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Acculturative Stress and Eating Disinhibition among Asian Young Adults: The Role of Depressive Symptoms and Gender

THESIS

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Peiyi Wang

Thesis Committee:
Professor Ilona Yim, Chair
Chancellor's Professor Chuansheng Chen
Professor Belinda Campos

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DEDICATION

To
my parents and other family members

Who have been unconditionally loving and inspiring me since the first day. Thank you for always being there for me, for understanding and supporting my every single decision, and for encouraging me to chase my dreams.

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ABSTRACT OF THE THESIS

Acculturative Stress and Eating Disinhibition among Asian Young Adults: The Role of Depressive Symptoms and Gender

Peiyi Wang

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Professor Ilona Yim, Chair

The direct link between acculturative stress and eating behavioral problems has been previously examined. However, scientific research focusing on Asian descendants and the mechanism behind this association is scant. Understanding the mechanisms underlying the association is critical. It can contribute to refining culturally sensitive preventive measures of eating pathologies and obesity, which can ultimately provide methods of minimizing health disparities in the United States. The present study sought to investigate the relation between acculturative stress and eating disinhibition among Asian young adults, as well as the mediating effect of depressive symptoms and the moderating effect of gender on these associations. Asian undergraduate students (N = 477; 78% females; M_{age} = 20.35, SD = 1.72) participated in an online cross-sectional study. Results showed that there was a positive association between acculturative stress and eating disinhibition. Depressive symptoms partially mediated this positive relation. Gender moderated the path between acculturative stress and depressive symptoms in the mediation model, and the mediating effect of depressive symptoms was stronger among Asian male than female students. Findings spark several promising future research directions, which are discussed. When treating eating disinhibition in the context of acculturative stress, the results suggest that preventive and treatment measures may prove effective to target depressive symptoms, especially among Asian male students.

INTRODUCTION

Asians are the most rapidly growing racial minority group in the United States (Cilluffo & Cohn, 2017). As a marginalized group, they experience culture-specific stressors such as acculturative stress, which is a multifactorial chronic stressor resulting from cultural adaptation (Berry, 1970; Berry, 2006) and containing aspects related to intercultural relations, discrimination, and language skills (Benet-Martínez & Haritatos, 2005; Gil et al., 1994). Due to contrasting norms between the Eastern and Western cultures (e.g., distinct emphases on interdependence vs. independence), Asians are particularly vulnerable to acculturative stress (Poyrazli et al., 2004) and the negative mental and physical consequences it carries (Byrne, 2001; Leong, 2015; Okazaki, 1997).

Acculturative stress has been studied as an antecedent factor influencing the development of some eating pathologies among adult racial/ethnic minorities (Ross & Gipson-Jones, 2018; Simmons & Limbers, 2019). For instance, Asian and Pacific Islander undergraduate students scoring higher on acculturative stress reported a greater degree of eating disorder symptoms (Kwan et al., 2018). There is also evidence suggesting that the effects of acculturative stress are distinct from those of perceived stress more broadly (Van Diest et al., 2014). A review article indicated that Asians and Asian Americans might be more vulnerable to developing disordered eating and unhealthy weight control behaviors compared to other racial/ethnic groups when facing acculturation-related stressors (Rodgers et al., 2018). Yet, few studies have empirically examined the possible mechanisms in the link between acculturative stress and maladaptive eating behavior among Asians in the United States. Disentangling this mechanism could improve our understanding of this phenomenon and provide necessary knowledge for the development of

culturally sensitive eating behavior interventions, ultimately reducing behavioral concerns around eating in this group.

Among problematic eating behaviors, eating disinhibition, which refers to eating emotionally and uncontrollably in the presence of disinhibiting stimuli such as palatable food or heightened affective state (Savage et al., 2009; Shomaker et al., 2011), requires particular future research attention. Eating disinhibition is predictive of eating disorder symptoms, poor diet quality, weight increase, and obesity (Bryant et al., 2008; Bryant et al., 2019; Hays & Roberts, 2008). Accordingly, eating disinhibition could be an initial sign of individuals developing a cascade of unhealthy eating behaviors and related health concerns. Notably, Neyland et al. (2021) highlighted the vital roles of eating disinhibition in the development of eating pathologies and health complications. These authors also advocated for in-depth inquiries of the eating disinhibition behavior within specific minority groups (e.g., Asians) and suggested to test relevant mechanisms to target in eating disinhibition prevention and treatment efforts.

Depressive Symptoms as a Mediator

One pathway whereby the experience of acculturative stress may be linked to eating disinhibition is through depressive symptoms. Several studies showed a positive association between acculturative stress and depressive symptoms (Hwang & Ting, 2008; Lee et al., 2004; Walker et al., 2008; Xu & Chi, 2013). In turn, depressive symptoms were also related to emotional eating (Konttinen et al., 2010) and overall dietary disinhibition (Grave et al., 1996). In fact, a component of depressive symptoms, negative affective state (Watson et al., 1988), was characterized as one trigger of eating disinhibition (Bond et al., 2001; Bryant et al., 2008). Other aspects of depressive symptoms, including, for example, poor sleep quality (e.g., restless sleep; Andresen et al., 1994), weakened psychological control (Wenzlaff et al., 1988), and low self-

efficacy (Saltzman & Holahan, 2002), were also related to greater eating disinhibition (Blumfield et al., 2018; Glasofer et al., 2013). Also, a symptom of clinical depression is changes in appetite. Importantly, when individuals experience milder and non-clinical symptoms of depression, their dietary consumption was found to increase, rather than decrease (Paykel, 1977). Consequently, this study proposed that depressive symptoms would mediate the relation between acculturative stress and eating disinhibition.

