THE RELATIONSHIP BETWEEN CULTURAL FOOD SECURITY AND INTERNATIONAL STUDENT PHYSICAL AND MENTAL HEALTH

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ABSTRACT

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International students encounter various challenges during their studies in the host country (Sherry et al., 2010; Poyrazli & Lopez, 2007; Brown & Holloway, 2008b), which may have negative effects on their mental and physical health (Brunsting et al., 2018; Msengi et al., 2011). Although researchers have identified several protective and vulnerability factors in the international student population (Bender et al., 2019; Zhang & Goodson, 2011; Li et al., 2014; Kawamoto et al., 2018), access to cultural foods is one element that has been given insufficient attention (Wright et al., 2021b). The current study examined the association of cultural food security (CFS) with international students' mental and physical health. First, two scales were developed and piloted to measure CFS and cultural food security importance (CFSI) among international students. Second, a cross sectional study investigated the relationships among CFS (predictor), health outcomes, and moderators, including CFSI, psychological flexibility, cultural distance, and social support. Results indicated that students struggle with CFS. CFS was a significant predictor of perceived physical health, but not of mental health outcomes. There was no significant interaction between CFS and examined moderators. Future research should assess the effects of CFS dimensions individually to better understand how these relate to international students' physical and mental health. Also, additional moderators of the relationship between CFS and health should be studied.

Keywords: cultural food security; international students; mental health; physical health

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INTRODUCTION

International "students are individuals who have physically crossed an international border between two countries with the objective of participating in educational activities in the country of destination, where the country of destination is different from their country of origin" (OECD, 2017, p. 38). International students have been studying in the United States for centuries (Akanwa, 2015). More than 5% (i.e., 1,057,188) of the student population in the United States (U.S.) is made up of international students (Institute of International Student Education, IIE, 2023a).

International students enrich the cultural, educational, and economic domains of U.S. society (Trice, 2003, Hegarty, 2014, NAFSA, 2023). International students add significant cultural diversity to campuses (Trice, 2003). They have strong academic outcomes (Trice, 2003; Andrade, 2006), thereby elevating the U.S. education system (Hegarty, 2014), and their presence has been found to contribute to domestic students' educational growth (Luo & Jamieson-Drake, 2013). Notably, most international students finance their studies by relying on "personal and family" funds (IIE, 2023b) and they bring in billions of dollars yearly (NAFSA, 2023). International students are often considered an important source of income to universities that may help in alleviating some of the economic hardships of these institutions (Viggiano et al., 2018; Hegarty, 2014) and in the funding of U.S. students (Shih, 2017).

Despite these benefits to the host institutions, international students encounter many challenges during their studies, such as visa-related issues, discrimination, and financial difficulties (Majorana, 2021; Hanassab, 2006; Sherry et al., 2010). These challenges often negatively impact international students' mental and physical health (e.g., Brunsting et al., 2018; Msengi et al., 2011). On the other hand, several protective factors, including, notably for this

study, access to their cultural foods, may help international students better react to difficulties (Wright et al., 2021b). Thus, the goal of the current study was to measure cultural food security (CFS) in international students, and to examine the relationship between CFS and these students' physical and mental health.

While the current research examines the experiences of international students in general, they are a diverse population (Andrade, 2006). Therefore, although a lot of the outlined issues impact all international students, the degree and manner of impact can be different for each student depending on individual characteristics, such as country of origin (e.g., Yeh & Inose, 2003; Kawamoto et al., 2018) and length of time in the U.S. (e.g., Li et al., 2014). For example, although China and India are the most represented countries (IIE, 2023c), international students in the U.S. come from all over the world (IIE, 2023d), and therefore, cultural differences between their home country and the U.S. and the subsequent acculturation challenges can vary among students (Yeh & Inose, 2003; Kawamoto et al., 2018). Moreover, heterogeneity is an issue not only between different cultures but also within the same cultural group (Heng, 2019). Because of this heterogeneity, the current study also examined several potential moderators that might strengthen or attenuate the relationship between CFS and international students' health.

Challenges Impacting International Students

International students confront numerous obstacles. For example, the legal threat to international students' presence is one major challenge (e.g., Pottie-Sherman, 2018; Buckner et al., 2021). During the COVID-19 pandemic, international students' position in the U.S. was threatened as a result of political policy that intended to force them to either take in-person classes or move back home (Majorana, 2021).

Another significant difficulty encountered by international students is the exposure to new cultural/social norms (Gu et al., 2010; Andrade, 2006; Vakkai et al., 2020). For instance, international students may need to learn how to navigate a new education system (e.g., Gu et al., 2010; Hussain and Shen, 2019, as cited in Qadeer et al., 2021), health care system (e.g., Adegboyega et al., 2020), or tax filing process (Finley et al., 2022). Indeed, researchers have found that international students report confusion about the intricacies of U.S. health insurance (Adegboyega et al., 2020) and limited information about the process of filing tax returns (Finley et al., 2022).

Discrimination may be another challenge that affects international students (Qadeer et al., 2021; Brown & Brown, 2013). International students perceive discrimination in various environments, especially non-academic/community settings, and students from certain areas (e.g., Asia, Africa, Middle East) report higher levels of perceived discrimination, highlighting the heterogeneity within the international student community (Hanassab, 2006). Self-reported discrimination may also be more prominent in international students than local students and can be positively associated with homesickness (Poyrazli & Lopez, 2007). Perceived discrimination can also impact students' assessment of their education (Wadsworth et al., 2008). In a cross-sectional study on the effects of discrimination in a diverse sample of international students, Karuppan and Barari (2011) found that greater levels of perceived discrimination were associated with lower "active and collaborative learning" and less favorable views on their education (Karuppan & Barari, 2011, p. 73).

International students may also be vulnerable to financial difficulties during their studies in the U.S. (Sherry, et al., 2010). These students typically rely on "personal and family" funds to support their studies (IIE, 2023b). Given that tuition and wages may be higher in the U.S. than in

the countries international students are from (OECD, 2021; International Labour Organization, 2022), this may pose a substantial financial burden on the students and their families. Furthermore, their inability to work above 20 hours a week or off-campus places them in an economically disadvantaged position (Majorana, 2021; U.S. Immigration and Customs Enforcement, 2022). In a cross-sectional study at The University of Toledo, 58% of international students reported financial struggles, sometimes despite receiving financial aid from the university (Sherry, et al., 2010). Gu et al. (2010) also found that first year international students' main worries revolve around their finances.

Finally, international students may encounter challenges in their social life (Ward, 2001). International students report more social difficulties than their U.S. peers (Andrade, 2006), and tend to experience feelings of loneliness, social dissatisfaction (Gu et al. 2010), and homesickness (Rajapaksa & Dundes, 2002, as cited in Andrade, 2006 pg. 140). Perceptions of seclusion and difficulties fostering relationships with host students has also been reported by international students (Karkour & Jusseaume, 2020).

Outcomes

The challenges experienced by international student are associated with negative consequences (Vakkai et al., 2020), including lower levels of physical (Msengi et al., 2011) and psychological health (Can et al., 2021, Akhtar & Kroener-Herwig, 2019), and quality of life (Hsu et al., 2009). For instance, in a systematic review, Brunsting et al. (2018) reported that factors including discrimination, language skills, and social support were predictors of psychological concerns (e.g., acculturative stress and mental health problems). The negative psychological outcomes may be greater for international students than for their native peers (Andrade, 2006).

As described by Smith and Khawaja (2011), international students can experience acculturative stress (Berry et al., 1987) especially if they lack means to react effectively to challenges. Kim et al. (2019) reported that acculturative stress is more predominant in international students who are older, identify as female, and have been in the U.S. for a longer time. Acculturative stress can further be associated with other negative outcomes, such as symptoms of depression (e.g., Jackson et al., 2013; Kim & Cronley, 2020; Kim et al., 2019; Ma, 2021) and anxiety (Kim & Cronley, 2020; Kim et al., 2019).

Indeed, international students struggle with mental health problems, such as anxiety (Kim et al., 2019; Lian & Wallace, 2020; Sun et al., 2021), depression (Kim et al., 2019; Lian & Wallace, 2020; Sun et al., 2021), suicidal ideation (Perez-Rojas et al., 2021; Taliaferro et al., 2020), alcohol use concerns (Kim et al., 2019), and eating disorder symptomatology (Nguyen & Soysa, 2019; Lipson & Sonneville, 2017). Specifically, Shadowen et al. (2019) reported that 24.7% and 45.3% of international students experienced clinically significant symptoms of anxiety and depression, respectively. Similarly elevated levels of anxiety and depression (i.e., > 20%) were reported by Lin et al. (2022).

Concerning physical health, a study assessing health variables in international students across multiple universities in the U.S. reported that students perceived their own physical health in various domains (e.g., sleep, food intake, physical activity, weight) as significantly poorer since they have been in the U.S., compared to when they were home (Msengi et al., 2011). Also, Katare and Beatty (2018) reported a positive association between the obesity rate in the location of the host university and weight gain in a sample of international students across the U.S., an effect that increased with time. Similarly, Almohanna et al. (2015) in a longitudinal study found that when international students adapted to the American diet (dietary acculturation), it resulted

in statistically significant weight gain (2.8 pounds) over the course of 12 weeks. Du et al.'s (2021) study did not find a significant increase in weight over time, but they did observe significantly higher body fat, emotional eating, uncontrolled eating, and lower quality of sleep, especially in women. Importantly, studies have linked acculturative stress with health outcomes (Du et al., 2021) and health-related quality of life (Ogunsanya et al., 2018).

General Protective and Vulnerability Factors

There are several protective and vulnerability factors that may affect international students' welfare that might be relevant to the current study (e.g., Bender et al., 2019; Zhang & Goodson, 2011). The factors outlined in this section were included as moderators or covariates in analyses examining the association between cultural food security and physical and mental health. One of the most widely researched protective factors is the presence of social support (Kristiana et al., 2022; Bender et al., 2019). For international students, social support is positively associated with adjustment and has a negative association with psychopathology and acculturative stress (Shadowen et al., 2019; Li et al., 2014; Zhang & Goodson, 2011). Meta-analyses have also shown that in the presence of social support from varying sources (i.e., home, U.S., other international students), acculturative stress tends to be lower (Kristiana et al., 2022). In their meta-analysis, Bender et al. (2019) reported better psychological outcomes in the presence of both objective and self-reported social support. Although both meta-analyses found significant heterogeneity and publication bias in their results, they point to the benefit of social support for international students.

International students' adjustment may also be related to the difference between their home culture and host culture (e.g., Kawamoto, et al., 2018). As noted by Bender et al. (2019), there is a paucity of measurement of cultural difference and therefore scholars rely on country of

origin as a proxy. Researchers indicate that students from Europe have better outcomes than students from Africa, Asia, or South America when studying in the U.S. (Yeh & Inose, 2003). Students from Asian countries are more susceptible to negative outcomes, including psychological (Kawamoto et al., 2018; Msengi, 2007) and sociocultural challenges (Zhang & Goodson, 2011), than their peers from other countries. More elevated symptoms of depression (Kawamoto et al., 2018; vs South and North America) and stress (Msengi, 2007, vs South America) have also been reported by students from Africa. Relatedly, Tan and Liu (2014) argue that "ethnic visibility" may impact international students' adjustment. More specifically, they found that international students who "visibly" fit in better with the host country (e.g., White international students in Australia) expected less cultural distance and discrimination, and higher acculturation to the host country than their peers who did not report Anglo/European heritage (Tan & Liu, 2014). One exception to the above findings is that substance use issues seem to be more prevalent in international students from Europe, relative to those from Asia and South America (Kawamoto et al., 2018). The aforementioned studies underline the necessity to consider the heterogeneity in outcomes pertaining to international students as a result of ethnicity or country of origin.

As argued by Smith and Khawaja (2011), international students' adjustment difficulties may be further augmented amidst a lack of appropriate skills to react effectively to challenges. Notably, Wei et al. (2008) found that in international students who relied more frequently on suppressive coping techniques, higher perceived discrimination was related to greater symptoms of depression. Similarly, Ra and Trusty (2015) reported a negative association between emotional control approaches and acculturative stress. A potential alternative to suppressive coping is acceptance, which is part of the psychological flexibility model proposed by

Acceptance and Commitment Therapy (Hayes et al., 2011). Although this construct is less researched in the international student population, there is a vast literature supporting the positive association between psychological flexibility and psychological well-being (Wersebe et al., 2018), functioning (Trainor et al., 2018; Davey et al., 2020), less psychopathology (Masuda et al., 2014; Masuda & Tully, 2012) and negative health behaviors (Roche et al., 2019). Two studies have investigated the effectiveness of an Acceptance and Commitment Therapy intervention within the international student population (Xu et al., 2020; Muto et al., 2011). Both studies found significant improvements in depression, anxiety, and stress symptoms following the intervention (Xu et al., 2020; Muto et al., 2011), showcasing the potential benefits of psychological flexibility processes in international students' well-being. Tian et al. (2019) reported that self-compassion, a psychological flexibility related construct, was a negative predictor of acculturative stress in international students. Nonetheless, researchers did not find self-compassion to moderate the relationship between ethnic identification and acculturative stress (Tian et al., 2019).

Researchers have identified several other protective/vulnerability factors within the international student community, including language competency, length of time in the host country, acculturation, age, gender, and socioeconomic status. For example, Zhang and Goodson (2011) reported that individuals who viewed their English skills as poorer tended to report more psychological difficulties, such as symptoms of depression and acculturative stress, lower life satisfaction, and diminished sociocultural adjustment. Language competency may impact social well-being, such as building relationships with locals (Andrade, 2006). Some authors have found a negative association between length of time in the host country and acculturative stress, mental health concerns (Zhang & Goodson, 2011), adjustment concerns (Duru & Poyrazli, 2011), and a

positive relationship with English language competency, psychological and sociocultural adjustment (Li et al., 2014), and life satisfaction (Zhang and Goodson, 2011). Kim et al. (2019), on the other hand, noted that international students experienced more acculturative stress if they were present in the U.S. for longer. Students who are more acculturated to the host country's culture also seem to report better outcomes, such as greater life satisfaction (Zhang & Goodson, 2011), better language skills (Li et al, 2014), less sociocultural concerns (Zhang & Goodson, 2011; Wang & Mallinckrodt, 2006), acculturative stress (Brunsting et al., 2018), and psychological concerns (Li et al., 2014; Wang & Mallinckrodt, 2006).

Finally, international students who identify as female may have poorer psychological and physical outcomes, such as higher acculturative stress (Zhang & Goodson, 2011; Kim et al., 2019), depression (Dao et al., 2007), physical complaints, as well as harmful health behaviors (Zhang & Goodson, 2011). In some cases, younger international students have better outcomes, including higher life satisfaction (Zhang & Goodson, 2011) and less acculturative stress (e.g., Kim et al., 2019). Msengi (2007), however, reported the opposite: younger students reported more stress than older students. International students who report lower socioeconomic status or greater financial difficulties also report more acculturative challenges (Koo et al., 2021) and depression (Fanyi et al., 2022). Satisfaction with one's financial situation is a critical predictor of overall life satisfaction in international students (Sam, 2000).

Cultural Food Security as a Protective Factor

In addition to the factors described above, international students' access to and consumption of their own traditional foods could represent an important protective factor that has not received much research attention (Wright et al., 2021b). Researchers have named this concept 'cultural food security' (e.g., Power, 2008, in Wright 2021a & 2021b). Examining the

situation of Aboriginal people in Canada, Power (2008) defined CFS as "the ability of Aboriginal people to reliably access important traditional/country food through traditional harvesting methods" (p. 96). Wright et al. (2021b), relying on the work of Alonso et al. (2018), defined several dimensions of CFS, described in more detail below: access, availability, quality, preparation, sharing, and consumption of cultural foods. These dimensions are categorized into two groups: the first three make up the 'cultural food security' dimension while the latter three are part of the 'foodways' dimension (Wright et al., 2021b, p. 640).

Research on the intersection of food and international student adjustment relies on the acculturation conceptual framework (e.g., Amos & Lordly, 2014; Wright et al., 2021b; Brown et al., 2019). Acculturation describes the changes individuals go through when encountering a new culture (Graves, 1967, as cited in Ward & Szabo, 2019; Berry et al., 1987; Berry 2006). During the acculturation process distress may emerge (Oberg, 1960; Berry et al., 1987). For example, culture shock (Oberg, 1960) refers to distress following the loss of "familiar signs and symbols of social intercourse" when faced with a new society (Oberg, 1960, pg. 177; Chapdelaine & Alexitch, 2004). The concept of 'culture shock' is critiqued as having limited theoretical underpinnings, not encompassing positive outcomes, and providing a limited understanding of cultural interactions (Berry, 2006, p. 294). Given these criticisms (e.g., Brown & Holloway, 2008a; Chien, 2016; Berry, 2006), some researchers prefer the associated notion of acculturative stress (Berry, 2006). Acculturative stress, an outcome that has been previously reported in international students (Smith & Khawaja, 2011), is linked to acculturation theory (Berry, 2006).

