
In contrast, no significant relationship was observed between self-esteem and cognitive restraint. The lack of significant relationship between self-esteem and cognitive restraint could be influenced by the distinct feeding practices observed among immigrant households. Being from lower socioeconomic and educational backgrounds, immigrant families often emphasize food security and resource conservation with limited health literacy on balanced nutrition and feeding. Consequently, this leads them to adopt rewarding and pressure-to-eat feeding practices (Chen et al., 2024). When food is associated reward for good behavior or comfort for distress, this can foster an unhealthy dependence on food as a coping mechanism for both positive and negative emotions, such as low self-esteem. Coupled with pressure-to-eat feeding practices, they work to interfere with their ability to self-regulate food intake and explains the lack of

significance between self-esteem and cognitive restraint. Instead, they foster disinhibited eating behaviors such as emotional eating and uncontrolled eating.

Public health interventions should tackle the socioeconomic and educational disparities that perpetuate these unhealthy feeding practices. Socioeconomic challenges, such as food insecurity and financial instability, often drive immigrant families to adopt strategies that prioritize food conservation and maximize food intake (Chen et al., 2024). Educational disparities, which has been shown to be associated with lower maternal health literacy, influences their ability to understand the negative impacts of such feeding practices. There should be culturally tailored programs focused on improving health literacy to equip parents with the knowledge needed for balanced and responsive feeding. By encouraging healthier relationships with food, these programs can reduce the reliance on food as a coping mechanism and mitigate disinhibited eating behaviors.

Lastly, the results also provide partial support for hypothesis 3. The direct effects of immigrant status on eating behaviors were not significant, suggesting that self-esteem mediates this relationship. On the other hand, the indirect effects of immigrant status on eating behaviors suggest that lower self-esteem, influenced by immigrant status, increases the risk of eating behavior disturbances. Notably, the largest indirect effect size was exhibited in the relationship between immigrant status and disordered eating. Meanwhile, the indirect effect sizes for the uncontrolled and emotional eating were smaller. These findings indicate that while self-esteem plays a mediating role, its influence on uncontrolled eating and emotional eating are less pronounced than for disordered eating. For cognitive restraint, the indirect effects of immigrant status via self-esteem were negligible, indicating no significant mediation. These findings relate back to the feeding practices observed in immigrant households,

which promote a dependency on food for comfort and motivation and further emphasize the need for culturally tailored interventions that equip parents with the knowledge to make healthier dietary choices and practices for their children.

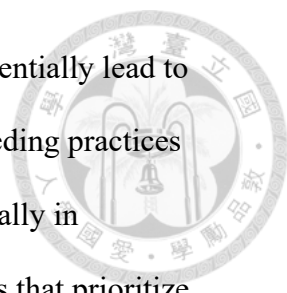


5.3 Findings in Context of Current Literature

Immigrant and Eating Behaviors

Prior research shows inconsistent findings regarding the relationship between immigrant status and eating behaviors, with some studies reporting a direct association between the two (D.-R. Chen et al., 2022; Salas-Wright et al., 2019). Other studies highlight the complexity of this relationship, suggesting that the relationship varies depending on mediating factors such as family dynamics, cultural norms, and individual psychological factors (D.-R. Chen, Lin, & Levin, 2023; Sussman & Truong, 2011). Findings from the present study shows no direct association between immigrant status and eating behaviors. Rather, the relationship between immigrant and eating behaviors is mediated by self-esteem, consistent with the minority stress framework (Pittman et al., 2017; Valentín-Cortés et al., 2020). According to the framework, immigrant adolescents experience unique sociocultural stressors, such as perceived discrimination and pressures to conform to mainstream beauty standards, which negatively affects self-esteem (Espinosa, 2020; Phinney et al., 2006). This diminished self-esteem increases the risk of engaging in adverse coping mechanisms, including unhealthy eating behaviors, as shown in the results of this study. The strongest effects were observed for disordered eating, followed by uncontrolled eating and emotional eating.