Gender as a Moderator

Gender is another key variable that may moderate the association between acculturative stress and depressive symptoms. The literature on gender differences in the acculturative stress and depressive symptoms association among Asians is limited. However, several studies found that gender moderated the relation between acculturative stress and depressive symptoms in another racial/ethnic minority group, Mexican Americans, with a stronger association reported for men compared to women (Castillo et al., 2015; Cheng et al., 2016). Little willingness to seek psychological help because of their socialization towards emotional suppression and less self-disclosure (Ramos-Sánchez & Atkinson, 2009; Snell Jr. et al., 1992) was speculated to be the reason for the stronger positive association between acculturative stress and depressive symptoms among Mexican men (Castillo et al., 2015). Since Asians similarly adopt the traditional masculine gender roles and may view self-disclosure as an indicator of weakness (Tai & Subramaniam, 2008), the link between acculturative stress and depressive symptoms may also be stronger among Asian men. Moreover, acculturating men, compared to women, reported lower levels of social support (López et al., 2002) which buffers against the development of depressive symptoms, especially among men (Fang et al., 2020). Therefore, acculturative stress and depressive symptoms might be related at a stronger degree among Asian men, and the

indirect effect of depressive symptoms in the acculturative stress and eating disinhibition association may be more robust among Asian men than women.

The Present Study

This study focused on the Asian young adult population given that the research understanding of the acculturative stress and eating disinhibition correlation among them is scant (Neyland et al., 2021). However, Asians are distinctively influenced by acculturative stress and shoulder unique risks in developing eating concerns (Rodgers et al., 2018). Their rapid growth further escalates the urgency to investigate this issue. Moreover, young adults in college are a predominant group at risk for developing eating problems as many of them live closely (e.g., in college dormitory) and are strongly influenced by members of their peer group, which can aggravate unhealthy eating habits (Hoerr et al., 2002; Koszewski & Kuo, 1996). Therefore, the first aim of this study was to investigate the direct relation between acculturative stress and eating disinhibition. It was hypothesized that greater acculturative stress would relate to greater eating disinhibition. The precise aspects of acculturative stress (e.g., that related to intercultural relations and discrimination), which may have more salient correlations with eating disinhibition, were explored. The second aim was to test the role of depressive symptoms in this association – depressive symptoms were postulated to mediate the link between acculturative stress and eating disinhibition. The third aim was to test whether gender moderates the mediation model. We hypothesized that the positive association between acculturative stress and depressive symptoms would be stronger among Asian male college students. Subsequently, the indirect relationship between acculturative stress and eating disinhibition via depressive symptoms would be stronger among Asian male students compared to their female counterparts.

METHOD

Participants and Procedure

Self-identified Asian undergraduate students were recruited from the University of California, Irvine (UCI) through the Human Subjects Lab Pool. Participants voluntarily completed online questionnaires at a place and time of their choice after reading the study information page and implying their consent to participate in the study. Upon completion, participants received partial course credit for finishing this 45-minute online survey. The current study was approved by the Institutional Review Board of UCI (IRB #: 2018-4803). Participants' demographic information was reported in Table 1.

[Table 1]

Measures

Eating Disinhibition

The Three-Factor Eating Questionnaire-R18 (TFEQ-R18; Karlsson et al., 2000) was used to measure eating disinhibition. The TFEQ-R18 contains three subscales including uncontrolled eating (9 items; e.g., "Sometimes when I start eating, I just can't seem to stop."), emotional eating (3 items; e.g., "When I feel blue, I often overeat."), and cognitive restraint (6 items; e.g., "I do not eat some foods because they make me fat."). Respondents assessed their behaviors on a 4-point response scale where a higher score indicates a higher tendency to behave in a certain way. For data analyses, scores were summed and then converted to a 0-100 scale, as suggested by De Lauzon et al. (2004). An eating disinhibition variable was then created by averaging the emotional and uncontrolled eating scores, in line with previous research (Karlsson et al., 2000; Masterson et al., 2019; Pentikainen et al., 2018).

The TFEQ-R18 differentiated eating patterns in non-obese populations (De Lauzon et al., 2004). Cronbach's alpha levels were reported at .85 (Uncontrolled Eating), .83 (Emotional

Eating), and .77 (Cognitive Restraint) in the original study (Karlsson et al., 2000). Internal consistency in the current study was comparable (α =.83, .83 and .75 respectively). For the Eating Disinhibition scale, internal consistency was good (α = .88).