Berry et al. (1987) defines acculturative stress as "one kind of stress, that in which the stressors are identified as having their source in the process of acculturation" and comprises "a reduction in the health status of individuals, and may include physical, psychological and social

aspects" (pp. 492-493). Losing one's familiar contextual cues and facing new ones when moving to a novel environment can result in significant distress (Pedersen, 1994). Therefore, having access to and consuming traditional foods, which is an aspect of cultural identity, aids in adjustment to the new environment and helps people remain connected with their culture (Garza-Guerrero, 1973, as cited in Amos & Lordly, 2014). Indeed, Ward and Szabo (2019) describe four major theories of acculturation, one of which, the stress and coping model, especially supports the proposed positive effect of CFS on international students' welfare. The 'stress and coping' model (e.g., Lazarus & Folkam, 1984; Berry, 1970; Ward, 1996; as cited in Ward & Szabo, 2019) addresses the individual's ability to cope with stressors as a result of "crossing cultures" (p. 642). Within this framework, consuming home culture foods can be regarded as a method of coping with difficult events related to moving abroad (as found in Wright et al., 2021b; Mustafa, 2016; Brown, 2009). Additionally, scholars (Berry, 2006, Ward & Szabo, 2019, p. 663) argue that the integration of home and host cultural elements is the most effective acculturation strategy with respect to adjustment. Given that access to and consumption of food from one's own culture is an important cultural touchstone (Wright et al., 2021b), consuming home culture foods in conjunction with host culture foods may be a form of integration of cultures.

Empirical support for the importance of cultural foods and eating practices in adjustment is evident in research focused on immigrant groups (e.g., Agutter & Ankeny, 2017; Aljaroudi et al., 2019; Brown & Paszkiewicz, 2017; Wright et al., 2021a & 2021b). Immigrants often go to great lengths to acquire home foods, such as transporting foods to the host country when traveling home (e.g., Brown & Paszkiewicz, 2017). Difficulties finding home foods may lead to distress (Terragni et al., 2014). Furthermore, unfamiliarity with available foods, diminished

access to traditional ingredients, and diminished food-related social interactions leads to significant stress in immigrant populations (e.g., Kavian et al., 2020).

Nonetheless, as noted by researchers (e.g., Wright et al. 2021b; Hartwell et al., 2010), outcomes related to international students' access to their cultural food are not widely studied. Overall, research on CFS in international students relies mainly on qualitative methods (e.g., Brown, 2009; Brown et al., 2010; Brown et al., 2019; Wright et al., 2021b; Amos & Lordly, 2014), is performed outside the U.S. (e.g., UK: Brown 2009; Brown et al., 2010; Brown et al., 2019; Canada: Amos & Lordly, 2014; Stewin, 2013), or focuses predominantly on physical health outcomes (e.g., Shi et al., 2021). Not a lot is known about how international students' dietary changes relate to psychological well-being (Shi et al., 2021).

Extant research indicates that international students have a strong preference towards their cultural foods (e.g., Brown 2009; Brown et al., 2010; Brown et al., 2019; Noyongoyo, 2011; Shi et al., 2021; Wright et al., 2021b). Shi et al. (2021) found that after adjusting to their new environment, international students consume and cook more of their home culture foods. Nonetheless, they experience significant general (Shi et al., 2021) and cultural food insecurity (Wright et al., 2021b; Hartwell et al., 2010; Stewin, 2013; Mustafa, 2016), due to a lack of availability, expensive products, and poor quality or authenticity of cultural foods (Hartwell et al., 2010; Alakaam & Willyard, 2020; Shi et al., 2021; Amos & Lordly, 2014). Researchers cite several other obstacles to CFS, including degree of cultural differences (Brown et al., 2010), time constraints (e.g., Hartwell et al., 2010; Pilli & Slater, 2021; Shi et al., 2021), and insufficient cooking capabilities (Pilli & Slater, 2021). A study in the UK found that students whose cultural food was more similar to British cuisine, acculturated more easily to the host country's foods (Brown, 2009).

International students describe positive psychological outcomes, such as positive affect, relaxation (Brown et al., 2019; Saccone & Obeng, 2015), and comfort (Brown, 2009) when they are able to access cultural foods. Insecurity, on the other hand, can lead to more stress (Wright et al., 2021b), disappointment, and frustration (e.g., Amos & Lordly, 2014). For instance, Brown (2009) conducted an ethnographic study and asked international students in England about their experiences with food. Participants found British food unhealthy and preferred to cook and eat their home foods which provided them comfort and a way to cope with difficult experiences associated with being an international student (Brown, 2009). Conversely, not having access to home foods was associated with upset (Brown, 2009).

The social life of international students is also positively related to CFS. Several studies report on the importance of eating together (e.g., Shi et al., 2021), which can strengthen social bonds (e.g., Brown et al., 2010; Brown et al., 2019; Saccone & Obeng, 2015; Wright et al., 2021b), enhance 'cultural acceptance' (Amos & Lordly, 2014, p. 61), and stimulate people to cook (e.g., Brown, 2009).

International students' physical health might also benefit from greater CFS. Indeed, researchers have reported negative health outcomes (e.g., gastrointestinal discomfort, fatigue; Alakaam & Willyard, 2020) and weight gain when students switch to a host diet (e.g., Shi et al., 2021; Saccone & Obeng, 2015; Alakaam & Willyard, 2020). Shi et al. (2021) carried out a review of both quantitative and qualitative studies, examining the diet and food insecurity of international students. Acculturation to the host country's diet was accompanied by higher sugar or fast-food intake (Shi et al., 2021). Weight gain, as a result of an unhealthy lifestyle, was also frequently reported. On the other hand, reduced appetite, dislike of host foods, and poor cooking skills resulted in weight loss (Shi et al., 2021). Given that these consequences seem to be

associated with dietary changes after moving abroad (Shi et al., 2021), being able to access cultural foods may help maintain dietary habits that students held before arriving to a new country and, as a result, promote healthier eating habits.

Finally, two important studies conducted in the U.S. that are closely aligned with the aims of the current study were carried out by Wright et al. (2021a & 2021b). The authors conducted two qualitative studies on CFS and its relationship to well-being and identity. Researchers implemented semi-structured interviews and an "exploratory qualitative methodology" (Wright et al., 2021b, p. 642). Both studies included participants from the University of Nevada, Reno. Their first study focused exclusively on second-generation American students (n = 16) and found that students described a positive association between cultural foodways (i.e., preparation, consumption, and sharing of home culture foods) and identity and well-being (Wright et al., 2021a). The second study examined and compared the experiences of second-generation Americans (n = 16) and international students (n = 15) (Wright et al., 2021b). An astonishing result of this study was that cultural food insecurity, measured by a two-item scale, was indicated by 100% of international students. On the other hand, only about half of second-generation American students reported similar difficulties (Wright et al., 2021b). Another important finding was that both cultural food insecurity and lack of cultural foodways were related to negative well-being variables, such as stress, homesickness, and weight loss (Wright et al., 2021b). Conversely, CFS contributed to well-being by acting as a coping strategy in the face of challenges (Wright et al., 2021b). Although some negative feelings, such as melancholy, emerged when consuming or preparing foods from home, generally, CFS and foodways were associated with positive outcomes (Wright et al., 2021b). Some students found it easier to acculturate to the American diet instead of maintaining a home culture diet. However,

this was often associated with weight gain and identity loss (Wright et al., 2021b). Besides availability, the prices of cultural foods also precluded international students from cooking or consuming the foods from their own culture (Wright et al., 2021b). International students reported that cultural foods and related behaviors are important pieces of their identity and their ability to stay connected to their family and culture (Wright et al., 2021b). Amos and Lordly (2014) and Stewin (2013) reported similarly strong associations between identity and home culture foods in international students in Canada.

The Current Study

The current study examined CFS in a sample of undergraduate and graduate international students at Bowling Green State University, a public university in Northwest Ohio. The study aimed to address limitations in prior research by: (1) developing and employing a comprehensive quantitative assessment of CFS and cultural food security importance (CFSI) in international students; (2) examining multiple potential health outcomes of CFS, including mental and physical health; (3) and including several moderators of the relationship between CFS and health, such as CFSI, psychological flexibility, cultural distance, and social support.

It was hypothesized that (a) CFS would have a positive relationship with mental and physical health (i.e., satisfaction with life and perceived physical well-being); and (b) CFS would have a negative relationship with health concerns (i.e., depression, anxiety, acculturative stress, and eating concerns). The following interactions were also hypothesized: (c) CFS would have a stronger relationship with physical and mental health when psychological flexibility and social support are lower, relative to when they are higher; and (d) CFS would have a stronger relationship with physical and mental health when CFSI and cultural distance are higher, compared to when they are lower.

METHOD

Procedure

The first step in the current study was to develop and pilot the Cultural Food Security Scale (CFS-S) and Cultural Food Security Importance Scale (CFSI-S) (see Appendix C. 5. & 7.). Subscales and items were developed as described below based on the qualitative study by Wright et al. (2021b). The scales were emailed to international students from Bowling Green State University (BGSU) for completion (see Appendix B.1.1. & 1.2.). The international students were given a $10 Amazon gift card for completing the assessment. In addition to the new measures, the pilot survey incorporated quantitative and qualitative questions about the scale's validity and item intelligibility, inclusion criteria items, demographics, perceived English proficiency, supplemental CFS items, cultural food preference, one attention check item, and a CAPTCHA verification (see Appendix C.). Additional demographic and financial well-being questions that were included in the survey were not analyzed in the current study. The survey was stored and administered on Qualtrics.

The second step of the study was the administration of the entire survey (see Appendix D.) to understand the relationship between CFS and mental and physical health variables. The survey included measures of the following variables: predictor (i.e., CFS), outcomes (i.e., mental health and physical health), and moderators (i.e., CFSI, psychological flexibility, cultural distance, and social support). Acculturation, perceived English language proficiency, length of time in the U.S., perceived financial well-being, age, and sex assigned at birth were measured as potential covariates, as these variables have also been previously associated with health outcomes. Additional items related to demographics, food, and academics were included in the survey to obtain a more comprehensive understanding of the sample. The survey included three

attention check items (see Appendix D. 7., 15., and 21.). Finally, additional quantitative (e.g., academic adjustment, financial well-being) and qualitative items were administered as part of the larger survey although not analyzed in the current study.

To complete the survey, international students at BGSU were contacted through email (see Appendix B.2.1., 2.2). The survey was also shared through BGSU newsletter (i.e., Campus Updates) and with several instructors (see Appendix B 2.3.). Participants were informed of the purpose of the study, the estimated completion time, and the benefits of participation. Following their participation, students were entered to win a $10 or $20 Amazon gift card if they met inclusion criteria, completed at least 75% of the survey, passed the CAPTCHA verification, and at least 2 attention check items. There was a 1 in 6 chance to win a gift card. Data were excluded from analyses if participants missed more than one of the attention check items. Instructions or items for some scales (i.e., general food security, satisfaction with life, acculturative stress, social support, physical health, acculturation) were slightly modified to better apply to the online administration format and increase clarity.

Inclusion criteria for the current study were as follows: (1) international student status; (2) at least 18 years of age; (3) a student enrolled in the current semester at BGSU; and (4) residing in the U.S. The survey was distributed to the entire BGSU international student main campus population during the 2023 Spring, Summer, and Fall semesters. The BGSU Office of Institutional Research (n.d.) reports that there were 702 (Spring 2023), 555 (Summer 2023), and 853 (Fall 2023) international students enrolled at BGSU's main campus. The current study was approved by the BGSU Institutional Review Board (IRB).

Location

BGSU is a public university located in Bowling Green, a northwestern city in Ohio. Similar to the city, Bowling Green (84.6%, United States Census Bureau, 2022), BGSU is a predominately white institution (BGSU Office of Institutional Research, n.d.) and hosts about 14,547 students. The primary group supporting international students at BGSU is the International Student Services office, part of the International Programs and Partnerships. The office provides assistance for students to navigate immigration/visa issues in the U.S., among other services (BGSU International Student Services, n.d. a).

The population of Bowling Green is 29,647 (United States Census Bureau, 2022). The closest metropolitan area is Toledo, Ohio, with a population of 266,301(United States Census Bureau, 2022). Both in Toledo and Bowling Green, 3.3% of the population is "foreign born." The average household income in Bowling Green ($ 41,346) is lower than the national average ($74,580) (United States Census Bureau, 2022). 24.6% of people are reported to live in poverty in Bowling Green (United States Census Bureau, 2022).

The Wood County Community Health Assessment (Wood County Health Department, 2022) reported that almost half of people in Wood County report 'excellent/very good' perceived health. BMI data indicates that over two thirds of Wood County residents are overweight or obese (Wood County Health Department, 2022). The most common health concerns were high blood pressure and cholesterol (30%) and arthritis (31%), followed by cancer (11%) and asthma (10%). "Stress, anxiety, depression, emotional health problems" were reported to have the greatest functional impact by 33% of adults (Wood County Health Department, 2022, p. 95).

Measures

Predictor

Cultural Food Security (CFS). The Cultural Food Security Scale (CFS-S) was developed based on the qualitative study by Wright et al. (2021b) (see Appendix C. 5. & D. 5.). Items were designed to reflect the six dimensions of CFS identified by Wright et al. (2021b) based on the work of Alonso et al. (2018). These dimensions are as follows: (1) access (e.g., affordability; physical distance); (2) availability (e.g., on campus; in stores); (3) quality (e.g., different/unpleasant taste); (4) preparation (e.g., mode of preparation; cooking); (5) sharing (e.g., eating/cooking together with others); (6) consumption (e.g., eating) (based on Wright et al., 2021b). Forty-two items were generated using the qualitative answers included in Wright et al. (2021b) and their analysis. Each item is scored on a 5-point Likert scale ranging from 'strongly disagree' (1) to 'strongly agree' (5). Each subscale has some reverse scored items to minimize patterned responding. Higher scores on each scale indicate greater CFS. Psychometric characteristics of this scale are presented in the results section for the pilot and main studies.

Supplemental CFS Items. Wright et al. (2021b) administered two quantitative items of CFS in their study (see Appendix D. 22.). These two items were utilized in the current study to allow for comparisons with the CFS-S and the results found by Wright et al. (2021b). These two items were: (1) "Since starting college, have you experienced the inability to purchase the foods that you used to eat at home?" and (2) "Did the inability to purchase your traditional food happen within the last three years?" Both items are rated dichotomously as 'yes' or 'no' (Wright et al., 2021b).

Outcomes

Mental Health. Five measures of mental health were employed. Zhang and Goodson (2011) and Bender et al. (2019) identified both positive and negative indicators of mental well-being in international students. Therefore, the following concepts were assessed: depression, anxiety, acculturative stress, life satisfaction, and eating concerns.

Students completed the Patient Health Questionnaire 9 Depression Scale (PHQ-9; Kroenke et al., 2001) and Generalized Anxiety Disorder 7 scale (GAD-7; Spitzer et al., 2006) as a measure of depression and anxiety symptoms (see Appendix D. 6. & 7.). These scales have been previously used with international students (e.g., Kim et al. 2019). The PHQ-9 scale includes 9 items, and the GAD-7 scale includes 7 items (Kroenke et al., 2001; Spitzer et al., 2006). Participants rated how often they have been "bothered" by the symptoms listed in the past two weeks on a 4-point Likert scale, varying from 'not at all' (0) to 'nearly every day' (3). Higher scores indicate greater symptomatology (Kroenke et al., 2001; Spitzer et al., 2006). Researchers have reported that the PHQ-9 (Cronbach's α = .89; Kroenke et al., 2001) and GAD-7 (Cronbach's α = .92; Spitzer et al., 2006) had excellent internal reliability. The Cronbach alpha for the PHQ-9 in the current study was .86 and for the GAD-7 was .91. In the current study, these two scales correlated strongly (r = .7). Therefore, they were combined into a single scale, measuring internalizing symptoms. The Cronbach alpha of this scale was .93.

The Index of Life Stress (ILS) was developed by Yang and Clum (1995) and has been utilized as a measure of acculturative stress in prior studies (e.g., Kim & Cronley, 2020). The scale measures stress on five empirically derived dimensions (i.e., perceived discrimination, financial difficulties and desire to remain in the U.S., cultural difficulties and desire to go back to home country, language barriers, and academic stress) with 30 items (Yang & Clum, 1995; see

Appendix D. 8.). Participants rated each item on a 4-point Likert scale, varying from ‘never’ (0) to ‘always’ (3). Higher scores indicate more stress (Yang & Clum, 1995). Yang and Clum (1995) reported adequate internal consistency for the ILS total scale and subscales (Kuder-Richardson coefficients .70 - .86). The scale was slightly modified for the current study: financial difficulties and food-related items were not included in the total scale as these constructs are measured by predictors. Instructions for the survey were developed based on the description of the authors. Two items were slightly modified to address diversity and grammar issues. In the current study, the ILS had excellent internal reliability for both the original (Cronbach’s $\alpha = .91$) and modified scale (Cronbach’s $\alpha = .90$).

The Satisfaction With Life Scale (SWLS; Diener et al., 1985) has also been used in prior studies with international students (see Bender et al., 2019). The SWLS assesses life satisfaction based on five items each rated on a 7-point Likert scale, ranging from ‘strongly disagree’ (1) to ‘strongly agree’ (7) (see Appendix D. 9.). Higher scores signify greater satisfaction with life (Diener et al., 1985). The internal consistency of the SWLS was reported to be high (Cronbach’s $\alpha = .87$; Diener et al., 1985). In the current study, the SWLS had adequate internal reliability (Cronbach’s $\alpha = .88$).