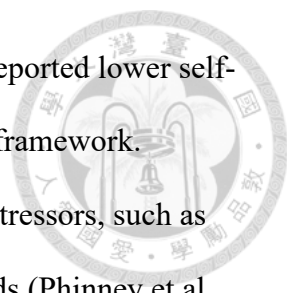
In contrast, no significant direct or indirect relationship was found between immigrant status and cognitive restraint. This aligns with one study conducted among Taiwanese children and their mothers, which found that immigrant children are more likely to be encouraged to eat (Chen et al., 2024). The results showed that mothers with



foreign nationality are more likely to adopt feeding practices that potentially lead to disinhibited eating behaviors, including cognitive restraint. These feeding practices include using food as a reward or pressuring their child to eat, especially in economically and educationally disadvantaged immigrant households that prioritize maximizing food intake and minimizing food waste. The inconsistency between feeding practices and mainstream beauty standards creates a vicious cycle, in which children are encouraged to eat more at home but feel pressured to restrict their eating outside of home. Looking back at the EAT-26 questionnaire, the questions reflect the nature of disordered eating. At home, immigrant children are encouraged to eat excessively, which may lead to body image issues. At the same time, they feel pressured to regulate their eating to conform to mainstream beauty standards, which can cause emotional distress such as low self-esteem, as children struggle to reconcile their home environment with societal expectations.

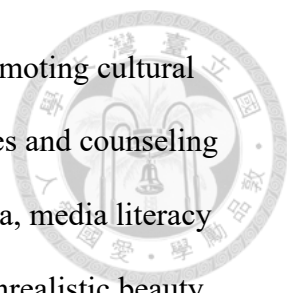
In the broader context, these results contribute to the limited body of research examining eating behaviors among immigrant children in non-Western contexts. Prior studies have emphasized the role of self-esteem and body image in shaping eating behaviors, yet minimal research has examined how these factors operate within immigrant populations. This study addresses these gaps by exploring how social and cultural factors uniquely influence immigrant and non-immigrant adolescents in Taiwan and how this, in turn, impacts their eating behaviors. By using multiple standardized measures to assess eating behaviors, this study provides a comprehensive view of eating behaviors. Coupled with the implementation of path analysis, this approach provides a more detailed investigation of the complex interactions between immigrant status, self-esteem, and eating behaviors.

Immigrant and Self-Esteem



The findings reveal that immigrant adolescents consistently reported lower self-esteem than their native peers, which aligns with the minority stress framework. According to this framework, immigrants face unique sociocultural stressors, such as perceived discrimination and pressures to conform to beauty standards (Phinney et al., 2006). Adolescents are particularly vulnerable due to their developmental stage, which involves identity formation and heightened sensitivity to social acceptance. These challenges can lead to feelings of inadequacy and rejection, which negatively affects self-esteem (Espinosa, 2020). In Taiwan, cultural beauty standards—rooted in both traditional Chinese and Western ideals—amplify body dissatisfaction and exacerbate the psychological burden on immigrant adolescents (L.-J. Chen et al., 2010; Huang & Chiang, 2013). Prior research also highlights how cultural identity conflicts and societal pressures to assimilate adversely affect self-esteem in immigrant populations (Pittman et al., 2017; Valentín-Cortés et al., 2020).