Acculturative Stress

The Riverside Acculturative Stress Inventory (RASI; Benet-Martínez & Haritatos, 2005) comprises 15 items that measure acculturative stress across five domains: Intercultural Relations (e.g., "I have had disagreements with other Asians for liking American customs or ways of doing things"), Cultural Isolation (e.g., "I feel that there are not enough Asian people in my living environment"), Work Challenge (e.g., "In looking for a job, I sometimes feel that my Asian background is a limitation"), Language Skills (e.g., "It bothers me that I have an accent"), and Discrimination (e.g., "I have been treated rudely or unfairly because of my Asian background"). Each subscale is constructed of three items, rated on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), with higher scores indicating higher levels of stress.

The scale reliability in the original study among Asian college samples was good. Cronbach's alpha was .85 for the overall acculturative stress score, and were 78, .67, .73, .81, and .86, for the Intercultural Relations, Cultural Isolation, Work Challenge, Language Skills, and Discrimination subscales respectively (Miller et al., 2011). In the current study, scale reliability was comparable for the overall score (α = .83), and the Intercultural Relations (α = .78), Work Challenge (α = .72), Language Skills (α = .82), and Discrimination subscales (α = .82). But it was lower for the Cultural Isolation subscale (α = .54). The undergraduate student population at the UCI where this study was conducted is ethnically diverse, with Asian students comprising the largest group (36%; followed by Hispanic: 26%, White: 13% and Black: 2%; US Department of Education, 2020). It is possible that on a campus where U.S. ethnic minorities are a local

majority, the cultural isolation subscale, which uses questions such as “I feel that there are not enough Asian people in my living environment,” may not be valid.

Perceived Stress

The Perceived Stress Scale-14 (PSS-14; Cohen et al., 1983) was used to assess the degree to which participants perceived their lives as stressful in the past month. Respondents rated the frequency of feeling in specific ways (e.g., “In the last month, how often have you felt that you were unable to control the important things in your life?”) on a 5-point Likert scale ranging from 0 (*never)* to 4 (*very often)*. After reverse-coding negative items, the total score was summed to reflect participants’ overall perceived stress. The range of possible scores is 0 – 56, where higher scores imply greater perceived stress. Studies have used the PSS-14 across Asian populations (Hwang & Ting, 2008; Wei et al., 2008). Cronbach’s alpha in the original scale was .85 (Cohen et al., 1983) and in the present study was .77.

Depressive Symptoms

The Center for Epidemiological Studies—Depression Scale Short Form (CES-D-10; Andresen et al., 1994) is a 10-item self-report scale assessing the respondent’s current degree of depressive symptoms. Participants rated their frequency of experiencing each symptom (e.g., “My sleep was restless”) during the past week on a 4-point Likert scale ranging from 0 (*rarely or none of the time*) to 3 (*all of the time*). The total score ranges from 0 to 30, where higher scores indicate higher levels of depressive symptoms. With a Cronbach’s alpha of .86, the CES-D-10 showed good internal consistency (Andresen et al., 1994). The internal consistency reliability of the scale in the current study was .82.

Demographic Information

Participants reported their gender, age, country of birth, citizenship, length of stay in the United States, own race/ethnicity, parent's race/ethnicity, own employment status, own income (if applicable), family income and parental education levels. They also reported weight and height, from which their BMI was computed using the formula, 703 x weight (lbs) / [height (in)]^2 (Centers for Disease Control and Prevention, 2020). BMIs below 18.5 were categorized as underweight, those ranging from 18.5 to 24.9 as normal, those from 25.0 to 29.9 as overweight and 30.0 and above as obese (Centers for Disease Control and Prevention, 2020).

Analytical Strategy

Statistical analyses were conducted with SPSS 24.0 (SPSS, Chicago, IL) on macOS and the macro-program PROCESS v3.4 (Hayes, 2017). The Little's test of Missing Completely at Random (Little, 1988) indicated that missing data in the current dataset was completely at random, χ^2 (29) = 24.95, p = .68. Missing data were listwise deleted in the statistical tests. Prior to hypothesis testing, statistical assumptions were analyzed. The P-P plots showed that residuals were normally distributed and homoscedastic, and variance inflation factor values indicated multicollinearity was not a major concern for the regression analyses. Statistical assumptions were met.

Descriptive statistics and bivariate Pearson's correlations were computed between all main study variables. Independent *t*-test was calculated to examine the variables mean differences based on gender. Two ordinary least squares hierarchical regression analyses were then performed to test the direct association between acculturative stress and eating disinhibition (Aim 1), partialling out the variabilities that might be explained by general perceived stress, and relevant demographic variables. In the first hierarchical regression analyses, demographic information (i.e., age, gender, BMI, birthplace, citizenship, perceived stress, and Asian heritage)

was entered in Step 1 and overall acculturative stress score was entered in Step 2 while eating disinhibition was the outcome variable. In the second hierarchical regression analyses, the same set of demographic information was entered in Step 1, but the five subscales of acculturative stress were entered altogether in Step 2 and eating disinhibition was the outcome variable.

Next, the hypothesized mediating role of depressive symptoms in the association between overall acculturative stress and eating disinhibition (Aim 2) was tested with Model 4 of PROCESS MACRO v3.4 (Hayes, 2017). The same analyses were run five additional times with the five subscales of acculturative stress individually entered as the predictor variable. Depressive symptoms were the mediator variable and eating disinhibition was the outcome variable in these models. Finally, the moderating role of gender on the path between overall acculturative stress and depressive symptoms in the mediation model (Aim 3) was examined using Model 7 in the PROCESS Macro (Hayes, 2017). Similarly, the same analyses were run five additional times with the five subscales of acculturative stress individually entered as the predictor variable. Gender was the moderator variable; depressive symptoms were the mediator variable; and eating disinhibition was the outcome variable in these model testing. All bootstrapped confidence intervals were calculated based on 5,000 resamples.