Participants completed the Eating Disorder Examination Questionnaire Short (EDE-QS; Gideon et al., 2016) as a measure of eating and body image concerns (see Appendix D. 10.). The EDE-QS is made up of 12 items assessing eating disorder indicators. All items are rated on a 4-point Likert scale, ranging from 0 to 3, with higher scores suggesting more eating disorder concerns (Gideon et al., 2016). Gideon et al. (2016) found an excellent internal reliability for the EDE-QS (Cronbach’s $\alpha = .91$). In the current study, the EDE-QS had excellent internal reliability (Cronbach’s $\alpha = .92$).

Physical Health. Participants responded to two questions on physical well-being from the Interpersonal, Community, Occupational, Physical, Psychological, and Economic scale (I COPPE; Prilleltensky et al., 2015; see Appendix D. 12.). The first item asks participants to rate their current physical well-being on a 11-point scale, ranging from 0 - 10 (Prilleltensky et al., 2015). This item was included as a physical health outcome in hypothesis testing. The second item – originally asking participants to rate their physical well-being from a year ago (Prilleltensky et al., 2015) - was adapted to measure participants' well-being before they came to the U.S. The second item was implemented to allow for comparisons between pre- and post-arrival to the U.S.

Moderators

Cultural Food Security Importance (CFSI). Items for the Cultural Food Security Importance Scale (CFSI-S) were developed based on the qualitative study by Wright et al. (2021b). Items were generated to assess how important access, availability, quality, preparation, sharing, and consumption of their cultural foods is for international students (see Appendix C. 7. & D. 14.). Each item was rated on a 5-point Likert scale, ranging from 'strongly disagree' (1) to 'strongly agree' (5). Higher scores indicate greater CFSI. This scale was piloted using the same procedure outlined above for the CFS-S. The CFSI-S had excellent internal reliability in the main study (Cronbach's $\alpha = .95$).

Psychological Flexibility. The Psy-Flex scale is a relatively new assessment of psychological flexibility created by Gloster et al. (2021) based on prior measures (see Appendix D. 15.). The Psy-Flex is made up of 6 items, one for each of the psychological flexibility processes (acceptance, cognitive defusion, present moment, values, committed action, and self-as-context; Gloster et al., 2021). Each item is assessed on a 5-point Likert scale, from 'very

often' (5) to 'very seldom' (1). Higher scores on the Psy-Flex reflect greater psychological flexibility (Gloster et al., 2021). The authors found the Psy-Flex to have good internal reliability (Raykov's coefficient = .91). The Psy-Flex had good internal reliability in the current study (Cronbach's α = .82)

Cultural Distance. The Brief Perceived Cultural Distance Scale (BPCDS), created by Demes and Geeraert (2014), evaluated perceived cultural differences between international students' home culture and American culture (see Appendix D. 16.). This scale was used in other studies with international students (e.g., Perez-Rojas & Gelso, 2020). The BPCDS has 12 items, each rated on a 7-point Likert scale, from 'very similar' (1) to 'very different' (7). Higher scores on the BPCDS suggest greater cultural distance (Demes & Geeraert 2014). The authors reported adequate psychometric properties for the BPCDS (Cronbach's α = .85). The BPCDS had good internal reliability in the current study (Cronbach's α = .86).

Social Support. The Multidimensional Scale of Perceived Social Support (MSPSS), a tool created by Zimet et al., (1988), assessed social support (see Appendix D. 17.). This scale was used in prior studies with international students (e.g., Aldawsari et al., 2018; Ma, 2021). The MSPSS has 12 items, 4 for each of the three social support subscales (i.e., 'significant other', 'family', and 'friends'; Zimet et al., 1988). Each item is rated on a 7-point Likert scale ranging from 'very strongly disagree' (1) to 'very strongly agree' (7). Higher scores on the MSPSS suggest greater social support (Zimet et al., 1988). Zimet et al. (1988) reported that the MSPSS had adequate psychometric properties for the total scale and its subscales (e.g., Cronbach's α = .85 - .91). In the current study, the MSPSS had excellent internal reliability for the total scale (Cronbach's α = .90), significant other subscale (α = .93), family subscale (α = .85), and friends subscale (Cronbach's α = .91).

Possible Covariates and Other Supplemental Measures

Demographic Variables. Students' demographic characteristics were assessed, including age, sex assigned at birth, gender, country of origin, race/ethnicity, international student status, education, living situation, length of time in the U.S., level of study, and perceived financial well-being (see Appendix D. 18.). Participants' weight before and after arriving to the U.S. was also assessed to calculate BMI (see Appendix D. 11.). Similar approaches to weight measurement were reported in other studies with international students (see Shi et al., 2021). Participants were asked to indicate their perceived English proficiency level (Ying & Han, 2008; see Appendix D. 19.), how much they like home and U.S. foods, respectively (see Appendix D. 23.), and whether they have any dietary restrictions (see Appendix D. 24.). Similar to other research (e.g., Bai, 2016; Glass & Westmont, 2014), participants reported their current GPA or, if unavailable, their average letter grade (i.e., A, B, C, D, F or below) (see Appendix D. 13.). Some demographic variable items (i.e., food sources, meal plan, living situation, living in other countries) were developed based on the survey of Noyongoyo (2011).

Acculturation. The Brief Acculturation Orientation Scale (Demes & Geeraert, 2014) measured acculturation to the 'home country' and 'host country' (see Appendix D. 20.). Both subscales contain four items, each rated on a 7-point Likert scale from 'strongly disagree' (1) to 'strongly agree' (7). Higher scores on each subscale suggest greater acculturation to the respective culture (Demes & Geeraert, 2014). The home and host subscales were found to have good psychometric properties (i.e., Cronbach's α = .79 and .80, respectively; Demes & Geeraert, 2014). In the current study, the 'home country' subscale and the 'host country' (i.e., U.S.) subscale had good internal reliability, with Cronbach's alphas of .83 and .86, respectively.

General Food Security. The Six-Item Short Form of the Household Food Security Scale measured general food security (Blumberg et al., 1999; see Appendix D. 21.). This survey was used in other studies with international students (see Shi et al., 2021; Wright et al., 2021b). The survey asks participants 6 items about their experiences of food security (Blumberg et al., 1999). The rating of each item differs. For the first two items, participants report the degree to which they consider the statements true (3-point Likert scale) while items three, five, and six are rated dichotomously as "Yes" or "No." Finally, item four asks participants to indicate the frequency of food saving behaviors on a 3-point rating scale (Blumberg et al., 1999). For each item, participants have the option to select "Don't Know" in addition to the other options. Greater endorsement of "affirmative responses" are indicative of greater food insecurity and/or hunger (Blumberg et al., 1999, p. 1233). Items 3 and 4 were combined in the current study for a better fit with the online administration format of the survey. Bloomberg et al. (1999) found that the scale had adequate sensitivity (92 and 84.7) and specificity (99.4 and 99.6) for the detection of food insecurity and hunger, respectively.

Analyses

Pilot Study

Participants' responses were examined to establish if they meet inclusion criteria for the study. Participant's responses to demographic, CFS, food preference, and English proficiency measures were analyzed to report descriptive information. Means, standard deviations, and Cronbach's alphas were calculated for the CFS-S and CFSI-S. Finally, the questions measuring intelligibility and face validity of the CFS-S and CFSI-S were also examined to ascertain if any changes were needed to the survey prior to the main study.

Main Study

Responses were checked for quality and inclusion criteria. Next, demographic measures were analyzed. The data were examined for missing data and outliers. Descriptives, including means, standard deviations, normal distribution indicators, as well as Cronbach's alphas were calculated for the predictor, outcomes, moderators, and covariates. Correlations were conducted between predictor, outcomes, moderators, and potential covariates. Moderation analyses using the PROCESS Macro (Hayes, 2022) for SPSS were carried out. Four analyses were conducted for each of the five outcomes (i.e., physical health, internalizing symptoms, acculturative stress, satisfaction with life, and eating concerns). Each moderation analysis included CFS-S as the main predictor and one of the four moderators (i.e., psychological flexibility, CFSI, cultural distance, and social support). Covariates (i.e., age, length of time in the U.S., financial well-being, sex assigned at birth, and acculturation to U.S. culture) were included if these were significantly correlated with the predictor or outcomes. Although English proficiency has been associated with several outcomes in international students, this variable was not included as a covariate as international students at BGSU have to meet a minimum requirement for a standardized English test (BGSU International Student Services, n.d. b & c). In addition, participants in the main study rated their English proficiency overall as "good" (M = 4.35) with a small standard deviation (.70, see Table 1). Because of the exploratory nature of the current study the number of correlation and moderation analyses were not limited. As such, the results of these analyses need to be interpreted with caution given the higher likelihood of type 1 error.

RESULTS

Pilot Study

International students from Bowling Green State University (n = 36) were randomly selected to be emailed the survey. A total of 6 participants attempted to take and completed the survey. Participants were from India (n = 2), Nigeria (n = 2), and Saudi Arabia (n = 2). The mean age was 27.25 (SD = 6.66), and 50% of participants (n = 3) reported being male and 50% female (n = 3). Four of the participants reported being a graduate student and two were undergraduate students. Students reported being in the U.S. for their studies for 3.13 years (SD = 2.57). Participants' mean on financial well-being was 5.17 (SD = .98), on a scale from 0 – 10. 100% of participants indicated that they primarily cook their own meals and denied having an on-campus meal plan. 100% of participants reported having a kitchen at their home. Four participants reported living off-campus in Bowling Green. The remaining two participants reported living off-campus, in nearby areas. Students rated their English proficiency level on reading, writing, speaking, and understanding an average of 4.34 (SD = .66), which corresponds to a rating of "good." Half of the participants reported an "inability to purchase the foods that you used to eat at home" and out of these people, one reported that this occurred within the last 3 years. Finally, when asked, on a scale from 1 to 5, how much they like consuming home culture and American foods, respectively, participants' preference was more towards home culture foods (M = 4.67, SD = .52) than American foods (M = 3.00, SD = .63). All participants correctly selected the attention check item (i.e., Please select 'Neutral' for this item).

The Cronbach's alpha for CFS-S total scale was .91 although reliability estimates should be interpreted with caution because only 6 participants were included in the pilot study. Participants' mean on the CFS-S was 3.21 (SD = .50) out of 5. For the subscales, means and

reliability indicators were: Access (M = 2.67, SD = .78, α = .73), Availability (M = 3.23, SD = .69, α = .65), Quality (M = 3.11, SD = .73, α = .82), Preparation (M = 3.75, SD = .29, α = -.55), Sharing (M = 3.19, SD = .64, α = .86), and Consumption (M = 2.93; SD = .91, α = .90). For the Access subscale, if Item 20 ("I am unable to find my cultural foods in restaurants here) was removed, Cronbach's alpha increased to .82.

When asked what they thought the questionnaire measured, participants responses were mostly consistent with the construct being measured (e.g., "availability of cultural foods…", "Ability to access their cultural foods in the US…"), or a related construct (e.g., "level of satisfaction of international students with American food). Two participants did not provide a response, while one participant reported "Good questions." All participants reported that the instructions and items were easy to understand. Participants were also asked to suggest additional statements to include and whether the survey missed anything. One participant recommended that the study assess for car ownership, and therefore, an item was included in the main study to assess for car access as a separate item. Another participant recommended that the questionnaire include an item for "What is the ease of accessing your cultural food," as well as more specific questions about restaurants and stores (e.g., "African or Asian stores"). The first suggestion regarding ease of access was not included as it was deemed that other items already assess this construct (e.g., "I can find my cultural foods while living here"; "I can physically access my cultural foods while living here"). As the current study aims to recruit international students from multiple countries and continents and the CFS-S aims to be a general CFS measure, the latter suggestion was considered to be unsuitable for the purposes of the current study.

Regarding the CFSI-S, Cronbach's alpha was .86 with a mean of 4.00 (SD = .41). When asked what they thought the questionnaire measures, participants responses were overall

consistent with the construct being measures (e.g., “asking if the availability is important to me”) or close (e.g., “preference between cultural and American foods”, “same as [CFS-S] survey. Just a little tweak.”). Two participants did not provide responses, and one participant indicated “good.” Overall, 100% of participants indicated that they found it easy to understand the instructions and items. Regarding suggestions, one participant indicated that there are “too many questions with the same meaning.”

Main Study

Participants

A total of 222 participants attempted the survey. Participants were removed from the data for not consenting (n = 4), not living in the U.S. (n = 6), not being an international student at BGSU (n = 14), not being enrolled in the current semester (n = 8), completing less than 75% of the survey (n = 58), duplicate submissions (n = 5), answering more than one attention check incorrectly (n = 13), not providing age information (n = 1), and being below the age of 18 (n = 2). The final sample consisted of 111 participants. Power analyses indicated that 55 participants are necessary for a medium effect size and .8 power level for a multiple regression including 9 predictors (i.e., main predictor, moderator, interaction, and six covariates) (G*Power, Faul et al., 2007).

Demographic information is detailed in Table 1. The mean age of participants was 27.22 (SD = 7.45). About half of participants reported being female. Overall, participants rated their English proficiency as “good.” Participants reported being in the U.S. for their studies for 1.58 years. Most participants reported living off-campus in Bowling Green, Ohio. Participants were predominantly graduate students and studying at BGSU for less than 1 year. Most participants reported that they primarily cook their own meal and do not have a meal plan at the University.

About 67% of participants reported not having a car (see Table 1). Participants were from 42 countries and the most represented countries were Nigeria (n = 9), India (n = 8), Vietnam (n = 8), Ghana (n = 6), Iran (n = 6), and Nepal (n = 6) (see Table 2).

Missing Data

Several measures had missing data for items (i.e., CFS-S n = 1; ILS n = 2; past perceived physical health n = 1; CFSI-S n = 3; BPCDS n = 1; time of arrival in the U.S. n = 1; weight n = 1; Psy-Flex n = 6; GPA n = 1). Means for the Psy-Flex scale was not calculated for 2 participants as they did not provide responses to 2 and 3 out of the 6 items, respectively. BMI was not calculated for nine participants as they provided unrealistic weight and/or height data (n = 8) and did not provide weight information (n = 1). One participant provided implausible arrival data therefore no length of time in the U.S. was calculated for this person. Finally, an outlier for GPA was removed.

Descriptive Statistics

Descriptive statistics and normal distribution indicators for each scale were calculated (see Table 3). Regarding the CFS-S, the average was 2.95 out of 5, meaning participants overall viewed their CFS as "neutral." In the main study, the CFS-S had good internal reliability for the entire scale (Cronbach's α = .93), as well as for the Access (α = .70), Availability (α = .76), Quality (α = .85), Preparation (α = .82), Sharing (α = .79), and Consumption (α = .86) subscales. Concerning CFSI-S, the internal reliability was excellent (Cronbach's α = .95). Participants 'agreed' that cultural food security is important to them (M = 3.85 out of 5). Additionally, on the single item measures (Wright et al., 2021b), almost two-thirds of the participants endorsed an inability to purchase their home culture foods since starting college and half reported that this inability occurred in the past three years (see Table 3).

Overall, participants reported being similarly acculturated to home and U.S. cultures. Nonetheless, participants reported a preference towards home culture foods, compared to American foods (see Table 3). About half of the participants reported high/marginal general food security, while 28.8% and 22.5% reported low and very low food security, respectively (see Table 3). General food security was significantly negatively correlated with financial well-being (r = -.44, p < .01) and CFS (r = -.21, p < .05).

Bivariate Correlations

Correlations Among Outcomes. Acculturative stress, internalizing symptoms, and eating disorder concerns were significantly positively correlated (see Table 4). Satisfaction with life and perceived physical health were positively correlated, and these variables negatively correlated with internalizing symptoms and acculturative stress. These correlations ranged from r = .21 to r = .55 (see Table 4). Given the small to moderate size of the correlations, all outcomes were retained as separate variables.

Correlations Among Cultural Food Security and Outcomes. Bivariate correlations were calculated among CFS and outcome variables (see Table 4). The CFS total scale was significantly positively correlated with physical health, but not significantly associated with any of the other outcomes. Considering the subscales, the CFS access and availability subscales were significantly negatively related to internalizing symptoms, indicating that greater access and availability of cultural foods is related to lower anxiety and depression symptoms. In addition, the access and preparation subscales were negatively related to acculturative stress, and the availability subscale was positively related to satisfaction with life. The access, availability, and quality subscales were positively correlated with perceived physical health (see Table 4).

Correlations Among Cultural Food Security and Moderators. The CFS total scale was significantly positively correlated with psychological flexibility, indicating that higher CFS is related to higher psychological flexibility (see Table 4). Considering the subscales, participants who reported more cultural difference between their home and U.S. culture, reported lower access and availability of cultural foods, but greater consumption of cultural foods. As expected, people who reported greater sharing of cultural foods also reported greater social support. Access to and sharing of cultural foods were related to greater psychological flexibility (see Table 4).

Correlations Among Key Variables and Covariates. Age was significantly, positively associated with CFS (see Table 4). Perceived financial well-being was significantly associated with all outcomes. Sex assigned at birth was significantly, positively associated with satisfaction with life, such that participants who identified as female reported higher satisfaction with life than males. Based on these findings, covariates were included in relevant moderation analyses below. Acculturation to U.S. culture and length of time in the U.S. were not significantly related to CFS or outcomes and thus not included as covariates in any analyses (see Table 4).