These findings expand our understanding of the interplay between immigrant status and self-esteem among Taiwanese adolescents, advancing our understanding of immigrant health. The duality of beauty standards in Taiwan offers valuable insight on the cultural and psychological impacts of Eastern and Western ideals. Therefore, insights from this study can be applied to diverse cultural contexts for conducting further research and developing culturally-inclusive interventions. Future research should look further into the role of other sociocultural factors, such as media exposure, parental influence, and peer dynamics, which are influential in shaping body image expectations (D.-R. Chen, Lin, & Hsiao, 2023; Castellanos Silva & Steins, 2023). By identifying specific pathways, the findings highlight the interplay of immigrant status in eating behaviors among Taiwanese adolescents, advancing our understanding of immigrant health. Interventions should be implemented in educational institutions,

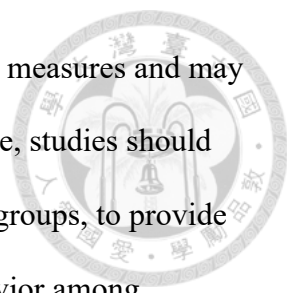


focusing on building self-esteem, fostering body confidence, and promoting cultural diversity. For example, schools should establish mentorship initiatives and counseling groups to build resilience and offer support. To eliminate body stigma, media literacy programs should be implemented to teach students how to identify unrealistic beauty standard. To boost self-esteem, schools should hold cultural exchange workshops to celebrate diversity and make immigrant children feel included and valued. By supporting cultural inclusivity and body positivity, this can play a key role in improving the overall well-being of immigrant adolescents.

5.4 Strengths and Limitations

This study has several strengths. First, this study offers insights on eating behaviors and their associated factors among a large sample of 786 adolescents in Taiwan. Moreover, the sample was relatively balanced in terms of age and gender, enhancing the representativeness of the findings and minimizing potential biases. Second, standardized measures were used for eating behaviors and self-esteem, allowing for international comparisons regarding the factors influencing eating behaviors across diverse adolescent populations. Third, two different measures were used to assess eating behaviors, which provides a more detailed understanding of various dimensions of eating behaviors, including disordered eating attitudes and specific eating behavior patterns.

At the same time, several limitations are worth mentioning. Firstly, immigrant adolescents make up only 10.94% of the participants. Future studies should aim to include more immigrant adolescents to achieve a more balanced distribution of immigrant and non-immigrant adolescents in Taiwan. Secondly, the sample was limited to only adolescents from New Taipei City. Therefore, future studies should expand their scope to include adolescents outside of New Taipei City, making the results more



generalizable. Thirdly, the research relies exclusively on quantitative measures and may not fully capture the nuanced experiences of adolescents. In the future, studies should employ qualitative methods, such as conducting interviews or focus groups, to provide richer insights into the underlying mechanisms affecting eating behavior among adolescents. Detailed responses to open-ended questions like, “What is your perception of ideal body image?” can help uncover the nuanced experiences and perspectives of adolescents. Lastly, the study does not examine the underlying causes of low self-esteem, which may be attributed to other factors such as poor academic performance, low socioeconomic status, or sexual identity.

5.5 Directions for Future Research

Future research may consider the impact of immigrants’ acculturation levels and ethnic identity on their eating behaviors and factors related with eating behaviors. Berry (1997) suggests four acculturation strategies: assimilation, integration, separation, and marginalization. Assimilation occurs when immigrants spend more time with the mainstream culture than their original culture. Integration is characterized by a balance between interacting with the mainstream culture while maintaining their original culture. Separation occurs when immigrants maintain their original culture while rejecting the mainstream culture. Lastly, marginalization occurs when immigrants reject both mainstream culture and cultural maintenance. This will provide a more comprehensive picture on the identity formation process and factors influencing eating behaviors, allowing for meaningful comparisons across the scale of acculturation strategies.

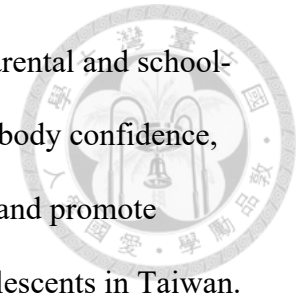
Many studies examine the relationship between acculturation and psychological well-being, finding that integration and assimilation tend to exhibit better psychological well-being compared to separation and marginalization strategies (Berry & Hou, 2016;

Li et al., 2021). Few studies have examined the multidimensionality of acculturation in the context of eating behaviors. Among Hispanic/Latino youths in the United States, those who integrated tend to engage in healthier eating behaviors compared to those who assimilated (Arandia et al., 2018). In a systematic review, different acculturation constructs led to varying outcomes in eating behaviors (Song et al., 2023). For example, higher levels of marginalization and separation were associated with increased eating disorder cognitions, such as weight and shape concerns, while integration was linked to a reduction in disordered eating tendencies. These findings highlight the importance of examining specific acculturation strategies to understand their unique impacts on eating behaviors.