Several covariates were considered in the analyses. First, following the previous work (Van Diest et al., 2014), to disambiguate the unique roles of acculturative stress in its association with depressive symptoms and eating disinhibition, general perceived stress was added as a covariate in all model testing because of its well-demonstrated associations with depressive symptoms (Cohen et al., 1983) and eating disinhibition (de Oliveira Penaforte et al., 2016). Second, weight status was shown to have systematic different associations with habitual dietary behavior (Dietrich et al., 2016), which potentially influence the stress and eating behavior

relationship. Thus, weight status was included in the current study analyses. Lastly, because Asian's generation status (Mena et al., 1987) and Asian ethnic group memberships (Frey & Roysircar, 2006) might link to distinctive acculturation experience and thus may be influential to the current study model, these variables were considered in model testing.

RESULTS

Preliminary Analyses

The descriptive statistics and bivariate correlations of the main study variables are listed in Table 2. Overall acculturative stress and the five subscales of acculturative stress were significantly related to depressive symptoms which were associated with higher eating disinhibition scores. Overall acculturative stress and the Intercultural Relations and Cultural Isolation subscales of acculturative stress were positively associated with eating disinhibition.

[Table 2]

The mean differences of main study variables based on participants' gender are represented Table 3. On average, scores of eating disinhibition, the two dimensions of acculturative stress (i.e., Work Challenge and Discrimination), perceived stress and BMI differed significantly between genders.

[Table 3]

Hypotheses Testing

Table 4 (model 1) shows the hierarchal regression analyses with a set of demographic information and overall acculturative stress as the predictor variables and eating disinhibition as the outcome variable (Aim 1). General perceived stress, and BMI emerged as significant in Step 1, and entering overall acculturative stress scale in Step 2 significantly improved the model (R^2

$_{adj.}$ = .09, $F_{change}(1, 454) = 6.44$, $p = .011$), with acculturative stress showing positive relation with eating disinhibition ($b = 3.59$, 95%CI = 0.81, 6.36, $b^* = .12$).

Table 4 (model 2) shows the hierarchal regression analyses with the same set of demographic information and five subscales of acculturative stress as the predictor variables and eating disinhibition as the outcome variable. General perceived stress, and BMI were again significant in Step 1. After five subscales of acculturative stress were simultaneously entered in Step 2, the overall model was significantly improved ($R^2_{adj.} = .10$, $F_{change}(5, 450) = 2.97$, $p = .012$), and the Intercultural Relations subscale of acculturative stress emerged as a significant and positive predictor variable of eating disinhibition ($b = 3.45$, 95%CI = 1.42, 5.47, $b^* = .18$). Overall, these findings showed that acculturative stress was associated with higher eating disinhibition, above and beyond the effects of perceived stress and BMI. Intercultural Relations was the subscale of acculturative stress driving the relation.

[Table 4]

The mediating role of depressive symptoms in the relation between acculturative stress and eating disinhibition was then estimated (Aim 2). Acculturative stress was positively linked to depressive symptoms ($b = 1.00$, 95% $CI_{boot} = 0.41, 1.59$) which were associated with higher eating disinhibition ($b = 0.64$, 95% $CI_{boot} = 0.21, 1.07$). Acculturative stress also directly correlated with eating disinhibition when the effect of depressive symptoms on eating disinhibition was simultaneously estimated ($b = 3.01$, 95% $CI_{boot} = 0.23, 5.78$). The index of mediation produced by PROCESS Macro further illustrated that depressive symptoms significantly and partially mediated the acculturative stress and eating disinhibition correlation (indirect effect = 0.64, $SE_{boot} = 0.32$, 95% $CI_{boot} = 0.11, 1.34$; Table 5).

Using the five dimensions of acculturative stress separately as one of the predictor variables, we explored the mediating effect of depressive symptoms in the link between each subscale of acculturative stress and eating disinhibition. There were significant correlations between the Intercultural Relations dimension of acculturative stress and depressive symptoms (b = .58, p = .002, 95% CI_{boot} = 0.22, 0.93) and between depressive symptoms and eating disinhibition (b = .60, p = .006, 95% CI_{boot} = 0.18, 1.03). The index of mediation showed that depressive symptoms were a significant partial mediator in the intercultural relations stress and eating disinhibition association (b = 0.35, SE_{boot} = 0.18, 95% CI_{boot} = 0.05, 0.75). Depressive symptoms were not a significant mediator when other dimensions of acculturative stress were estimated as the predictor variable while eating disinhibition was the outcome variable in the mediation analyses. Taken together, these results showed that depressive symptoms were a partial mediator in the association between acculturative stress and eating disinhibition. Intercultural relations stress was a more salient dimension of acculturative stress driving these associations.