Hypotheses Testing

Moderation analyses were conducted using the PROCESS macro for SPSS (Hayes, 2022) to examine whether CFS is a significant predictor of physical and mental health (i.e., perceived physical health; internalizing symptoms; acculturative stress; satisfaction with life; eating concerns). Moderation analyses also assessed whether CFSI, social support, cultural distance, and psychological flexibility are significant moderators of the relationship between CFS and main outcomes (see Tables 5 – 24). Age and perceived financial well-being were entered as covariates as these variables significantly correlated with CFS-S and outcomes, respectively. Sex

assigned at birth was included as an additional covariate in the analyses examining predictors of satisfaction with life, as these two variables were statistically significantly associated.

Physical Health. The first model included CFS (predictor), psychological flexibility (moderator), age, and perceived financial well-being (covariates). This model was statistically significant F (5, 103) = 6.67, R^2 = .24, p < .001, accounting for 24% of the variance in perceived physical health. Financial well-being was a significant positive predictor of physical health (p < .01). Psychological flexibility was a significant positive predictor of physical health (p < .01). CFS was a significant positive predictor of physical health (p < .05). The interaction between CFS and psychological flexibility was not significant (see Table 5). Although this interaction was not significant, a figure of the results is included to help the reader visualize the data (see Figure 1).

The second model included CFS (predictor), CFSI (moderator), age, and perceived financial well-being (covariates). This model was statistically significant F (5, 105) = 4.88, R^2 = .19, p <.001, accounting for 19% of the variance in perceived physical health. Financial well-being was a significant positive predictor of physical health (p < .001). The main effect of CFSI was not significant. CFS was a significant positive predictor of physical health (p < .05). The interaction between CFS and CFSI was not significant (see Table 6).

The third model included CFS (predictor), cultural distance (moderator), age, and perceived financial well-being (covariates). This model was statistically significant F (5, 105) = 4.67, R^2 = .18, p < .001, accounting for 18% of the variance in perceived physical health. Financial well-being was a significant positive predictor of physical health (p < .001). The main effect of cultural distance was not significant. CFS was a significant positive predictor of

physical health ($p < .05$). The interaction between CFS and cultural distance was not significant (see Table 7).

The fourth model included CFS (predictor), social support (moderator), age, and perceived financial well-being (covariates). This model was statistically significant F (5, 105) = 5.00, $R^2 = .19$, $p < .001$, accounting for 19% of the variance in perceived physical health. Financial well-being was a significant positive predictor of physical health ($p < .01$). The main effect of social support was not significant. CFS was a significant positive predictor of perceived physical health ($p < .05$). The interaction between CFS and social support was not significant (see Table 8).

Internalizing Symptoms. The first model included CFS (predictor), psychological flexibility (moderator), age, and perceived financial well-being (covariates). This model was statistically significant F (5, 103) = 3.60, $R^2 = .15$, $p < .01$, indicating that it accounted for 15% of the variance in internalizing symptoms. Financial well-being was a significant negative predictor of internalizing symptoms ($p < .01$). The main effects of psychological flexibility and CFS were not significant. The interaction between CFS and psychological flexibility was not significant (see Table 9).

The second model included CFS (predictor), CFSI (moderator), age, and perceived financial well-being (covariates). This model was statistically significant F (5, 105) = 3.92, $R^2 = .16$, $p < .01$, indicating that it accounted for 16% of the variance in internalizing symptoms. Financial well-being was a significant negative predictor of internalizing symptoms ($p < .01$). CFSI was a significant positive predictor of internalizing symptoms ($p < .05$). The main effect of CFS was not significant. Finally, the interaction between CFS and CFSI was not significant (see Table 10).

The third model included CFS (predictor), cultural distance (moderator), age, and perceived financial well-being (covariates). This model was statistically significant F (5, 105) = 4.14, R^2 = .16, p < .01, accounting for 16% of the variance in internalizing symptoms. Financial well-being was a significant negative predictor of internalizing symptoms (p < .05). Cultural distance was a significant positive predictor of internalizing symptoms (p < .05). The main effect of CFS was not significant. The interaction between CFS and cultural distance was not significant (see Table 11).

The fourth model included CFS (predictor), social support (moderator), as well as age and perceived financial well-being (covariates). This model was statistically significant F (5, 105) = 4.08, R^2 = .16, p < .01, accounting for 16% of the variance in internalizing symptoms. Financial well-being was a significant negative predictor of internalizing symptoms (p < .05). The main effects of social support and CFS were not significant. The interaction between CFS and social support was not significant (see Table 12).

Acculturative Stress. The first model included CFS (predictor), psychological flexibility (moderator), age, and perceived financial well-being (covariates). This model was statistically significant F (5, 103) = 4.68, R^2 = .19, p < .01, accounting for 19% of the variance in acculturative stress. Financial well-being was a significant negative predictor of acculturative stress (p < .001). The main effects of psychological flexibility and CFS were not significant. The interaction between CFS and psychological flexibility was not significant (see Table 13).

The second model included CFS (predictor), CFSI (moderator), age, and perceived financial well-being (covariates). This model was statistically significant F (5, 105) = 4.97, R^2 = .19, p < .001, accounting for 19% of the variance in acculturative stress. Financial well-being was a significant negative predictor of acculturative stress (p < .001). The main effects of CFSI

and CFS were not significant. The interaction between CFS and CFSI was not significant (see Table 14).

The third model included CFS (predictor), cultural distance (moderator), age, and perceived financial well-being (covariates). This model was statistically significant F (5, 105) = 6.21, R^2 = .23, p < .001, accounting for 23% of the variance in acculturative stress. Financial well-being was a significant negative predictor of acculturative stress (p < .01). Cultural distance was a significant positive predictor of acculturative stress (p < .01). The main effect of CFS was not significant. The interaction between CFS and cultural distance was not significant (see Table 15).

The fourth model included CFS (predictor), social support (moderator), age, and perceived financial well-being (covariates). This model was statistically significant F (5, 105) = 5.66, R^2 = .21, p < .001, accounting for 21% of the variance in acculturative stress. Financial well-being was a significant negative predictor of acculturative stress (p < .01). Social support was a significant negative predictor of acculturative stress (p < .05). The main effect of CFS was not significant. The interaction between CFS and social support was not significant (see Table 16).

Satisfaction With Life. The first model included CFS (predictor), psychological flexibility (moderator), age, sex assigned at birth, and perceived financial well-being (covariates). This model was statistically significant F (6, 102) = 6.06, R^2 = .26, p < .001, accounting for 26% of the variance in satisfaction with life. Financial well-being (p < .001) and sex assigned at birth (p < .05) were significant positive predictors of satisfaction with life. The main effects of psychological flexibility and CFS were not significant. The interaction between CFS and psychological flexibility was not significant (see Table 17).

The second model included CFS (predictor), CFSI (moderator), age, sex assigned at birth, and perceived financial well-being (covariates). This model was statistically significant F (6, 104) = 6.13, R^2 = .26, p < .001, accounting for 26% of the variance in satisfaction with life. Financial well-being (p < .001) and sex assigned at birth (p < .05) were significant positive predictors of satisfaction with life. The main effect of CFSI and CFS were not significant. The interaction between CFS and CFSI was not significant (see Table 18).

The third model included CFS (predictor), cultural distance (moderator), age, sex assigned at birth, and perceived financial well-being (covariates). This model was statistically significant F (6, 104) = 6.72, R^2 = .28, p < .001, accounting for 28% of the variance in satisfaction with life. Financial well-being (p < .001) and sex assigned at birth (p < .05) were significant positive predictors of satisfaction with life. The main effects of cultural distance and CFS were not significant. The interaction between CFS and cultural distance was not significant (see Table 19).

The fourth model included CFS (predictor), social support (moderator), age, sex assigned at birth, and perceived financial well-being (covariates). This model was statistically significant F (6, 104) = 8.01, R^2 = .32, p < .001, accounting for 32% of the variance in satisfaction with life. Financial well-being (p = .001) and sex assigned at birth (p < .05) were significant positive predictors of satisfaction with life. Social support was a significant positive predictor of satisfaction with life (p < .01). The main effect of CFS was not significant. The interaction between CFS and social support was not significant (see Table 20).

Eating Concerns. The first model included CFS (predictor), psychological flexibility (moderator), age, and perceived financial well-being (covariates). This model was not significant F (5, 103) = 1.99, R^2 = .09, p = .09. Financial well-being was a significant negative predictor of

eating concerns ($p < .05$). The main effects of psychological flexibility and CFS were not significant. The interaction between CFS and psychological flexibility was not significant (Table 21).

The second model included CFS (predictor), CFSI (moderator), age, and perceived financial well-being (covariates). This model was not significant F (5, 105) = 1.89, R^2 = .08, p = .10. Financial well-being was a significant negative predictor of eating concerns ($p < .05$). The main effects of CFSI and CFS were not significant. The interaction between CFS and CFSI was not significant (see Table 22).

The third model included CFS (predictor), cultural distance (moderator), age, and perceived financial well-being (covariates). This model was not significant F (5, 105) = 1.99, R^2 = .09, p = .09. Financial well-being was a significant negative predictor of eating concerns ($p < .05$). The main effects of cultural distance and CFS were not significant. The interaction between CFS and cultural distance was not significant (see Table 23).

The fourth model included CFS (predictor), social support (moderator), age, and perceived financial well-being (covariates). This model was not significant F (5, 105) = 2.08, R^2 = .09, p = .07. Financial well-being was a significant negative predictor of eating concerns ($p < .01$). The main effects of social support and CFS were not significant. The interaction between CFS and social support was not significant (see Table 24).

Exploratory Analyses

Relationship Between Cultural Food Security Measures. Independent *t*-tests were conducted to examine the relationship between the dichotomous CFS item utilized in the Wright et al (2021b) study and CFS-S (see Table 25). The item utilized in the Wright et al. (2021b) study asks participants whether they have experienced the inability to purchase home culture

foods since starting college. The t-test was significant for the Access and the Quality subscales (see Table 25.). Participants who reported inability to purchase cultural foods ($N = 71$) reported lower Access ($M = 2.25$, $SD = .67$) and Quality ($M = 2.54$, $SD = .73$) of cultural foods than participants who denied inability ($N = 40$), ($M = 2.65$, $SD = .89$ and $M = 2.86$, $SD = .81$, respectively). Although the results were non-significant ($p > .05$) for the total scale and the other subscales, the means of the total and subscale CFS-S scores trended lower for people who reported inability to purchase home culture foods, compared to those who did not (see Table 25).

Pre- and Post-Arrival BMI and Physical Health Comparisons. Participants' BMI and perceived physical health pre- and post-arrival to the United States were also compared using paired *t*-tests. Regarding BMI, the mean for BMI pre-United States was slightly lower than participant's current BMI, although the difference was not significant (see Table 3). Similarly, participants' current perceived physical health was slightly lower, but not significantly different from their perceived physical health before arriving to the United States (see Table 3).

Comparisons Between Undergraduate and Graduate Students. Undergraduate and graduate students' means on the CFS-S were compared using independent *t*-tests. Graduate students ($M = 3.06$, $SD = .51$) reported significantly higher cultural food security than undergraduate students ($M = 2.70$, $SD = .63$; $t\ (107) = -3.09$, $p < .01$). The t-tests were also significant for the Preparation ($t\ (107) = -3.60$, $p < .001$), Sharing ($t\ (107) = -2.29$, $p < .05$), and Consumption subscales ($t\ (107) = -5.05$, $p < .001$). Graduate students' scores were significantly higher on the Preparation ($M = 3.73$, $SD = .66$), Sharing ($M = 3.18$, $SD = .57$), and Consumption subscales ($M = 3.14$, $SD = .74$) than undergraduate students' ($M = 3.23$, $SD = .71$; $M = 2.85$, $SD = .91$; $M = 2.29$, $SD = .92$, respectively). The comparisons on the Access ($t\ (107) = -1.26$, $p > .05$), Availability ($t\ (107) = .72$, $p > .05$), and Quality subscales ($t\ (107) = -.90$, $p > .05$) were not

statistically significant. Graduate students' means on the Access (M = 2.45, SD = .80), Availability (M = 2.52, SD = .84), and Quality subscales (M = 2.71, SD = .77) were not significantly different than the means of undergraduate students (M = 2.24, SD = .72; M = 2.65, SD = .79; M = 2.56, SD = .79, respectively).

DISCUSSION

In the current study, a quantitative measure of cultural food security (CFS-S) and cultural food security importance (CFSI-S) were developed. Both measures had excellent internal reliability and validity. International students reported a moderate level of CFS. Although CFS was a significant predictor of perceived physical health, the relationship between CFS and mental health outcomes was not significant. Furthermore, there was no significant interaction between CFS and moderators, including psychological flexibility, CFSI, cultural distance, and social support. Taken together, the findings suggest that CFS is important and relevant in the context of international students' experiences, but that additional research is needed to measure and understand this construct.

The CFS-S and CFSI-S developed in this study had good psychometric properties and might be appropriate for further research in this domain. In the pilot study, the CFS-S and CFSI-S had excellent and good internal reliability, respectively. All participants indicated that the instructions and the items for the two scales were easy to understand. The Cronbach's alphas for both scales in the main study also indicated excellent reliability. Furthermore, the mean of the CFS-S-Access and CFS-S-Quality subscales were significantly lower for people who reported inability to purchase cultural foods (CFS item from Wright et al., 2021b), than for those who did not, and the CFS-S-Sharing subscale was positively correlated with social support. These findings provide evidence for the internal reliability and construct validity of the CFS-S. Two subscales of the CFS-S (Availability and Preparation) had inadequate internal reliability in the pilot study. As the sample size in the pilot study was too small to obtain a reliable Cronbach's alpha, no changes were made to the scales based on these findings, and the reliability of these scales was good in the main study.

Prior to the current study, CFS had been predominately examined qualitatively (e.g., Brown, 2009; Brown et al., 2010; Brown et al., 2019; Wright et al., 2021b; Amos & Lordly, 2014). While these qualitative studies have helped researchers understand the experiences of international students in the domain of CFS, an easily implemented quantitative scale such as the one developed here has the potential to broaden and deepen our understanding of this phenomenon and individual differences within it As such the development of the CFS-S and CFSI-S is a notable contribution to this area of study.

On average, international students in this study reported a moderate level of difficulty with CFS. Participants viewed their CFS as just under "neutral" (i.e., average was 2.95 out of 5). Results suggest that students mainly struggle with accessing cultural foods (average 2.39 out of 5). The highest subscale score mean was Preparation (average 3.57 out of 5), indicating that students are less likely to experience difficulties with cooking their own cultural foods. This is consistent with the finding that almost 80% of the participants in the current study reported cooking their own meals, and consistent with Shi et al.'s (2021) observation of students' high engagement in cooking home culture foods while studying abroad.

Furthermore, on two items measuring CFS, half of international students reported an inability to buy home foods in the past three years. Using the same items, Wright et al. (2021b) noted that cultural food insecurity was reported by all their participants (n = 15). The somewhat higher CFS in the current study could be due to methodology, sample size, and the difference in location. It is possible, that by having a larger sample, this study had the ability to obtain a more comprehensive representation of CFS in international students from various countries. Also, Wright et al. (2021b) carried out their study in Reno, Nevada. The potential differences in food climate between Reno and Bowling Green may also result in differences in CFS.

Notably, participants overall 'agreed' that access, availability, quality, consumption, sharing, and preparation of cultural food (CFSI) are important to them (average 3.85 out of 5). Foods from one's country represent an important part of culture and identity (i.e., Wright et al., 2021b; Stewin, 2013). Consistent with previous literature (e.g., Brown 2009; Brown et al., 2010; Brown et al., 2019; Noyongoyo, 2011; Shi et al., 2021; Wright et al., 2021b), students in the current study predominately reported a preference towards home culture foods.

In this study, international students who reported higher CFS also reported better physical health. In addition, CFS remained a significant predictor of perceived physical health after the addition of moderators and relevant covariates. These findings suggest that students view their physical well-being more positively when they have more CFS. Prior studies have found that international students view U.S. foods as less healthy than home foods (e.g., Saccone & Obeng, 2015; Shi et al., 2021). Therefore, if students are compelled to consume U.S. foods as a result of low CFS, this may result in developing a more negative view of their physical health.

Unlike perceived physical heath, CFS was not a significant predictor of mental health, including internalizing symptoms, acculturative stress, satisfaction with life, and eating concerns. These results are counter to expectations. Although there is limited research on the relationship between CFS and mental health (Shi et al., 2021), international students reported positive affect (Brown et al., 2019) and a sense of comfort (Brown, 2009) when they experience CFS, and low CFS is associated with stress (Wright et al., 2021b) and feelings of upset (Brown, 2009).