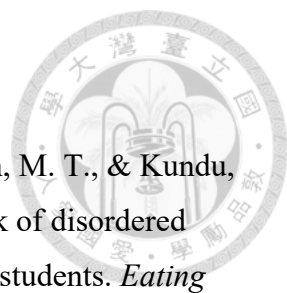
5.6 Conclusion

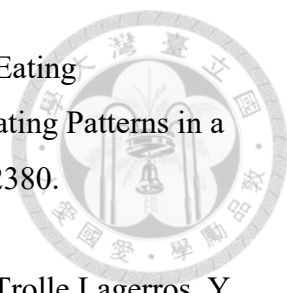
Overall, this research contributes to the current body of literature on eating behaviors by providing insight into the immigrant population, which is often overlooked, especially for second-generation immigrants in non-Western contexts. This study found that immigrant status does not directly affect eating behaviors but rather may influence them indirectly through other factors. The results highlight the significant role of self-esteem in mediating the relationship between immigrant status and eating behaviors among adolescents in Taiwan. Future research should explore the mediating role of other factors such as media exposure, peer dynamics, and family influence to gain a more comprehensive understanding of the pathways affecting eating behaviors in immigrant and non-immigrant adolescents. Another finding from this study was that disordered eating exhibited the strongest indirect effect sizes, while cognitive restraint exhibited negligible effect sizes. This discrepancy should be investigated in future studies so that public health practitioners can better tailor interventions and support for addressing the challenges faced by immigrants. Given the influential role of self-esteem

on eating behaviors, public health practitioners should implement parental and school-based education programs that promote health literacy, self-esteem, body confidence, and cultural inclusivity. These efforts can help improve self-esteem and promote healthier eating behaviors within immigrant and non-immigrant adolescents in Taiwan.



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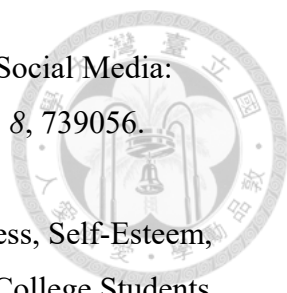
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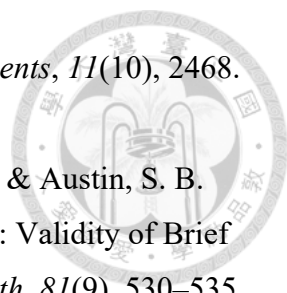
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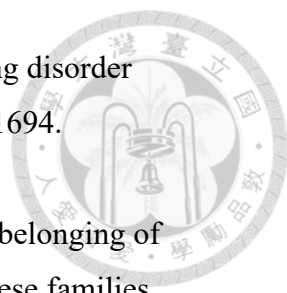
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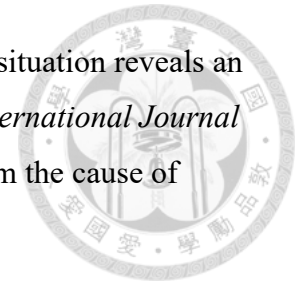
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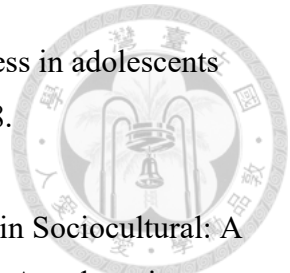
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Appendix