[Table 5]

The moderating role of gender on the path between the overall acculturative stress and depressive symptoms in the mediation model was tested (Aim 3; Table 6). As illustrated in Figure 1, acculturative stress was associated with depressive symptoms more strongly among Asian male students (b = 1.89, p = .002, 95% CI_{boot} = 0.71, 3.08) than their female counterparts (b = 0.74, p = .029, 95% CI_{boot} = 0.07, 1.40). In turn, the indirect effect of depressive symptoms on the acculturative stress and eating disinhibition association was stronger for Asian male students (b = 1.19, SE_{boot} = 0.58, 95% CI_{boot} = 0.22, 2.47) than for Asian female students (b = 0.47, SE_{boot} = 0.29, 95% CI_{boot} = 0.002, 1.14). The interaction term of acculturative stress and

gender was marginally significant in predicting depressive symptoms (b = -1.16, p = .089, 95% CI_{boot} = (-2.49, 0.18). Thus, gender marginally moderated the mediating effect of depressive symptoms in the acculturative stress and eating disinhibition correlation.

Then, the moderating role of gender was explored individually for each of the five subscales of acculturative stress as the predictor variable, eating disinhibition as the outcome variable and depressive symptoms as the mediator variable. The interaction terms between the five dimensions of acculturative stress and gender in predicting depressive symptoms in the mediation model were significant for the Intercultural Relations dimension of acculturative stress ($b_{(intercultural\ relations\ stress\ x\ gender)}$ = -1.09, p = .016, 95% CI_{boot} = -1.97, -0.21), but not for other dimensions. Intercultural relations stress was more strongly associated with depressive symptoms among Asian male students (b = 1.45, p < .001, 95% CI_{boot} = 0.65, 2.25) compared to Asian female students (b = 0.36, p = .069, 95% CI_{boot} = 0.07, 1.40). The indirect effect of depressive symptoms on the intercultural relations stress and eating disinhibition association for Asian male students was stronger (b = 0.87, SE_{boot} = 0.42, 95% CI_{boot} = 0.14, 1.79) than for Asian female students (b = 0.22, SE_{boot} = 0.16, 95% CI_{boot} = -0.03, 0.60). Collectively, findings showed that the association between acculturative stress and depressive symptoms was stronger among Asian men, and in turn, the mediating effect of depressive symptoms on the acculturative stress and eating disinhibition association was stronger among Asian men than women. This pattern of result appeared to be driven by the Intercultural Relations subscale of acculturative stress.

DISCUSSION

The study findings support the hypothesis that acculturative stress and eating disinhibition would be positively correlated among Asian young adults in the United States,

above and beyond the effects of general perceived stress and relevant sociodemographic information (e.g., weight status). Depressive symptoms were a partial mediator in this direct association, and the mediating effect was contingent on gender. Specifically, acculturative stress correlated with depressive symptoms to a stronger degree among Asian male students, and the mediating role of depressive symptoms in the acculturative stress and eating disinhibition association was more robust among Asian male than female students.

The result that acculturative stress and eating disinhibition were linked, after the effects of general perceived stress was taken into account, supports our hypothesis and replicates previous findings (e.g., Van Diest et al., 2014). Additionally, we demonstrate that this positive association held, even including some theoretically relevant demographic information in the model testing. Body weight and immigration status, for instance, were previously shown to be associated with problematic eating behavior and acculturative stress (Dietrich et al., 2016; Mena et al., 1987). Therefore, some studies acknowledged that the lack of considerations of these variables in their studies investigating the acculturative stress and eating behavior relation was their study limitations (Kwan et al., 2018). However, the current finding suggests that the positive acculturative stress and eating disinhibition association was robust, even with these variables considered in the model testing. Furthermore, the Intercultural Relations subscale of acculturative stress, which refers to the stress stemming from cultural conflicts with one or both heritage and mainstream social relationships, appeared to drive the positive association between acculturative stress and eating disinhibition. Since intercultural relations stress essentially captures interpersonal sources of stress, our finding supports the notion that interpersonal stress is a more salient factor correlating with eating disinhibition (Oliver et al., 2001).

Depressive symptoms explained the association between acculturative stress and eating disinhibition among Asian young adults. This result echoes our hypothesis and shows that depressive symptoms may be a larger construct relating to problematic eating concerns. Furthermore, after depressive symptoms were introduced in the mediation model analysis, the effect size of general perceived stress in predicting eating disinhibition was reduced, and the effect became statistically non-significant. This suggests that depressive symptoms, in the context of acculturative stress, attenuate the effect of general perceived stress in its relation to eating disinhibition. General perceived stress has been the focus in the problematic eating behavior literature even among racial/ethnic minorities (e.g., Groesz et al., 2012). Nevertheless, this study underlines that depressive symptoms may be a more critical factor to consider in understanding eating disinhibition and its association with acculturative stress.