It is not clear why the current study did not find this predicted relationship. Given that the CFS-S is a newly developed scale and has not been widely researched, the lack of significant relationship with mental health outcomes might be a result of inadequate measurement. Further research is needed to ascertain the psychometric properties of the CFS-S as well as the overall

measurement of CFS. Another potential reason why this study did not find a significant relationship between CFS and outcomes is that the CFS-S was developed based on a study that was conducted in Nevada using a small sample size (i.e., Wright et al., 2021b). As such, it may be that the CFS items in the CFS-S do not fully depict the diverse experiences of international students in other locations, such as Bowling Green, Ohio. Furthermore, CFS is made up of various factors. While some may be related to mental health, others may have less of an impact. For example, the Access subscale was significantly negatively correlated with internalizing symptoms and acculturative stress, while the Availability subscale was positively associated with satisfaction with life. Similarly, in their qualitative study, Wright et al. (2021b) highlight the importance of foodways (i.e., consumption, preparation, and sharing of foods) in cultural identity. This may indicate, that foodways in particular may have a stronger effect on international student's mental health, compared to other aspects of CFS, such as access, availability, and quality. Finally, most of the prior research has examined the role of CFS using qualitative methods. To our knowledge, this is the first study to comprehensively assess CFS quantitatively. Therefore, it is possible that the relationships between CFS and mental health might manifest through different avenues that were not measured in the current study.

Also contrary to predictions, there were no significant interactions between CFS and moderators, including CFSI, psychological flexibility, cultural distance, and social support. Prior research on the interaction between CFS and other predictors of physical and mental health is limited. Other factors not considered in the current study may moderate the relationship between CFS and mental and physical health. Furthermore, as previously mentioned, a larger sample size may be needed to assess the interaction between CFS and moderators if effect sizes are small.

While the main aim of this research was to examine the association between CFS and international students' physical and mental health, other interesting results emerged. Notably, about half of students reported low or very low general food security in the current study. Shi et al. (2021) in their scoping review also found an elevated level of food insecurity in the international student population. The authors indicated that due to limited analyses in studies, it was difficult to ascertain what specific factors lead to food insecurity in international students. Low financial well-being and CFS may be contributing factors. In the current study, perceived financial well-being and CFS significantly negatively correlated with general food insecurity.

Limitations and Future Directions

The current study provides psychometric evidence for a novel quantitative assessment of CFS as well as the role of CFS in international student physical health. Nonetheless, there are several limitations that need to be considered. First, the CFS-S and CFSI-S are new scales that were developed based on prior research (e.g., Wright et al., 2021b). The items were generated using the findings of Wright et al. (2021b), which utilized a small sample size (i.e., $n = 15$) of international students from Reno, Nevada. Therefore, it is possible that international students in other locations may experience CFS-related concerns that were not described in the CFS-S items. Future research may consider conducting focus groups where participants can actively participate in the item generation of CFS. International students may have different experiences depending on where in the United States or other world regions they live.

Another limitation of this study is the low sample size. Power analysis indicated that the current study was sufficiently powered to observe a moderate effect size. However, the majority of the hypothesized relationships were non-significant. The associations between CFS and outcomes, as well as the interactions between CFS and moderators may be small. As such, a

larger sample size is needed to detect a significant difference. Furthermore, because the number of correlation and moderation analyses were not limited, the likelihood of type 1 error may be increased in the current study. Therefore, results should be interpreted with care.

Relatedly, although students reported being from different countries, the sample size for each individual country was small. International students are a heterogenous population (Andrade, 2006; Yeh & Inose, 2003; Kawamoto et al., 2018) and therefore, the relationships between the predictors and outcomes examined within this study, may be different based on individual characteristics, such as country and culture of origin. As such, the findings may not be generalizable to all international students. Future research should aim to examine the relationship between CFS and health, focusing on different countries individually and recruiting a larger sample size for each nationality.

As mentioned above, CFS is composed of six different dimensions. As such, these may have different effects on the adjustment process of international students. The current study's aim was to examine the overall impact of CFS on physical and mental health. Examining CFS overall instead of focusing on the subscales may limit our understanding of the dynamics of these relationships. Future research could study how the distinct aspects of CFS impacts the health of international students. For example, students living in New York City, NY, a city that provides access to a multitude of cuisines and food options, may experience higher access, availability, and quality of cultural foods than someone studying in Bowling Green, OH, an area with less diverse food opportunities. Nonetheless, students from both places may engage in similar eating behaviors, such as sharing, preparation, and consumption of home foods, which are different aspects of CFS (Wright et al., 2021b).

The current study focused exclusively on international students at Bowling Green State University, a public institution in northwest Ohio. Future research may consider including other college campuses and immigrant populations in their sample. Relatedly, a little over two-thirds of the sample was made up of graduate students. Graduate students, compared to undergraduates, may receive more funding from universities (Institute of International Education, 2023b) and they may also be typically older than undergraduate students. These characteristics may have a beneficial effect on international students' adjustment overall (e.g., Msengi, 2007; Sam, 2000), and therefore, may help alleviate some of the negative impact that low CFS may have. Future studies should generalize these methods to undergraduate students, a group in which CFS issues may be more prominent.

Finally, future research might also examine how cultural distance is related to the specific dimensions of CFS to better understand CFS in the context of the lives of international students from different parts of the world. In the current sample, the degree of difference between cultures impacted international students' experiences. For example, higher cultural distance was related to lower access and availability but higher consumption of cultural foods. It is possible that someone who views their home culture as very different from the host culture may engage in more consumption of their home foods as a way to maintain their cultural identity even, or maybe especially, when there is limited access and availability of cultural foods.

Conclusions

Overall, the results of the current study underscore the importance of CFS in the experience of international students. There may be important applications of these results. This study found that international students experience concerns related to CFS, view their ability to access and consume cultural foods as important to them, and having higher CFS relates to better

perceived physical health. If future studies confirm or extend these findings, institutions, such as universities, may consider implementing additional cultural food related resources on campuses. These might include a greater variety of cultural foods in college food pantries, transportation to cultural stores that are inaccessible for students who do not own a car, and social events surrounding foods. Given the tremendous positive impact international students have on their host institutions, finding ways to support their success and well-being, including efforts focused on CFS, are worthwhile and important.

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APPENDIX A. TABLES AND FIGURES

Table 1.

Sample demographics

Variable	Category	*Frequency (N)*	*Percent*
Sex assigned at birth	Male	53	47.7%
	Female	58	52.3%
Gender	Male	45	40.5%
	Female	58	52.3%
	Missing	8	7.2%
Ethnicity/Race	African	21	18.9%
	Arab/Middle Eastern	3	2.70%
	Asian/South Asian/Pacific Islander	49	44.14%
	Latino	1	.9%
	White/European/ Mediterranean	26	23.42%
	Other	9	8.1%
	Missing	2	1.8%
Living situation	On-campus housing	25	22.5%
	Off-campus housing in Bowling Green, OH	80	72.0%
	Off-campus housing outside of Bowling Green, OH	6	5.4%
Degree type	Undergraduate	32	28.8%
	Graduate	77	69.4%
	No degree	2	1.8%
Student at BGSU for	Less than 1 year	54	48.6%
	1 year	21	18.9%
	2 years	18	16.2%
	3 years	5	4.5%
	4 years	10	9.0%
	6 years	3	2.7%
Food source	I primarily cook my own meals	79	72.2%
	I primarily eat/order food from on-campus dining options	26	23.4%
	I primarily eat/order food from off-campus restaurants	5	4.5%

Variable	Category	*Frequency (N)*	*Percent*
	Other (I cook with friends)	1	.9%
Food restrictions	Yes	22	19.8%
	No	85	79.4%
	Missing	4	3.6%
Meal plan	Yes	28	25.2%
	No	83	74.8%
Kitchen	Yes	103	92.8%
	No	8	7.2%
Car	Yes	37	33.3%
	No	74	66.7%
Lived in other countries	Yes	28	25.2%
	No	83	74.8%
Variable	*Mean*	*Standard deviation*	*Range*
Age (years)	27.22	7.45	18 - 47
Financial well-being	5.33	2.31	0 – 10
Length of time in U.S. (years)	1.60	2.00	.17 – 10.00
Perceived English proficiency	4.35	.70	2.75 – 5.00
Grade point average	3.77	.32	3.00 – 4.00

Note. For Ethnicity/Race 'Other' category, participants reported the following: 1. Asian and African (n = 1); 2. Black (n = 2); 3. Caribbean, Black, and Indian (n = 1); 4. Latino and White (n = 1); 5. Persian (n = 1); 6. White, Canadian Indigenous/Native American (n = 1); White/Middle Eastern (n = 2).

Table 2.

Country of origin

Country	N	Percent
Nigeria	9	8.1%
India	8	7.2%
Vietnam	8	7.2%
Ghana	6	5.4%
Iran	6	5.4%
Nepal	6	5.4%
Bangladesh	5	4.5%
Canada	5	4.5%
China	5	4.5%
Brazil	4	3.6%
Sri Lanka	4	3.6%
France	3	2.7%
Greece	3	2.7%
Pakistan	3	2.7%
Taiwan	3	2.7%
Austria	2	1.8%
Kenya	2	1.8%
Lebanon	2	1.8%
South Korea	2	1.8%
Spain	2	1.8%
Ukraine	2	1.8%
Argentina	1	.9%
Cote D'Ivoire	1	.9%
Czech Republic	1	.9%
Ethiopia	1	.9%
Germany	1	.9%
Hungary	1	.9%
Italy	1	.9%
Japan	1	.9%
Malawi	1	.9%
Malaysia	1	.9%
Morocco	1	.9%
Palestine	1	.9%
Philippines	1	.9%
Saudi Arabia	1	.9%
Senegal	1	.9%
Singapore and Philippines	1	.9%
Tanzania	1	.9%
Thailand	1	.9%
Trinidad and Tobago	1	.9%
Turkey	1	.9%

Country	N	Percent
Uzbekistan	1	.9%

Table 3.

Descriptive statistics for study variables

Variable	Mean	*SD*	Skewness		Kurtosis		Cronbach's α
			Statistic	Std. Error	Statistic	Std. Error	
CFS-S	2.95	.57	-.26	.23	-.23	.46	.93
CFS-S-Access	2.39	.78	.48	.23	-.05	.46	.70
CFS-S-Availability	2.55	.82	.10	.23	-.29	.46	.76
CFS-S-Quality	2.66	.77	.06	.23	-.19	.46	.85
CFS-S-Preparation	3.57	.70	-.37	.23	-.31	.46	.82
CFS-S-Sharing	3.07	.71	-.57	.23	.11	.46	.79
CFS-S-Consumption	2.87	.89	-.09	.23	-.73	.46	.86
PHQ-9	.82	.61	.68	.23	-.08	.46	.86
GAD-7	.83	.76	.93	.23	.08	.46	.91
Internalizing scale	.83	.63	.72	.23	-.01	.46	.93
ILS	.96	.47	.15	.23	-.57	.46	.91
ILS-Modified	.88	.47	.25	.23	-.41	.46	.90
SWLS	4.31	1.37	-.45	.23	-.45	.46	.88
EDE-QS	.75	.67	.80	.23	-.18	.46	.92
CFSI-S	3.85	.78	-.87	.23	.64	.46	.95
Psy-Flex	3.53	.75	-.52	.23	.97	.46	.82
BPCDS	5.21	1.11	-.43	.23	-.11	.46	.86
MSPSS	5.29	1.14	-.37	.23	-.45	.46	.90
MSPSS - Significant other	4.63	2.00	-.44	.23	-1.12	.46	.93
MSPSS – Family	5.63	1.22	-1.22	.23	1.99	.46	.85
MSPSS – Friends	5.60	1.07	-.82	.23	.88	.46	.91
Acculturation (Home)	5.21	1.18	-.74	.23	.52	.46	.83
Acculturation (U.S.)	5.02	1.21	-.57	.23	-.04	.46	.86

Variable		Mean	*SD*	Skewness		Kurtosis		Cronbach's α
				Statistic	Std. Error	Statistic	Std. Error	
General food security		.44	.43	.47	.23	-1.29	.46	
Like home foods		4.58	.70	-1.55	.23	1.55	.46	
Like American foods		2.81	.87	-.13	.23	.39	.46	
Variable	Category	*N*	*Percent*					
General food security (categories)	High/ marginal food security	54	48.6%					
	Low	32	28.8%					
	Very low	25	22.5 %					
CFS – Inability to purchase home foods	Yes	71	64%					
	No	40	36%					
CFS – Inability to purchase home foods within last 3 years		55	50%					
Variable	*M* (*SD*)	Paired *t*-test	*p*	Skewness		Kurtosis		
				Statistic	Std. Error	Statistic	Std. Error	
Physical health – current (I COPPE)	6.84 (1.68)	-1.43	.16	-.85	.23	.63	.46	
Physical health – before U.S. (I COPPE)	7.09 (1.77)			-1.16	.23	2.20	.46	
BMI (Current)	24.29 (5.08)	1.56	.12	1.38	.24	2.99	.47	
BMI (Before)	23.83 (5.79)			1.85	.24	4.86	.47	

Note. CFS-S = Cultural Food Security Scale; PHQ-9 = Patient Health Questionnaire 9; GAD-7 = Generalized Anxiety Disorder 7; Internalizing scale = Combined PHQ-9 and GAD-7; ILS = Index of Life Stress; ILS-Modified = Index of Life Stress without food and financial attitudes items; SWLS = Satisfaction with Life Scale; EDE-QS = Eating Disorder Examination Questionnaire Short; CFSI-S = Cultural Food Security Importance Scale; Psy-Flex = Psychological flexibility scale; BPCDS = Brief Perceived Cultural Distance Scale; MSPSS = Multidimensional Scale of Perceived Social Support; CFS – Inability to purchase home foods & CFS – Inability to purchase home foods within last 3 years: CFS items from Wright et al. (2021b); ICOPPE = Interpersonal, Community, Occupational, Physical, Psychological, Economic (I COPPE) Scale.

Table 4.

Bivariate correlations between predictor, outcomes, moderators, and covariates

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.
1. CFS-S	-																				
2. CFS-S-Ac	.68**	-																			
3. CFS-S-Av	.71**	.66**	-																		
4. CFS-S-Q	.79**	.59**	.75**	-																	
5. CFS-S-P	.80**	.40**	.37**	.50**	-																
6. CFS-S-S	.71**	.30**	.39**	.41**	.46**	-															
7. CFSS-C	.74**	.34**	.24**	.39**	.61**	.49**	-														
8. Intern	-.13	-.28**	-.20*	-.14	-.12	.02	.04	-													
9. ILS	-.17	-.23*	-.16	-.17	-.20*	-.09	.06	.55**	-												
10. SWLS	.16	.16	.22*	.16	.11	.14	-.03	-.36**	-.36**	-											
11. EDE-QS	-.03	-.13	.00	-.00	.01	-.09	.05	.21*	.25**	-.03	-										
12. Phys.	.24*	.23*	.21*	.22*	.15	.16	.16	-.30**	-.34**	.39**	-.17	-									
13. CFSI-S	.15	-.20*	-.05	-.05	.25**	.21*	.30**	.17	.15	-.03	.12	-.08	-								
14. Psy-Flex	.21*	.27**	.13	.15	.14	.20*	.06	-.24*	-.04	.24*	-.14	.34**	-.18	-							
15. BPCDS	-.01	-.19*	-.20*	-.11	-.05	.12	.26**	.30**	.35**	-.23*	.16	-.11	.33**	.003	1						
16. MSPSS	.16	.03	.07	.08	.16	.26**	.06	-.31**	-.33**	.39**	.02	.25**	.13	.05	-.15	1					
17. Age	.29*	.27**	.14	.20*	.29**	.06	.30**	-.12	.04	.000	.08	-.01	.10	.09	.03	.10	1				
18. Time in U.S.	.09	.04	.15	.11	-.02	.13	.02	-.04	-.02	.01	-.03	-.12	-.05	.03	.02	.19	.12	1			
19. Financ.	.09	.14	.10	.14	.05	.06	-.04	-.31**	-.38**	.46**	-.26**	.37**	-.07	.21*	-.35**	.40**	-.11	.09	1		
20. SAB	-.03	.02	.04	-.01	-.19	.18	-.08	.16	.11	.23*	.02	-.09	.001	.10	-.02	-.04	-.13	-.04	.13	1	
21. Accult-U.S.	.01	-.04	.03	.09	-.00	-.05	-.00	.03	.04	.05	.08	.05	.09	-.03	-.14	.12	-.00	-.12	.02	-.09	1

Note. CFS-S = Cultural food security scale; CFSS – Ac = Access subscale; CFSS – Av = Availability subscale; CFSS – Q = Quality subscale; CFSS – P = Preparation subscale; CFSS – S = Sharing subscale; CFSS – C = Consumption subscale; Intern = Internalizing symptoms; ILS = Index of Life Stress (modified: without food and financial attitudes items); SWLS = Satisfaction with Life Scale; EDE-QS = Eating Disorder Examination Questionnaire Short; Phys. = Interpersonal, Community, Occupational, Physical, Psychological, Economic (I COPPE) Scale, Physical health item (current); CFSI-S = Cultural Food Security Importance Scale; Psy-Flex = Psychological flexibility scale; BPCDS = Brief Perceived Cultural Distance Scale; MSPSS = Multidimensional Scale of Perceived Social Support; Financ. = Interpersonal, Community, Occupational, Physical, Psychological, Economic (I COPPE) Scale, Financial well-being item; SAB = Sex assigned at birth; Accult – U.S. = Acculturation to U.S. culture subscale (Brief Acculturation Orientation Scale).

*$p < .05$.

** $p < .01$.

Table 5.