Table 1 Sample characteristics

Variables	All adolescents (N=796)	Native adolescents (N=700, 89.06%)	Immigrant adolescents (N=96, 10.94%)	Chi-square/T-test	p-value	Sig
Grade	N (%) / Mean (SD)	N (%) / Mean (SD)	N (%) / Mean (SD)			
1	256 (32.57)	229 (32.71)	27 (31.40)	2.14 (2)	0.34	
2	280 (35.62)	254 (36.29)	26 (30.23)			
3	250 (31.81)	217 (31.00)	33 (38.37)			
Sex						
Male	409 (52.04)	360 (51.43)	49 (56.98)	0.94 (1)	0.33	
Female	377 (47.96)	340 (48.57)	37 (43.02)			
Disordered eating (EAT-26)						
Yes	81 (10.31)	67 (9.57)	14 (16.28)	3.73 (1)	0.05	
Mean EAT-26 score	9.55 (8.59)	9.49 (8.69)	10.03 (7.75)	-0.55 (784)	0.29	
Three-Factor Eating Questionnaire Revised 18-item version (TFEQ R-18)						
Uncontrolled eating (0-27)	14.51 (4.35)	14.51 (4.34)	14.55 (4.49)	-0.07 (784)	0.47	
Emotional eating (0-9)	4.59 (2.43)	4.58 (2.44)	4.66 (2.43)	-0.31 (784)	0.38	
Cognitive restraint (0-18)	8.51 (3.61)	8.49 (3.61)	8.63 (3.56)	-0.33 (784)	0.37	
Mean TFEQ score	27.60 (7.37)	27.58 (7.34)	27.84 (7.64)	-0.31 (784)	0.38	
Family structure						
Two-parent family	551 (70.10)	505 (72.14)	46 (53.49)	35.28 (4)	0.00	*
Intergenerational family, living with grandparents and parents	101 (12.85)	93 (13.29)	8 (9.30)			
Single-parent, living with father	51 (6.49)	42 (6.00)	9 (10.47)			
Single parent, living with mother	59 (7.51)	40 (5.71)	19 (22.09)			
Other	24 (3.05)	20 (2.86)	4 (4.65)			
Body overestimation						
Yes	146 (18.58)	131 (18.71)	15 (17.44)	0.08 (1)	0.78	
Family support (4-20)						
Mean score	14.98 (3.46)	15.15 (3.42)	13.87 (3.55)	3.75 (784)	0.00	*
Friend pressure (0-3)						
Mean score	0.37 (0.80)	0.36 (0.77)	0.51 (1.00)	-1.69 (784)	0.05	*
Friend support (4-20)						
Mean score	11.19 (2.94)	15.16 (2.99)	15.40 (2.53)	-0.70 (784)	0.24	
Father with college degree or above						
Yes	311 (39.57)	293 (41.86)	18 (20.93)	14.03 (1)	0.00	*
Exercise behavior						
Mean score	3.09 (1.94)	3.10 (1.93)	3.00 (2.08)	0.44 (784)	0.33	