The mediating effect of depressive symptoms in the association between acculturative stress and eating disinhibition was contingent on gender. This finding is consistent with the study hypothesis that Asian men would experience greater depressive symptoms while facing acculturative stress and the mediating effect of depressive symptoms in the acculturative stress and eating disinhibition association would be stronger among Asian male than female students. As speculated in the previous studies among Mexican men (López et al., 2002; Ramos-Sánchez & Atkinson, 2009), Asian men might similarly suffer from the adverse impacts of gender roles socialization, such as by less self-disclosing in the context of experiencing high acculturative stress, and they may also perceive lower social support than desired. Furthermore, the result pattern appeared to be derived by the Intercultural Relations subscale of acculturative stress. Since the concept of intercultural relations stress involves the psychological struggles in navigating two cultures, this finding hints at the idea that racial/ethnic minority men (compared

to women) may be more adversely influenced while navigating between two sets of cultural norms (Crockett et al., 2007). Lastly, most previous studies investigating the correlates of acculturative stress and problematic eating behavior focused solely on the women (Perez et al., 2002; Van Diest et al., 2014). The present study, however, underscores the unique gender effect on the acculturative stress and eating disinhibition relation.

Several limitations are worth noting. First, our sample consists of Asian college students in Southern California, where Asians represent the highest percentage of the population compared with all other areas in the United States, except in Hawaii (Hoeffel et al., 2012). Moreover, we recruited our participants from UCI where Asian is the largest racial group among the undergraduate student population (US Department of Education, 2020). Therefore, because of the social ecological context of the study, findings may not be generalizable to a broader Asian population in the United States, especially for those who reside in areas where the Asian population is exceptionally small. An extension to this study would be to replicate the current findings in a broader U.S. context and compare the results with the current ones, which may also suggest reverent geographical and environmental factors to the current findings. Second, the current study was cross-sectional, and eating habits prior to participants experiencing acculturative stress were unattainable. This will be important to address in future research because habitual restrained eaters, compared to unrestrained eaters, tend to be more likely to disinhibit their food consumption following negative affect induction (Yeomans & Coughlan, 2009). This implies that the association between acculturative stress and eating disinhibition behavior may be more pronounced among cognitive restraint eaters. Future qualitative work may advance the current study by analyzing participants' reflections on how their habitual eating tendency influences their food intakes while experiencing acculturative stress.

Despite the limitations, the current study represents a crucial first step in understanding the association between acculturative stress and eating disinhibition among Asian students in the United States and highlighting the role of depressive symptoms and gender within the correlates. Minorities persistently suffer from problematic eating behavior (Crago et al., 1996; Croll et al., 2002; Shaw et al., 2004), unhealthy weight gain, and obesity (Murphy et al., 2017; Osei-Assibey et al., 2010), thereby contributing to health disparities in the United States, and Asian young adults are not exempted from these adverse health issues. The present findings spark several promising empirical research directions in advancing the understanding of the acculturative stress and eating disinhibition association. For instance, studies on other theory-driven mediators and the underlying mechanism of the moderating gender effect in the acculturative stress and eating disinhibition relation would be informative. Also, investigation on the construct of intercultural relations stress and its relation with depressive symptoms and eating behavioral problems may shed new light on the field among acculturating young adults. Moreover, the study results can inform the creation and improvement of culturally sensitive preventive measures dealing with eating pathologies and weight gain among Asian students. Curbing depressive symptoms might warrant effectiveness in reducing eating disinhibition when Asian undergraduate students experience acculturative stress. This strategy may show a more pronounced effect among Asian male students compared to female students.

CONCLUSIONS

This study documents that acculturative stress and eating disinhibition were positively correlated among Asian young adults. Depressive symptoms partially mediated this association, and gender moderated this mediation model, particularly, on the path between acculturative stress and depressive symptoms. The strength of the positive association between acculturative

stress and depressive symptoms was stronger among Asian male than female students, and thus, the mediating role of depressive symptoms in the acculturative stress and eating disinhibition relation was stronger among Asian male than female students. The findings contribute to the acculturation, stress, and appetite literature by demonstrating the novel role of depressive symptoms and gender in the relation of acculturative stress and eating disinhibition, igniting several new research directions. The current study also provides practical and clinical implications. To improve culturally sensitive and Asian-tailored preventive and treatment strategies to decrease eating behavior problems and weight gain, researchers, health professionals, and practitioners should consider addressing depressive symptoms, especially when treating Asian male students.

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Table 1

Participants Demographic Information (N = 477)

Variable	*M (SD)*	Range
Age	20.35 (1.72)	18-32
Length of Stay	15.25 (7.19)	0-30
	n	*%*
Gender		
Female	372	78.0
Male	102	21.4
Others	3	0.6
BMI		
Underweight (below 18.5)	51	10.7
Normal weight (18.5-24.9)	315	66.0
Overweight (25-29.9)	72	15.1
Obese (30 and above)	26	5.5
Missing	*13*	2.7
Asian Ethnicity		
Chinese	180	37.7
Vietnamese	89	18.7
Filipino	50	10.5
Korean	49	10.3
Indian	30	6.3
Japanese	6	1.3
Mixed or others	73	15.2
Citizenship		
U.S. citizen	359	75.3
Non-U.S. citizen	188	24.7
Birthplace		
U.S. born	288	60.4
Foreign-born	189	39.6
Annual Family Income		
$0~$25,000	71	14.9
$25,001~$50,000	102	21.4
$50,001~$75,000	96	20.1
$75,001~$100,000	76	15.9
$100,001 and above	128	26.8