Moderation analysis: Effects of CFS and psychological flexibility on physical health

Variable	Coefficient	se	*t*	*p*	Confidence Interval	
					Lower	Upper
Constant	6.25	.74	8.39	< .001	4.77	7.72
Cultural food security	.60	.27	2.19	< .05	.06	1.13
Psychological flexibility	.55	.20	2.68	< .01	.14	.95
Interaction	.33	.31	1.04	.30	-.29	.95
Age	-.02	.02	-.87	.39	-.06	.02
Financial well-being	.20	.07	2.90	< .01	.06	.33

Note: Interaction = cultural food security * psychological flexibility.

Figure 1.

The interaction between cultural food security and psychological flexibility with perceived physical health as an outcome

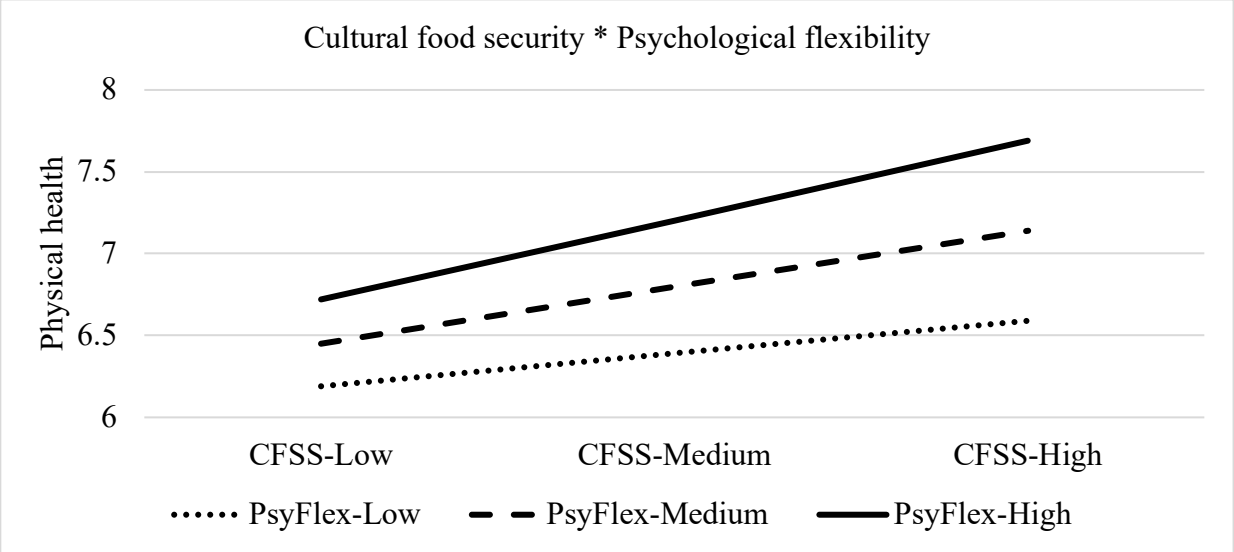

Table 6.

Moderation analysis: Effects of CFS and CFSI on physical health

Variable	Coefficient	se	*t*	*p*	Confidence Interval	
					Lower	Upper
Constant	5.80	.74	7.81	< .001	4.29	7.21
Cultural food security	.70	.28	2.52	< .05	.15	1.24
Cultural food security importance	-.19	.20	-.94	.35	-.59	.21
Interaction	-.07	.35	-.19	.85	-.76	.63
Age	-.01	.02	-.37	.71	-.05	.03
Financial well-being	.24	.07	3.69	< .001	.11	.38

Note: Interaction = cultural food security * cultural food security importance.

Table 7.

Moderation analysis: Effects of CFS and cultural distance on physical health

Variable	Coefficient	se	*t*	*p*	Confidence Interval	
					Lower	Upper
Constant	5.73	.75	7.61	< .001	4.24	7.23
Cultural food security	.66	.27	2.40	< .05	.12	1.20
Cultural distance	.02	.14	.12	.90	-.27	.30
Interaction	-.04	.22	-.17	.87	-.48	.40
Age	-.01	.02	-.43	.67	-.05	.03
Financial well-being	.25	.07	3.64	< .001	.12	.39

Note: Interaction = cultural food security * cultural distance.

Table 8.

Moderation analysis: Effects of CFS and social support on physical health

Variable	Coefficient	se	*t*	*p*	Confidence Interval	
					Lower	Upper
Constant	5.94	.76	7.84	< .001	4.44	7.45
Cultural food security	.64	.27	2.34	< .05	.10	1.18
Social support	.14	.14	1.00	.32	-.14	.43
Interaction	-.13	.22	-.58	.57	-.56	.31
Age	-.01	.02	-.54	.59	-.05	.03
Financial well-being	.23	.07	3.16	< .01	.09	.37

Note: Interaction = cultural food security * social support.

Table 9.

Moderation analysis: Effects of CFS and psychological flexibility on internalizing symptoms

Variable	Coefficient	se	*t*	*p*	Confidence Interval	
					Lower	Upper
Constant	1.55	.29	5.25	< .001	.96	2.13
Cultural food security	-.05	.11	-.49	.63	-.27	.16
Psychological flexibility	-.13	.08	-1.58	.12	-.29	.03
Interaction	-.00	.12	-.01	.99	-.25	.24
Age	-.01	.01	-1.25	.21	-.03	.01
Financial well-being	-.08	.03	-3.01	< .01	-.13	-.03

Note: Interaction = cultural food security * psychological flexibility.

Table 10.

Moderation analysis: Effects of CFS and CFSI on internalizing symptoms

Variable	Coefficient	*se*	*t*	*p*	Confidence Interval	
					Lower	Upper
Constant	1.55	.28	5.55	<.001	1.00	2.11
Cultural food security	-.11	.10	-1.02	.31	-.31	.10
Cultural food security importance	.16	.08	2.09	< .05	.01	.31
Interaction	.11	.13	.80	.43	-.16	.37
Age	-.01	.01	-1.43	.16	-.03	.00
Financial well-being	-.08	.03	-3.15	<.01	-.13	-.03

Note: Interaction = cultural food security * cultural food security importance.

Table 11.

Moderation analysis: Effects of CFS and cultural distance on internalizing symptoms

Variable	Coefficient	se	*t*	*p*	Confidence Interval	
					Lower	Upper
Constant	1.47	.28	5.17	< .001	.91	2.03
Cultural food security	-.08	.10	-.77	.44	-.28	.13
Cultural distance	.12	.05	2.32	< .05	.02	.23
Interaction	.00	.08	.02	.99	-.16	.17
Age	-.01	.01	-1.34	.18	-.03	.01
Financial well-being	-.06	.03	-2.46	< .05	-.12	-.01

Note: Interaction = cultural food security * cultural distance.

Table 12.

Moderation analysis: Effects of CFS and social support on internalizing symptoms

Variable	Coefficient	se	*t*	*p*	Confidence Interval	
					Lower	Upper
Constant	1.44	.29	4.98	< .001	.86	2.01
Cultural food security	-.06	.10	-.56	.58	-.26	.15
Social support	-.10	.05	-1.91	.06	-.21	.00
Interaction	.09	.08	1.07	.29	-.08	.25
Age	-.01	.01	-1.13	.26	-.02	.01
Financial well-being	-.07	.03	-2.54	< .05	-.12	-.02

Note: Interaction = cultural food security * social support.

Table 13.

Moderation analysis: Effects of CFS and psychological flexibility on acculturative stress

Variable	Coefficient	se	*t*	*p*	Confidence Interval	
					Lower	Upper
Constant	1.18	.22	5.47	< .001	.75	1.60
Cultural food security	-.15	.08	-1.93	.06	-.31	.00
Psychological flexibility	.05	.06	.77	.44	-.07	.16
Interaction	-.04	.09	-.48	.63	-.22	.14
Age	.00	.01	.72	.47	-.01	.02
Financial well-being	-.08	.02	-3.89	< .001	-.11	-.04

Note: Interaction = cultural food security * psychological flexibility.

Table 14.

Moderation analysis: Effects of CFS and CFSI on acculturative stress

Variable	Coefficient	se	*t*	*p*	Confidence Interval	
					Lower	Upper
Constant	1.17	.21	5.67	< .001	.76	1.58
Cultural food security	-.15	.08	-1.87	.06	-.30	.01
Cultural food security importance	.10	.06	1.82	.07	-.01	.21
Interaction	.07	.10	.73	.47	-.12	.27
Age	.00	.01	.46	.64	-.01	.01
Financial well-being	-.07	.02	-3.77	< .001	-.11	-.03

Note: Interaction = cultural food security * cultural food security importance.

Table 15.

Moderation analysis: Effects of CFS and cultural distance on acculturative stress

Variable	Coefficient	se	*t*	*p*	Confidence Interval	
					Lower	Upper
Constant	1.13	.21	5.48	< .001	.72	1.54
Cultural food security	-.13	.08	-1.69	.09	-.27	.02
Cultural distance	.11	.04	2.72	< .01	.03	.18
Interaction	-.06	.06	-.92	.36	-.18	.06
Age	.00	.01	.32	.75	-.01	.01
Financial well-being	-.06	.02	-2.96	< .01	-.09	-.02

Note: Interaction = cultural food security * cultural distance.

Table 16.

Moderation analysis: Effects of CFS and social support on acculturative stress

Variable	Coefficient	se	*t*	*p*	Confidence Interval	
					Lower	Upper
Constant	1.08	.21	5.12	< .001	.66	1.50
Cultural food security	-.11	.08	-1.48	.14	-.26	.04
Social support	-.08	.04	-2.02	< .05	-.16	-.00
Interaction	.08	.06	1.32	.19	-.04	.20
Age	.00	.06	.79	.43	-.01	.02
Financial well-being	-.06	.02	-3.12	< .01	-.10	-.02

Note: Interaction = cultural food security * social support.

Table 17.

Moderation analysis: Effects of CFS and psychological flexibility on satisfaction with life

Variable	Coefficient	se	*t*	*p*	Confidence Interval	
					Lower	Upper
Constant	2.27	.69	3.27	< .01	.89	3.64
Cultural food security	.22	.22	1.02	.31	-.21	.65
Psychological flexibility	.21	.16	1.27	.21	-.12	.53
Interaction	.16	.26	.61	.54	-.35	.66
Age	.00	.02	.18	.86	-.03	.04
Sex assigned at birth	.49	.24	2.03	< .05	.01	.96
Financial well-being	.23	.05	4.19	< .001	.12	.34

Note: Interaction = cultural food security * psychological flexibility.

Table 18.

Moderation analysis: Effects of CFS and CFSI on satisfaction with life

Variable	Coefficient	se	*t*	*p*	Confidence Interval	
					Lower	Upper
Constant	1.96	.68	2.88	< .01	.61	3.30
Cultural food security	.27	.22	1.25	.22	-.16	.70
Cultural food security importance	-.03	.16	-.19	.85	-.34	.28
Interaction	.01	.28	.04	.97	-.54	.56
Age	.01	.02	.47	.64	-.03	.04
Sex assigned at birth	.50	.24	2.12	< .05	.03	.97
Financial well-being	.26	.05	4.92	< .001	.15	.36

Note: Interaction = cultural food security * cultural food security importance.

Table 19.

Moderation analysis: Effects of CFS and cultural distance on satisfaction with life

Variable	Coefficient	se	*t*	*p*	Confidence Interval	
					Lower	Upper
Constant	1.88	.69	2.72	< .01	.51	3.25
Cultural food security	.26	.21	1.25	.22	-.16	.68
Cultural distance	-.10	.11	-.90	.37	-.32	.12
Interaction	.22	.17	1.31	.19	-.11	.56
Age	.01	.02	.75	.46	-.02	.05
Sex assigned at birth	.53	.23	2.29	< .05	.07	.99
Financial well-being	.24	.05	4.46	< .001	.13	.35

Note: Interaction = cultural food security * cultural distance.

Table 20.

Moderation analysis: Effects of CFS and social support on satisfaction with life

Variable	Coefficient	se	*t*	*p*	Confidence Interval	
					Lower	Upper
Constant	2.36	.67	3.54	< .001	1.04	3.69
Cultural food security	.20	.21	1.00	.32	-.20	.61
Social support	.30	.11	2.80	< .01	.09	.52
Interaction	.15	.16	.93	.36	-.17	.48
Age	.00	.02	.17	.87	-.03	.03
Sex assigned at birth	.56	.23	2.50	< .05	.12	1.01
Financial well-being	.19	.06	3.40	.001	.08	.30

Note: Interaction = cultural food security * social support.

Table 21.

Moderation analysis: Effects of CFS and psychological flexibility on eating concerns

Variable	Coefficient	se	*t*	*p*	Confidence Interval	
					Lower	Upper
Constant	.94	.32	2.92	< .01	.30	1.58
Cultural food security	-.02	.12	-.18	.85	-.25	.21
Psychological flexibility	-.08	.09	-.95	.34	-.26	.09
Interaction	.04	.14	.29	.77	-.23	.31
Age	.01	.01	.80	.42	-.01	.03
Financial well-being	-.07	.03	-2.43	< .05	-.13	-.01

Note: Interaction = cultural food security * psychological flexibility.

Table 22.

Moderation analysis: Effects of CFS and CFSI on eating concerns

Variable	Coefficient	se	*t*	*p*	Confidence Interval	
					Lower	Upper
Constant	1.01	.31	3.23	< .01	.39	1.62
Cultural food security	-.04	.12	-.35	.73	-.27	.19
Cultural food security importance	.09	.09	1.01	.32	-.08	.25
Interaction	-.01	.15	-.09	.93	-.31	.28
Age	.00	.01	.53	.59	-.01	.02
Financial well-being	-.07	.03	-2.57	< .05	-.13	-.02

Note: Interaction = cultural food security * cultural food security importance.

Table 23.

Moderation analysis: Effects of CFS and cultural distance on eating concerns

Variable	Coefficient	se	*t*	*p*	Confidence Interval	
					Lower	Upper
Constant	.89	.32	2.82	< .01	.26	1.52
Cultural food security	-.03	.12	-.26	.79	-.26	.20
Cultural distance	.05	.06	.86	.39	-.07	.17
Interaction	.09	.09	.99	.32	-.09	.28
Age	.01	.01	.82	.41	-.01	.03
Financial well-being	-.06	.03	-2.20	< .05	-.12	-.01

Note: Interaction = cultural food security * cultural distance.

Table 24.

Moderation analysis: Effects of CFS and social support on eating concerns

Variable	Coefficient	se	*t*	*p*	Confidence Interval	
					Lower	Upper
Constant	1.14	.32	3.55	< .001	.50	1.77
Cultural food security	-.04	.12	-.35	.73	-.27	.19
Social support	.08	.06	1.39	.17	-.04	.20
Interaction	.04	.09	.44	.66	-.14	.22
Age	.00	.01	.43	.67	-.01	.02
Financial well-being	-.09	.03	-3.05	< .01	-.15	-.03

Note: Interaction = cultural food security * social support.

Table 25.

Independent t-test between single item inability to access foods and CFS-S

Variable	Inability (*N*)	Mean (*SD*)	*t*	*p*
1. CFS-S	Yes (71)	2.88 (.54)	-1.73 (109)	.09
	No (40)	3.07 (.60)		
2. CFS-S-Ac	Yes (71)	2.25 (.67)	-2.61 (109)	< .05
	No (40)	2.65 (.89)		
3. CFS-S-Av	Yes (71)	2.50 (.78)	.99 (109)	.33
	No (40)	2.66 (.88)		
4. CFS-S-Q	Yes (71)	2.54 (.73)	-2.12 (109)	< .05
	No (40)	2.86 (.81)		
5. CFS-S-P	Yes (71)	3.50 (.69)	-1.50 (109)	.14
	No (40)	3.71 (.71)		
6. CFS-S-S	Yes (71)	3.07 (.73)	-.03 (109)	.97
	No (40)	3.08 (.67)		
7. CFS-S-C	Yes (71)	2.81 (.90)	-.86 (109)	.39
	No (40)	2.96 (.88)		

Note. Single item inability to access foods = CFS item from Wright et al. (2021b); CFS-S = Cultural Food Security Scale; CFSS – Ac = Access subscale; CFSS – Av = Availability subscale; CFSS – Q = Quality subscales; CFSS – P = Preparation subscale; CFSS – S = Sharing subscale; CFSS – C = Consumption subscale.

APPENDIX B. RECRUITMENT EMAILS

Pilot Study

1. First Email:
Subject: Quick Research Study On Cultural Foods

Dear International Student,

My name is Aniko Varga, a graduate student in the Bowling Green State University (BGSU) Department of Psychology. I am conducting a research study investigating the effects of cultural food security (e.g., access to foods from one's home country) on international students' well-being, under the supervision of Dr. Dara Musher-Eizenman. To do this, I am developing two measures to assess cultural food security and importance. I am looking to recruit international students from BGSU to complete these two questionnaires and answer questions about their content and quality. The study should take approximately 20 minutes to complete. As a compensation, each qualifying participant will be awarded a $10 Amazon gift card for completing the survey. This study has been approved by the Bowling Green State University Institutional Review Board.

If you would like to participate in the study and complete the survey, please follow the link below:

SURVEY LINK

Please feel free to reach out with any questions you may have!