Figure 1 Conceptual model

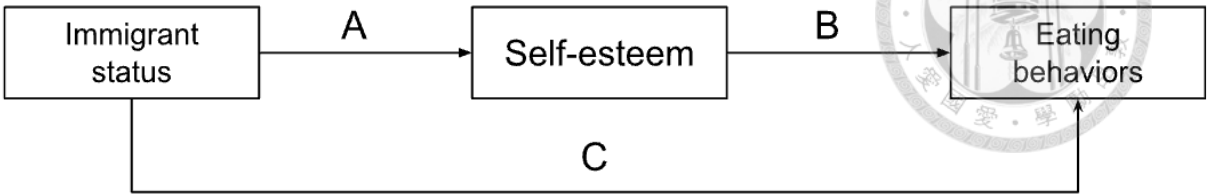


Figure 2.1 Path analysis for high-risk disordered eating

A



B

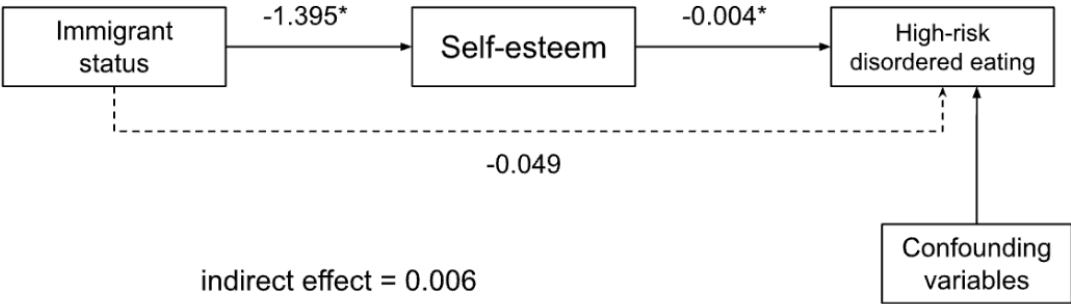


Figure 2.2 Path analysis for disordered eating

A



B

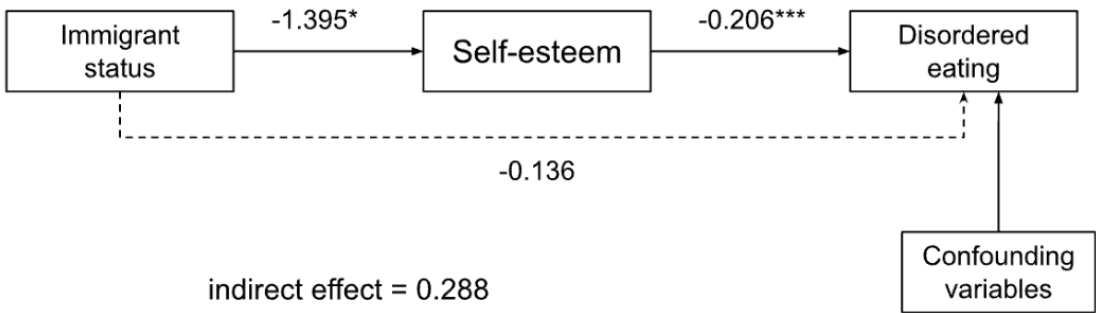
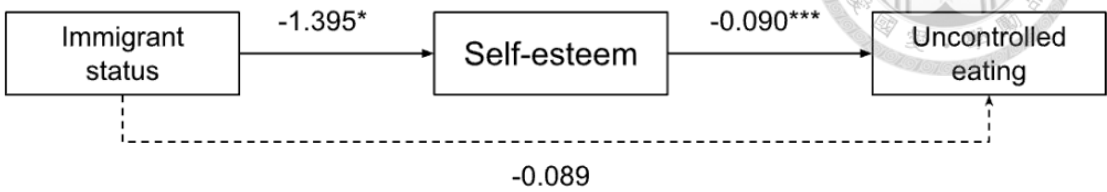