Missing	*4*	*0.8*
Own Employment Status		
Unemployed	278	58.3
Part-time	196	41.1
Full-time	3	0.6
Annual Own Income		
$0~$25,000	193	40.5
$25,001~$50,000	5	1.0
$50,001~$75,000	1	0.2
Missing	*278*	*58.3*
Mother's Highest Education Level		
No School	6	1.3
Primary, Elementary or Middle School	48	10.1
High School or GED	105	22.0
Technical or Vocational School	15	3.1
Some college, no degree	63	13.2
Associate Degree	42	8.8
Bachelor's Degree	137	28.7
Graduate Degree	61	12.8
Father's Highest Education Level		
No School	9	1.9
Primary, Elementary or Middle School	34	7.1
High School or GED	92	19.3
Technical or Vocational School	10	2.1
Some college, no degree	74	15.5
Associate Degree	31	6.5
Bachelor's Degree	116	24.3
Graduate Degree	109	22.9
Missing	*2*	*.4*

Note: BMI status was calculated according to the standards of the Centers for Disease Control and Prevention (CDC, 2020).

Table 2

Descriptive Statistics and Bivariate Correlations of Main Study Variables

Variable	*M (SD)*	1	1.1	1.2	1.3	1.4	1.5	2	3	3.1	3.2	4	5
1. Overall AS	2.76 (.68)	_											
1.1 Intercultural Relations	2.55 (1.10)	.75***	_										
1.2 Cultural Isolation	2.48 (.91)	.66***	.41***	_									
1.3 Work Challenge	3.57 (.91)	.59***	.22***	.20***	_								
1.4 Language Skills	2.36 (.96)	.63***	.28***	.27***	.43***	_							
1.5 Discrimination	3.24 (1.14)	.75***	.49***	.38***	.44**	.22***	_						
2. Cognitive Restraint	44.91 (19.38)	.16***	.11*	.12**	.09	.11*	.10*	_					
3. Eating Disinhibition	43.65 (20.68)	.15***	.20***	.10*	.03	.02	.08	.18**	_				
3.1 Uncontrolled Eating	43.96 (18.17)	.13**	.18***	.08	.03	.05	.04	.11*	.86***	_			
3.2 Emotional Eating	43.35 (27.34)	.14**	.19***	.11*	.02	-.002	.10*	.20***	.94***	.64***	_		
4. Perceived Stress	28.91 (6.73)	.17***	.14**	.13**	.14**	0.04	.13**	.06	.24***	.19***	.23***	_	
5. Depressive Symptoms	11.48 (5.68)	.22***	.21***	.16***	.13**	.09**	.15**	.06	.27***	.24***	.25***	.67***	_
6. BMI	22.63 (5.41)	-.03	.04	.03	-.04	-.09*	-.03	.10*	.18***	.16**	.17***	.07	.10*

Notes. AS = acculturative stress.

*$p < .05$. **$p < .01$. ***$p < .001$

Table 3

Mean Differences of Main Study Variables Based on Gender

Variable	Men		Women		*t*	95% CI
	M	*SD*	*M*	*SD*		
AS total	2.67	0.71	2.79	0.67	-1.58	(-0.27, 0.03)
Intercultural Relations AS	2.49	1.04	2.56	1.12	-0.60	(-0.32, 0.17)
Cultural Isolation AS	2.42	.93	2.50	.90	-0.77	(-0.28, 0.12)
Work Challenge AS	3.41	.90	3.62	.91	-2.03*	(-0.41, -0.01)
Language Skills AS	2.44	1.00	2.34	.96	0.89	(-0.12, 0.31)
Discrimination AS	2.92	1.11	3.32	1.14	-3.15**	(-0.65, -0.15)
Cognitive Restraint	42.65	18.19	45.53	19.60	-1.33	(-7.14, 1.37)
Eating Disinhibition	39.00	21.27	45.01	20.35	-2.62**	(-10.52, -1.50)
Uncontrolled Eating	43.57	19.78	44.14	17.74	-0.28	(-4.56, 3.43)
Emotional Eating	34.42	26.92	45.88	26.98	-3.80***	(-17.38, -5.53)
Perceived Stress	26.99	6.21	29.45	6.80	-3.28**	(-3.93, -0.98)
Depressive Symptoms	10.93	5.32	11.62	5.79	-1.08	(-1.94, 0.57)
BMI	23.76	3.89	22.33	5.74	2.36*	(0.24, 2.63)

Notes. AS = acculturative stress.

*$p < .05$. **$p < .01$. ***$p < .001$

Table 4

The OLS Hierarchical Regression Testing with Acculturative Stress (AS) and Eating Disinhibition