Sincerely,
Aniko Varga (she/her)
Graduate Student
Department of Psychology
BGSU | Bowling Green State University
Follow the link to opt out of future emails:
LINK

2. Reminder Email:
Subject: Reminder: Quick Research Study On Cultural Foods
Dear International Student,

This is a reminder that there is still time to take part in the survey on cultural foods. The participation of international students is strongly needed. Qualifying participants will be given a $10 Amazon gift card. Please see details below:

My name is Aniko Varga, a graduate student in the Bowling Green State University (BGSU) Department of Psychology. I am conducting a research study investigating the effects of cultural

food security (e.g., access to foods from one's home country) on international students' well-being, under the supervision of Dr. Dara Musher-Eizenman. To do this, I am developing two measures to assess cultural food security and importance. I am looking to recruit international students from BGSU to complete these two questionnaires and answer questions about their content and quality. The study should take approximately 20 minutes to complete. As a compensation, each qualifying participant will be awarded a $10 Amazon gift card for completing the survey. This study has been approved by the Bowling Green State University Institutional Review Board.

If you would like to participate in the study and complete the survey, please follow the link below:

SURVEY LINK

Please feel free to reach out with any questions you may have!

Sincerely,
Aniko Varga (she/her)
Graduate Student
Department of Psychology
BGSU | Bowling Green State University
Follow the link to opt out of future emails:
LINK

Main Study

1. Qualtrics - First Email:
Subject: Opinion of international students strongly needed/Opinion of BGSU international students strongly needed

Dear International Student,

My name is Aniko Varga, a graduate student in the Bowling Green State University (BGSU) Department of Psychology. I am conducting a research study investigating the effects of cultural food security (e.g., access to foods from one's home country) on international students' well-being, under the supervision of Dr. Dara Musher-Eizenman. To do this, I am looking to recruit international students from BGSU to take part in the survey. The study should take approximately 30 minutes to complete. As a compensation, each qualifying participant will be entered into a raffle and **randomly selected to earn one of the twenty $10 or fifteen $20 Amazon gift cards.** This study has been approved by the Bowling Green State University Institutional Review Board.
If you would like to participate in the study and complete the survey, please follow the link below:
SURVEY LINK

Please feel free to reach out with any questions you may have!

Sincerely,
Aniko Varga (she/her)
Graduate Student
Department of Psychology
BGSU | Bowling Green State University
Follow the link to opt out of future emails:
LINK

2. Qualtrics - Reminder Email:
Subject: Opinion of international students strongly needed/Reminder: Opinion of international students strongly needed

Dear International Student,

This is a reminder that there is still time to take part in the survey on cultural foods. The participation of international students is strongly needed. Qualifying participants will be entered into a raffle to win one of the **twenty $10 or fifteen $20 Amazon gift cards**. Please see details below:

My name is Aniko Varga, a graduate student in the Bowling Green State University (BGSU) Department of Psychology. I am conducting a research study investigating the effects of cultural food security (e.g., access to foods from one's home country) on international students' well-being, under the supervision of Dr. Dara Musher-Eizenman. To do this, I am looking to recruit international students from BGSU to take part in the survey. The study should take approximately 30 minutes to complete. As a compensation, each qualifying participant will be entered into a raffle and **randomly selected to earn one of the twenty $10 or fifteen $20 Amazon gift cards.** This study has been approved by the Bowling Green State University Institutional Review Board.
If you would like to participate in the study and complete the survey, please follow the link below:
SURVEY LINK

Please feel free to reach out with any questions you may have!

Sincerely,
Aniko Varga (she/her)
Graduate Student
Department of Psychology
BGSU | Bowling Green State University

Follow the link to opt out of future emails:
LINK

3. BGSU Class/Newsletter Advertisement:
Subject: International students: chance to win a $10 or $20 gift card!

My name is Aniko Varga, a graduate student in the Bowling Green State University (BGSU) Department of Psychology. I am conducting a research study investigating the effects of cultural food security (e.g., access to foods from one's home country) on international students' well-being, under the supervision of Dr. Dara Musher-Eizenman. To do this, I am looking to recruit international students from BGSU to take part in the survey. The study should take approximately 30 minutes to complete. As a compensation, each qualifying participant will be entered into a raffle and randomly selected to earn one of the twenty $10 or fifteen $20 Amazon gift cards. The chance to win a gift card is approximately 1 in 6. This study has been approved by the Bowling Green State University Institutional Review Board. Please contact Aniko Varga (email) with any questions you may have about this study. If you already participated in this study, please do not complete the survey again.

If you would like to participate in the study and complete the survey, please follow the link below:
LINK

APPENDIX C. PILOT STUDY SURVEY

1. Informed Consent

INFORMED CONSENT FOR CULTURAL FOOD MEASURES STUDY

KEY INFORMATION
This study asks you to complete two scales on cultural foods. It also asks you questions about these two measures. It should take about 20 minutes to complete. This study may help us learn more about cultural food security. If you meet the requirements below, you will be rewarded with a $10 Amazon gift card. Your email address will be recorded so we can send you the gift card. We will then delete it. Your participation is confidential. The risk of participating is no greater than that experienced in daily life. Your participation is completely voluntary. To participate, you must be at least 18 years old. You must also be an international student at Bowling Green State University (BGSU). You must be living in the United States.

THE RESEARCHERS
This study is being done by Aniko Varga. Ms. Varga is a graduate student in the Department of Psychology at Bowling Green State University. The study is supervised by Dr. Dara Musher-Eizenman. Dr. Musher-Eizenman is a Professor in the Department of Psychology at Bowling Green State University.

PURPOSE
This study examines the characteristics of two new measures of cultural food security and cultural food importance among international students. Cultural foods refer to foods typically eaten in one's home country. We are measuring six components of cultural food security. These include access, availability, and quality of cultural foods. They also include the ability to eat, share, and prepare cultural foods. This study fills gaps in the research on cultural food security. There are no direct benefits to the participants in the current study.

COMPENSATION
If you participate in this study, you will receive a $10 Amazon gift card. *To qualify for the gift card, you need to complete at least 75% of the survey. You must also pass the attention check question and the Captcha verification embedded in the survey. You will receive the gift card by email.*

ELIGIBILITY
To participate you must be at least 18 years old. You must also be an international student enrolled at Bowling Green State University. You must live in the United States when you complete the survey. You need to have access to a laptop, personal computer, or other device.

PROCEDURE
After you agree to participate, you will be asked to complete two scales on cultural food security and importance. You will also be asked questions about these scales. Your responses will help us improve these measures. You will also be asked questions about demographics and language competency. You will be asked food preference and additional cultural food security questions.

It should take about 20 minutes to complete the study. Your email address will be recorded so we can send you the gift card. We will then delete it.

VOLUNTARY NATURE
Participation is completely voluntary. You can skip questions or stop participating at any time without explanation or penalty. Your decision whether to participate will not affect your relationship with Bowling Green State University. You need to complete at least 75% of the survey to receive the gift card.

CONFIDENTIALITY PROTECTION
Your data will be confidential. We will record your email address to send you the Amazon gift card. Email addresses will be deleted after the gift cards have been sent. Data will be stored on a password-protected server and on a password-protected computer. Only the research team will have access to the data. Please note, employers may use tracking software so you may want to complete the survey on a personal computer. You should not leave the survey open if using a public computer or a computer that others may have access to. You should clear your browser cache and page history after completing the survey. Quotes may be used from your responses. They will not be linked to your name or identifying information.

RISKS
The risk of participation is no greater than that experienced in daily life.

CONTACT INFORMATION
If you have any questions about this study, you can contact the research team. This study is being done by Aniko Varga. Ms. Varga can be reached at (email and phone number). The supervisor is Dr. Dara Musher-Eizenman. Dr. Musher-Eizenman can be reached at (email and phone number). You may also contact the Chair of the Bowling Green State University Institutional Review Board if you have any questions about your rights as a participant in this research. Their contact information is: 419-373-7716 or irb@bgsu.edu.

Thank you for your time!

Please note that selecting *'I have been informed of the purposes, procedures, risks, and benefits of this study. I have had the opportunity to have all my questions answered and I have been informed that my participation is completely voluntary.* ***I CONSENT to participate in this research.'*** **indicates consent to participate in this study.**

- I have been informed of the purposes, procedures, risks, and benefits of this study. I have had the opportunity to have all my questions answered and I have been informed that my participation is completely voluntary. **I CONSENT to participate in this research.**
- **I DO NOT consent to participate in this research.**

2. Captcha Verification

3. Inclusion Criteria

I. Are you currently living in the United States?
   a. Yes
   b. No

II. Are you currently an international student at Bowling Green State University?
   a. Yes (Please specify your type of visa):
   b. No

III. Are you currently enrolled in the Spring 2023 Semester at Bowling Green State University?
   a. Yes
   b. No

4. Home country

What is your home country? _____

5. Cultural Food Security Scale (CFS-S)

- Based on Wright et al. (2021b) -

The following statements are about your experiences regarding your cultural foods **while living in the United States. Cultural foods** *refer to foods specific to your home country, foods that are typically eaten in your home country.*

There are no right or wrong answers. Please indicate how much you agree or disagree with the statements below:

Subscale	Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Access	1. I can afford my cultural foods while living here	1	2	3	4	5
Availability	2. The foods that I am used to eating in my home country are available in stores here	1	2	3	4	5
Quality	3. I can buy fresh ingredients here to cook my cultural foods	1	2	3	4	5
Preparation	4. I cook my cultural foods often	1	2	3	4	5
Sharing	5. I can share my cultural foods with others here	1	2	3	4	5
Consumption	6. I mostly eat foods from my own culture while living in the United States	1	2	3	4	5

Subscale	Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Access	7. I can physically access (e.g., by walking or transportation) my cultural foods while living here	1	2	3	4	5
Availability	8. The foods that I am used to eating in my home country are available in restaurants here	1	2	3	4	5
Quality	9. The ingredients that I buy here to cook my cultural foods taste the same as in my home country	1	2	3	4	5
Preparation	10. I can prepare my cultural foods here the same way as back home	1	2	3	4	5
Sharing	11. I can eat my cultural foods together with other people here	1	2	3	4	5
Consumption	12. While I've been living here, I have mostly eaten American foods	1	2	3	4	5
Access	13. I have to travel a long distance to access my cultural foods	1	2	3	4	5
Availability	14. The ingredients that I am used to cooking with in my home country are available in stores here	1	2	3	4	5
Quality	15. My cultural ingredients that I buy here to cook with taste good	1	2	3	4	5
Preparation	16. I have adequate kitchen supplies here to prepare my cultural foods	1	2	3	4	5
Sharing	17. I can cook my cultural foods together with other people here	1	2	3	4	5
Consumption	18. A lot of the foods that I eat here are my own culture's foods	1	2	3	4	5
Access	19. I can find my cultural foods while living here	1	2	3	4	5

Subscale	Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Availability	20. I am unable to find my cultural foods in restaurants here	1	2	3	4	5
Quality	21. I have access to good quality cultural foods from my home country in restaurants here	1	2	3	4	5
Preparation	22. My roommates/neighbors do not like it when I make my cultural foods, so I avoid cooking them	1	2	3	4	5
Sharing	23. I often eat and/or cook my cultural foods together with other international students here	1	2	3	4	5
Consumption	24. I tend to eat my cultural foods rather than American foods here	1	2	3	4	5
Access	25. My cultural foods are very expensive here	1	2	3	4	5
Availability	26. I am unable to find ingredients in stores here to cook my cultural foods	1	2	3	4	5
Quality	27. I have access to good quality cultural ingredients from my home country in stores here	1	2	3	4	5
Preparation	28. I have adequate cooking skills to prepare my cultural foods	1	2	3	4	5
Sharing	29. I frequently eat and/or cook my cultural foods together with other Americans here	1	2	3	4	5
Consumption	30. At restaurants here, I mostly eat my cultural foods instead of American foods	1	2	3	4	5
Preparation	31. I have never cooked before coming to the United States	1	2	3	4	5

Subscale	Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Quality	32. I cannot find good quality ingredients here to cook my cultural dishes	1	2	3	4	5
Preparation	33. It takes a long time to make my cultural foods, so I avoid cooking them	1	2	3	4	5
Sharing	34. I am unable to share my cultural foods with anyone here	1	2	3	4	5
Preparation	35. I don't know how to cook so I don't make my cultural foods	1	2	3	4	5
Consumption	36. At stores here I usually buy my cultural foods instead of American foods	1	2	3	4	5
Preparation	37. I rarely cook my cultural foods here	1	2	3	4	5
Quality	38. My cultural foods that are available in restaurants here taste bad	1	2	3	4	5
	Attention Check: Please select 'Neutral' for this question	1	2	3	4	5
Sharing	39. I am unable to cook my cultural foods together with anyone here	1	2	3	4	5
Preparation	40. It is too time consuming to cook my cultural foods, so I never make them	1	2	3	4	5
Consumption	41. I never eat my cultural foods while living in the United States	1	2	3	4	5
Sharing	42. I video call (e.g., FaceTime, Skype) my family and/or friends from my home country to cook or eat together virtually	1	2	3	4	5

6. CFS-S Pilot Questions

The next questions ask about your views on the questionnaire you just completed. There are no right or wrong answers. We are simply interested in your opinion.

I. What do you think the questionnaire above measures? _____

II. Were the instructions easy to understand?
    a. Yes
    b. No (Please specify): _____
III. Were the statements easy to understand?
    a. Yes
    b. No
IV. Which statements were hard to understand? Please list the statements below and propose improvements if you can: _____
V. Is there anything you think we should ask about in this questionnaire that we are missing? Are there any other statements you think we should include that you can think of?
    _____

7. Cultural Food Security Importance Scale (CFSI-S)

- Based on Wright et al. (2021b) -

The following statements are about how important your cultural foods and related activities are to you. ***Cultural foods*** *refer to foods specific to your home country, foods that are typically eaten in your home country.*

There are no right or wrong answers. Please indicate how much you agree or disagree with the statements below:

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Being able to afford my cultural foods is important to me	1	2	3	4	5
2. It is important to me to have my cultural foods available in restaurants	1	2	3	4	5
3. It is important to me to have access to good quality cultural foods and ingredients	1	2	3	4	5
4. It is important to me to prepare foods the same way as back home	1	2	3	4	5
5. Eating and cooking together with others is an important part of my culture	1	2	3	4	5
6. It is important to me to eat my cultural foods consistently	1	2	3	4	5
7. My cultural foods are an important part of my identity	1	2	3	4	5
8. It is important to me to have close access to my cultural foods, such as at nearby restaurants or stores	1	2	3	4	5
9. It is important to me to have my cultural foods available in stores	1	2	3	4	5

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
10. Having access to fresh cultural foods and ingredients is important to me	1	2	3	4	5
11. Cooking my own cultural foods is important to me	1	2	3	4	5
12. Eating and cooking together with my family or friends is important to me	1	2	3	4	5
13. Eating my cultural foods is important to me	1	2	3	4	5
14. It is important to me to eat my cultural foods together with others	1	2	3	4	5
15. I prefer eating my own cultural foods rather than American foods	1	2	3	4	5
16. It is important to me to cook my cultural foods together with others	1	2	3	4	5
17. I miss eating my foods from back home	1	2	3	4	5

8. CFSI-S Pilot Questions

The next questions ask about your views on the questionnaire you just completed. There are no right or wrong answers. We are simply interested in your opinion.

I. What do you think the questionnaire above measures? _____
II. Were the instructions easy to understand?
    a. Yes
    b. No (Please specify): _____
III. Were the statements easy to understand?
    a. Yes
    b. No
IV. Which statements were hard to understand? Please list the statements below and propose improvements if you can: _____
V. Is there anything you think we should ask about in this questionnaire that we are missing? Are there any other statements you think we should include that you can think of?

9. Demographics

I. What is your birthdate?
    a. Month _____
    b. Day _____
    c. Year _____
II. Please indicate your sex assigned at birth
    a. Male

b. Female
c. Other (Please specify): _____
d. Prefer not to say

III. What type of degree are you pursuing at Bowling Green State University?
a. Undergraduate
b. Graduate
c. Other (Please specify): _____
d. No degree

IV. Where do you live?
a. On-campus housing
b. Off-campus housing in Bowling Green (Ohio)
c. Off-campus housing outside of Bowling Green (Ohio) (Please specify City and State): _____
d. Other (Please specify): _____

V. When did you arrive in the United States for your studies?
a. Month of arrival _____
b. Year of arrival _____

VI. I COPPE Scale – Financial Well-Being: This question pertains to your economic situation. The top number ten represents the best your life can be. The bottom number zero represents the worst your life can be. When it comes to **your economic situation**, on which number do you stand **now**?
- 10
- 9
- 8
- 7
- 6
- 5
- 4
- 3
- 2
- 1
- 0

VII. What is your primary source of food?
a. I primarily cook my own meals
b. I primarily eat/order food from on-campus dining options
c. I primarily eat/order food from off-campus restaurant
d. Other (Please specify): _____

VIII. Do you currently have a Meal Plan at BGSU?
a. Yes
b. No

IX. Do you have a kitchen that you can use where you currently live?
a. Yes
b. No

10. English Proficiency

- Ying & Han (2008) -

I. Your ability to read/write/speak/understand English is …
1. very poor
2. poor
3. average
4. good
5. excellent

11. Cultural Food Security

- Wright et al. (2021b) -

I. Since starting college, have you experienced the inability to purchase the foods that you used to eat at home?
   a. Yes
   b. No

II. Did the inability to purchase your traditional food happen within the last three years?
   a. Yes
   b. No

12. Food Preference

On a scale of 1 to 5 (1 = not at all; 5 = very much) ...