Figure 2.3 Path analysis for uncontrolled eating

A



B

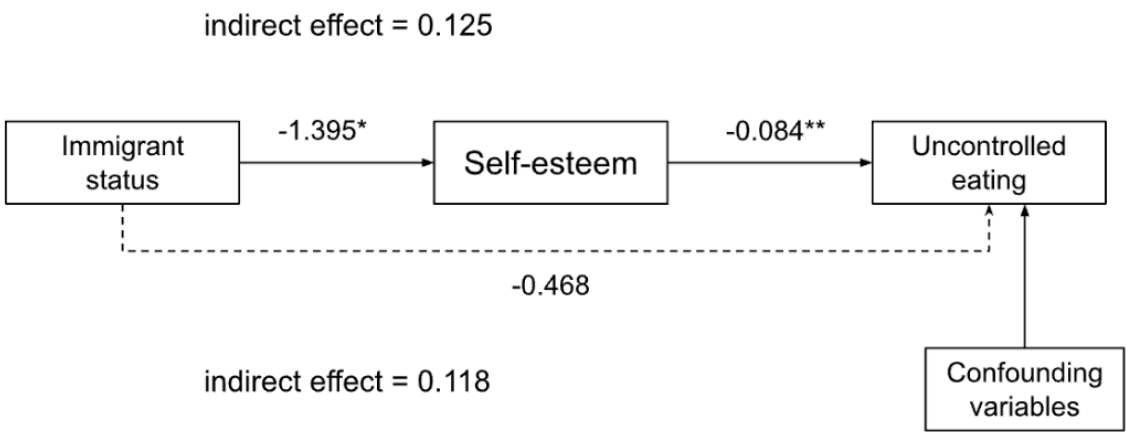


Figure 2.4 Path analysis for emotional eating

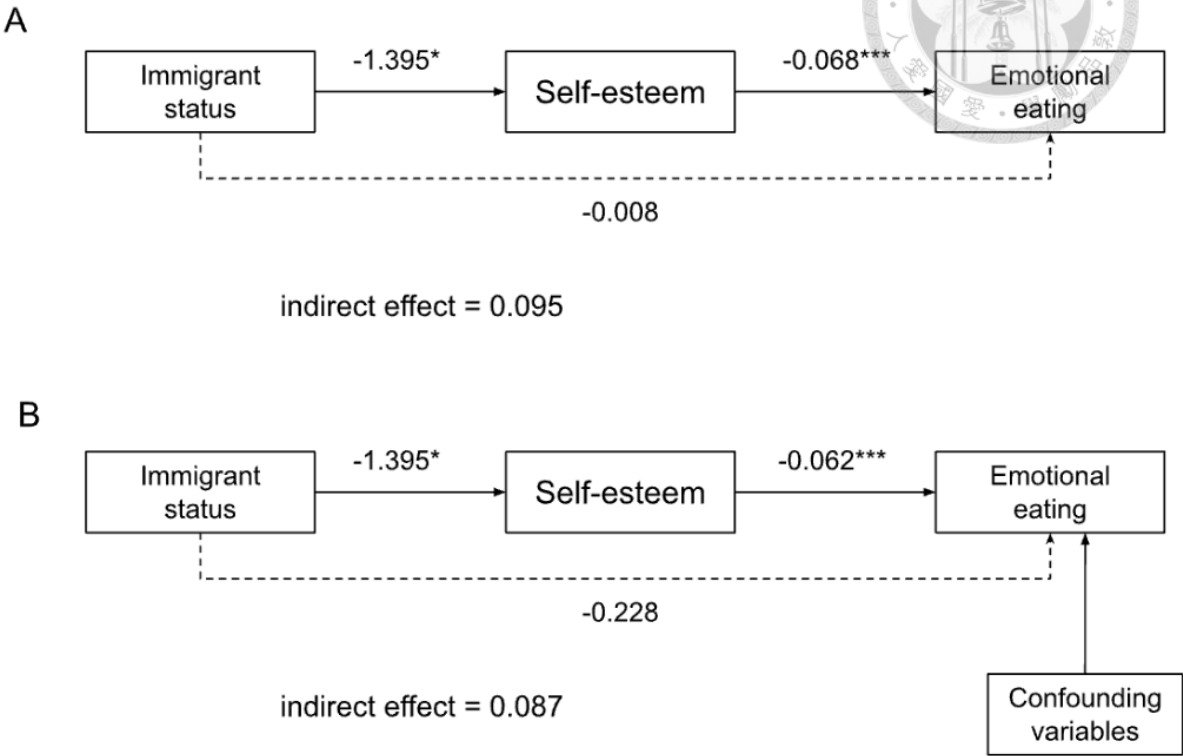


Figure 2.5 Path analysis for cognitive restraint

A



B