	Model 1						Model 2					
	Step 1 (control variables)			*Step 2*			*Step 1 (control variables)*			*Step 2*		
Variable	*b*	95% CI	b^*	*b*	95% CI	b^*	*b*	95% CI	b^*	*b*	95% CI	b^*
Age	.44	(-0.65, 1.53)	.04	0.39	(-0.70, 1.47)	.03	0.44	(-0.65, 1.53)	.04	0.17	(-0.93, 1.26)	.01
Gender	4.16	(-0.07, 8.40)	.09	3.79	(-0.43, 8.01)	.08	4.16	(-0.07, 8.40)	.09	4.03	(-.20, 8.26)	.09
BMI	$.69^{***}$	(0.35, 1.03)	.18	0.70^{***}	(0.36, 1.04)	.18	0.69^{***}	(0.35, 1.04)	.18	0.65^{***}	(.31, .99)	.17
Birthplace	-1.84	(-7.09, 3.42)	-.04	-1.70	(-6.92, 3.53)	-.04	-1.84	(-7.09, 3.42)	-.04	-2.20	(-7.47, 3.06)	-.05
Citizenship	-.53	(-6.66, 5.61)	-.01	0.42	(-5.72, 6.55)	.01	-0.53	(-6.66, 5.61)	-.01	0.28	(-6.07, 6.62)	.01
Perceived stress	$.70^{***}$	(0.42, 0.97)	.23	0.62^{***}	(0.34, 0.90)	.20	0.70^{***}	(0.42, .97)	.23	0.63^{***}	(.35, .91)	.20
Asian heritage	.01	(-0.78, 0.80)	.001	0.05	(-0.74, 0.83)	.01	0.01	(-0.78, .80)	.001	-0.06	(-.85, .73)	-.01
AS total	–	–	–	3.59^{*}	(0.81, 6.36)	.12	–	–	–	–	–	–
Intercultural	–	–	–	–	–	–	–	–	–	3.45^{**}		
Relations											(1.42, 5.47)	.18
Cultural	–	–	–	–	–	–	–	–	–	0.63		
Isolation											(-1.68, 2.93)	.03
Work	–	–	–	–	–	–	–	–	–	-0.49		
Challenge											(-2.91, 1.94)	-.02
Language	–	–	–	–	–	–	–	–	–	-0.53		
Skills											(-3.08, 2.03)	-.02
Discrimination	–	–	–	–	–	–	–	–	–	-0.63	(-2.68, 1.42)	-.03
	$R^2 = .10$, $R^2_{adj.} = .08$, $F(7, 455) = 6.92$, $p < .001$			$R^2 = .11$, $R^2_{adj.} = .09$, $F_{change}(1, 454) = 6.44$, $p = .011$			$R^2 = .10$, $R^2_{adj.} = .08$, $F(7, 455) = 6.92$, $p < .001$			$R^2 = .13$, $R^2_{adj.} = .10$, $F_{change}(5, 450) = 2.97$, $p = .012$		

Notes. b^* = standardized regression coefficient.

$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Table 5

Indirect Effect of Intercultural Relations Acculturative Stress (AS) on Eating Disinhibition Through Depressive Symptoms

	Direct Effect						Total Effect		
	Depressive Symptoms			Eating Disinhibition			Eating Disinhibition		
Predictor	*b*	SE	95% CI	*b*	SE	95% CI	*b*	SE	95% CI
AS total	1.00***	0.30	0.41, 1.59	3.01*	1.41	0.23, 5.78	3.64**	1.41	0.88, 6.41
Depressive Symptoms	–	–	–	0.64**	0.22	0.21, 1.07	–	–	–
Gender	-0.50	0.45	-1.39, 0.39	4.10	2.13	-0.07, 8.28	3.78	2.14	-0.42, 7.99
BMI	0.06	0.04	-0.02, 0.13	0.67***	0.17	0.33, 1.01	0.71***	0.17	0.37, 1.05
Citizenship	0.02	0.47	-0.90, 0.95	-0.79	2.20	-5.10, 3.53	-0.77	2.22	-5.13, 3.58
Perceived stress	0.53***	0.03	0.47, 0.59	0.27	0.18	-0.09, 0.63	0.61***	0.14	0.33, 0.89
Indirect Effect of AS on Eating Disinhibition = 0.64, SE_{boot} = 0.32, 95% CI_{boot} = 0.11, 1.34									

Notes. N = 463. Each column is a regression model that predicts the criterion variable at the top of the column. Coefficients were unstandardized.

*$p < .05$. **$p < .01$. ***$p < .001$.

Table 6

Conditional Process Analysis with Gender as the Moderator

	Depressive Symptoms			Eating Disinhibition		
Predictor	*b*	SE	95% CI	*b*	SE	95% CI
AS total	1.89**	0.60	(0.71, 3.08)	3.27*	1.42	(0.49, 6.06)
Depressive Symptoms	–	–	–	0.63**	0.22	(0.20, 1.06)
Gender	-0.88†	0.49	(-1.84, 0.08)	–	–	–
AS total x Gender	-1.16†	0.68	(-2.49, 0.18)	–	–	–
BMI	0.05	0.04	(-0.02, 0.12)	0.63***	0.17	(0.29, 0.97)
Citizenship	0.09	0.47	(-0.84, 1.02)	-0.24	2.19	(-4.55, 4.07)
Perceived stress	0.54***	0.03	(0.48, 0.60)	0.29	0.18	(-0.06, 0.65)
			Index of moderated mediation = -0.73, SE_{boot} = 0.52, 95% CI_{boot} = -1.92, 0.08			

Notes. N = 460. AS = Acculturative stress. Each column is a regression model that predicts the criterion variable at the top of the column. Coefficients were unstandardized.

† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Figure 1

Interaction of Acculturative Stress and Depressive Symptoms by Gender