I. how much do you like eating your **home culture foods**? 1 – 2 – 3 – 4 – 5

II. how much do you like eating **American foods**? 1 – 2 – 3 – 4 – 5

13. End of Survey

Thank you for completing this survey! You will be provided with a $10 Amazon gift card for your participation if you met all requirements specified in the consent form at the beginning of the survey (e.g., passed the attention check, Captcha verification, completed at least 75% of the survey). You will receive the gift card via email.

APPENDIX D. MAIN STUDY SURVEY

1. Informed Consent

INFORMED CONSENT FOR CULTURAL FOOD SECURITY AND WELL-BEING STUDY

KEY INFORMATION
This study looks at the effects of access to cultural foods on well-being in international students. It should take about 30 minutes to complete this survey. This study may help us learn more about access to cultural foods. If you meet the requirements below, you will be entered into a raffle to win an Amazon gift card. Your email address will be recorded so we can send you the gift card. We will then delete it. Your participation is confidential. The risk of participating is no greater than that experienced in daily life. Your participation is completely voluntary. To participate, you must be at least 18 years old. You must also be an international student at Bowling Green State University (BGSU). You must be living in the United States.

THE RESEARCHERS
This study is being done by Aniko Varga. Ms. Varga is a graduate student in the Department of Psychology at Bowling Green State University. The study is supervised by Dr. Dara Musher-Eizenman. Dr. Musher-Eizenman is a Professor in the Department of Psychology at Bowling Green State University.

PURPOSE
This study looks at the link between access to cultural foods and well-being. Cultural foods refer to foods typically eaten in one's home country. We are measuring six components of cultural food security. These include access, availability, and quality of cultural foods. They also include the ability to eat, share, and prepare cultural foods. This study fills gaps in the research on cultural food security. There are no direct benefits to the participants in the study.

COMPENSATION
If you participate in this study, you will be entered into a raffle to win one of twenty $10 or fifteen $20 Amazon gift cards. The chance to win a gift card is about 1 in 6. To qualify for the raffle, you need to complete at least 75% of the survey. You must also pass two out of three attention check questions. You also need to pass the Captcha verification in the survey. The gift card will be sent by email.

ELIGIBILITY
To participate you must be at least 18 years old. You must also be an international student currently enrolled at Bowling Green State University. You must live in the United States when you complete the survey. You need to have access to a laptop, personal computer, or other device.

PROCEDURE
After you agree to participate, you will be asked to complete a survey. The survey looks at the effects of access to cultural foods. It includes cultural food security scales. It also includes scales

of mental, physical, and academic well-being. The survey also includes cultural food importance, psychological flexibility, cultural distance, and social support measures. You will also be asked questions about demographics, language competency, acculturation, food security, and food preference. You will also be asked open-ended questions about your experiences. It should take about 30 minutes to complete the study. Your email address will be collected only for the raffle. After the raffle, we will delete your email address.

VOLUNTARY NATURE
Participation is completely voluntary. You can skip questions or stop participating at any time without explanation or penalty. Your decision whether to participate will not affect your relationship with Bowling Green State University. To be entered in the raffle, you need to complete at least 75% of the survey.

CONFIDENTIALITY PROTECTION
Your data will be confidential. We will record your email address so we can enter you in the raffle for the gift card. We will delete your email address after the raffle. Data will be stored on a password-protected server and on a password-protected computer. Only the research team will have access to the data. Please note, employers may use tracking software so you may want to complete the survey on a personal computer. You should not leave the survey open on a public computer or a computer that others may have access to. You should clear your browser cache and page history after completing the survey. Quotes may be used from your responses. They will not be linked to your name or identifying information.

RISKS
The risk of participation is no greater than that experienced in daily life.

CONTACT INFORMATION
If you have any questions about this study, you can contact the research team. This study is being done by Aniko Varga. Ms. Varga can be reached at (email and phone number). The supervisor is Dr. Dara Musher-Eizenman. Dr. Musher-Eizenman can be reached at (email and phone number). You may also contact the Chair of the Bowling Green State University Institutional Review Board if you have any questions about your rights as a participant in this research. Their contact information is: 419-373-7716 or irb@bgsu.edu.

Thank you for your time!

Please note that selecting *'I have been informed of the purposes, procedures, risks, and benefits of this study. I have had the opportunity to have all my questions answered and I have been informed that my participation is completely voluntary.* ***I CONSENT to participate in this research.'*** **indicates consent to participate in this study.**

- o I have been informed of the purposes, procedures, risks, and benefits of this study. I have had the opportunity to have all my questions answered and I have been informed that my participation is completely voluntary. **I CONSENT to participate in this research.**
- o **I DO NOT consent to participate in this research.**

2. Inclusion Criteria

I. Are you currently living in the United States?
   a. Yes
   b. No

II. Are you currently an international student at Bowling Green State University?
   a. Yes (Please specify your type of visa):
   b. No

III. Are you currently enrolled in the Spring/Summer/Fall 2023 Semester at Bowling Green State University?
   a. Yes
   b. No

3. Captcha Verification

Please complete the following Captcha verification

reCAPTCHA

4. Home country

What is your home country? _____

5. Cultural Food Security Scale (CFS-S)

- Based on Wright et al. (2021b) -

The following statements are about your experiences regarding your cultural foods **while living in the United States**. **Cultural foods** *refer to foods specific to your home country, foods that are typically eaten in your home country.*

There are no right or wrong answers. Please indicate how much you agree or disagree with the statements below:

Subscale	Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Access	1. I can afford my cultural foods while living here	1	2	3	4	5
Availability	2. The foods that I am used to eating in my home country are available in stores here	1	2	3	4	5
Quality	3. I can buy fresh ingredients here to cook my cultural foods	1	2	3	4	5
Preparation	4. I cook my cultural foods often	1	2	3	4	5
Sharing	5. I can share my cultural foods with others here	1	2	3	4	5

Subscale	Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Consumption	6. I mostly eat foods from my own culture while living in the United States	1	2	3	4	5
Access	7. I can physically access (e.g., by walking or transportation) my cultural foods while living here	1	2	3	4	5
Availability	8. The foods that I am used to eating in my home country are available in restaurants here	1	2	3	4	5
Quality	9. The ingredients that I buy here to cook my cultural foods taste the same as in my home country	1	2	3	4	5
Preparation	10. I can prepare my cultural foods here the same way as back home	1	2	3	4	5
Sharing	11. I can eat my cultural foods together with other people here	1	2	3	4	5
Consumption	12. While I've been living here, I have mostly eaten American foods	1	2	3	4	5
Access	13. I have to travel a long distance to access my cultural foods	1	2	3	4	5
Availability	14. The ingredients that I am used to cooking with in my home country are available in stores here	1	2	3	4	5
Quality	15. My cultural ingredients that I buy here to cook with taste good	1	2	3	4	5
Preparation	16. I have adequate kitchen supplies here to prepare my cultural foods	1	2	3	4	5
Sharing	17. I can cook my cultural foods together with other people here	1	2	3	4	5
Consumption	18. A lot of the foods that I eat here are my own culture's foods	1	2	3	4	5

Subscale	Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Access	19. I can find my cultural foods while living here	1	2	3	4	5
Availability	20. I am unable to find my cultural foods in restaurants here	1	2	3	4	5
Quality	21. I have access to good quality cultural foods from my home country in restaurants here	1	2	3	4	5
Preparation	22. My roommates/neighbors do not like it when I make my cultural foods, so I avoid cooking them	1	2	3	4	5
Sharing	23. I often eat and/or cook my cultural foods together with other international students here	1	2	3	4	5
Consumption	24. I tend to eat my cultural foods rather than American foods here	1	2	3	4	5
Access	25. My cultural foods are very expensive here	1	2	3	4	5
Availability	26. I am unable to find ingredients in stores here to cook my cultural foods	1	2	3	4	5
Quality	27. I have access to good quality cultural ingredients from my home country in stores here	1	2	3	4	5
Preparation	28. I have adequate cooking skills to prepare my cultural foods	1	2	3	4	5
Sharing	29. I frequently eat and/or cook my cultural foods together with other Americans here	1	2	3	4	5
Consumption	30. At restaurants here, I mostly eat my cultural foods instead of American foods	1	2	3	4	5
Preparation	31. I have never cooked before coming to the United States	1	2	3	4	5

Subscale	Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Quality	32. I cannot find good quality ingredients here to cook my cultural dishes	1	2	3	4	5
Preparation	33. It takes a long time to make my cultural foods, so I avoid cooking them	1	2	3	4	5
Sharing	34. I am unable to share my cultural foods with anyone here	1	2	3	4	5
Preparation	35. I don't know how to cook so I don't make my cultural foods	1	2	3	4	5
Consumption	36. At stores here I usually buy my cultural foods instead of American foods	1	2	3	4	5
Preparation	37. I rarely cook my cultural foods here	1	2	3	4	5
Quality	38. My cultural foods that are available in restaurants here taste bad	1	2	3	4	5
Sharing	39. I am unable to cook my cultural foods together with anyone here	1	2	3	4	5
Preparation	40. It is too time consuming to cook my cultural foods, so I never make them	1	2	3	4	5
Consumption	41. I never eat my cultural foods while living in America	1	2	3	4	5
Sharing	42. I video call (e.g., FaceTime, Skype) my family and/or friends from my home country to cook or eat together virtually	1	2	3	4	5

6. Patient Health Questionnaire 9 (PHQ-9)

- Kroenke et al. (2001) –

Over the *last 2 weeks*, how often have you been bothered by any of the following problems?

Item	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself - or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite - being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3

If you checked off *any* problems, how *difficult* have these problems made it for you to do your work, take care of things at home, or get along with other people?

- Not difficult at all
- Somewhat difficult
- Very difficult
- Extremely difficult

7. Generalized Anxiety Disorder 7 (GAD-7)

- Spitzer et al. (2006) –

Over the *last 2 weeks*, how often have you been bothered by any of the following problems?

Item	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it is hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid as if something awful might happen	0	1	2	3
Attention check: Please select 'several days' for this item	0	1	2	3

If you checked off *any* problems, how *difficult* have these problems made it for you to do your work, take care of things at home, or get along with other people?

- Not difficult at all
- Somewhat difficult
- Very difficult
- Extremely difficult

8. Index of Life Stress (ILS)

- Yang & Clum (1995) –

Please rate each of the following statements from ‘never’ to ‘always’ according to how often do you feel the way described in each statement.

Item	Never	Rarely	Often	Always
1. My English embarrasses me when I talk to people.	0	1	2	3
2. I don’t like the religions in the U.S.A.	0	1	2	3
3. I worry about my academic performance	0	1	2	3
4. I worry about whether I will have my future career in my own country	0	1	2	3
5. I can feel racial discrimination towards me from other students.	0	1	2	3
6. I’m not doing as well as I want to in school	0	1	2	3

Item	Never	Rarely	Often	Always
7. My English makes it hard for me to read articles, books, etc.	0	1	2	3
8. It's hard for me to develop romantic relationships here.	0	1	2	3
9. I don't like the way people treat each other here	0	1	2	3
10. I don't like American food.	0	1	2	3
11. People treat me badly just because I am a foreigner.	0	1	2	3
12. I think that people are very selfish here.	0	1	2	3
13. I don't like the things people do for their entertainment here	0	1	2	3
14. I can feel racial discrimination toward me in stores.	0	1	2	3
15. I worry about whether I will have my future career in the U.S.A.	0	1	2	3
16. American's way of being too direct is uncomfortable to me.	0	1	2	3
17. I study very hard in order not to disappoint my family.	0	1	2	3
18. I can feel racial discrimination toward me from professors.	0	1	2	3
19. I can express myself well in English.	0	1	2	3
20. It would be the biggest shame for me if I fail in school	0	1	2	3
21. I worry about my financial situation.	0	1	2	3
22. I don't like American music.	0	1	2	3
23. I can feel racial discrimination toward me in restaurants.	0	1	2	3
24. My financial situation influences my academic study.	0	1	2	3
25. I worry about my future: will I return to my home country or stay in the U.S.A.	0	1	2	3
26. I haven't become used to enjoying the American holidays.	0	1	2	3
27. I don't want to return to my home country, but I may have to do so.	0	1	2	3
28. My English makes it hard for me to understand lectures.	0	1	2	3
29. I want to go back to my home country in the future, but I may not be able to do so.	0	1	2	3
30. My financial situation makes my life here very hard.	0	1	2	3

9. Satisfaction With Life Scale (SWLS)

- Diener et al. (1985) –

Below are five statements with which you may agree or disagree. Using the scale below, indicate your agreement with each item by selecting the appropriate answer next to each item. Please be open and honest in your responding.

Item	Strongly disagree	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Strongly agree
1. In most ways my life is close to my ideal	1	2	3	4	5	6	7
2. The conditions of my life are excellent	1	2	3	4	5	6	7
3. I am satisfied with my life	1	2	3	4	5	6	7
4. So far, I have gotten the important things I want in life	1	2	3	4	5	6	7
5. If I could live my life over, I would change almost nothing	1	2	3	4	5	6	7

10. Eating Disorder Examination Questionnaire - Short (EDE-QS)

- Gideon et al. (2016) –

On how many of the past 7 days …	0 days	1-2 days	3-5 days	6-7 days
1. Have you been deliberately trying to limit the amount of food you eat to influence your weight or shape (whether or not you have succeeded)?	0	1	2	3
2. Have you gone for long periods of time (e.g., 8 or more waking hours) without eating anything at all in order to influence your weight or shape?	0	1	2	3
3. Has thinking about food, eating or calories made it very difficult to concentrate on things you are interested in (such as working, following a conversation or reading)?	0	1	2	3
4. Has thinking about your weight or shape made it very difficult to concentrate on things you are interested in (such as	0	1	2	3

On how many of the past 7 days …	0 days	1-2 days	3-5 days	6-7 days
working, following a conversation or reading)?				
5. Have you had a definite fear that you might gain weight?	0	1	2	3
6. Have you had a strong desire to lose weight?	0	1	2	3
7. Have you tried to control your weight or shape by making yourself sick (vomit) or taking laxatives?	0	1	2	3
8. Have you exercised in a driven or compulsive way as a means of controlling your weight, shape or body fat, or to burn off calories?	0	1	2	3
9. Have you had a sense of having lost control over your eating (at the time that you were eating)?	0	1	2	3
10. On how many of these days (i.e., days on which you had a sense of having lost control over your eating) did you eat what other people would regard as an unusually large amount of food in one go?	0	1	2	3
Over the past 7 days …	Not at all	Slightly	Moderately	Markedly
11. Has your weight or shape influenced how you think about (judge) yourself as a person?	0	1	2	3
12. How dissatisfied have you been with your weight or shape?	0	1	2	3

11. Body Mass Index

I. What is your current height in centimeters? _____
II. What is your current weight in kilograms? _____
III. What was your height BEFORE coming to the United States? (in centimeters)
IV. What was your weight BEFORE coming to the United States? (in kilograms)

12. Perceived Physical Health (items from the I COPPE Scale)

- Prilleltensky et al. (2015) -

This set of questions pertains to your physical health and wellness.

I. The top number ten represents the best your life can be. The bottom number zero represents the worst your life can be. When it comes to <u>your physical health and wellness,</u> on which number do you stand <u>now?</u>
   - 10
   - 9
   - 8

- 7
- 6
- 5
- 4
- 3
- 2
- 1
- 0

II. The top number ten represents the best your life can be. The bottom number zero represents the worst your life can be. When it comes to <u>your physical health and wellness</u>, on which number did you stand <u>before coming to the United States?</u>
    - 10
    - 9
    - 8
    - 7
    - 6
    - 5
    - 4
    - 3
    - 2
    - 1
    - 0

13. GPA

I. What is your current Grade Point Average (GPA)? _____

II. If you DO NOT have a GPA, what is your current average letter grade? (adapted from Glass & Westmont, 2014)
    - A
    - B
    - C
    - D
    - F or below

14. Cultural Food Security Importance Scale (CFSI-S)

- Based on Wright et al. (2021b) -

The following statements are about how important your cultural foods and related activities are to you. ***Cultural foods*** *refer to foods specific to your home country, foods that are typically eaten in your home country.*

There are no right or wrong answers. Please indicate how much you agree or disagree with the statements below:

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Being able to afford my cultural foods is important to me	1	2	3	4	5
2. It is important to me to have my cultural foods available in restaurants	1	2	3	4	5
3. It is important to me to have access to good quality cultural foods and ingredients	1	2	3	4	5
4. It is important to me to prepare foods the same way as back home	1	2	3	4	5
5. Eating and cooking together with others is an important part of my culture	1	2	3	4	5
6. It is important to me to eat my cultural foods consistently	1	2	3	4	5
7. My cultural foods are an important part of my identity	1	2	3	4	5
8. It is important to me to have close access to my cultural foods, such as at nearby restaurants or stores	1	2	3	4	5
9. It is important to me to have my cultural foods available in stores	1	2	3	4	5
10. Having access to fresh cultural foods and ingredients is important to me	1	2	3	4	5
11. Cooking my own cultural foods is important to me	1	2	3	4	5
12. Eating and cooking together with my family or friends is important to me	1	2	3	4	5
13. Eating my cultural foods is important to me	1	2	3	4	5
14. It is important to me to eat my cultural foods together with others	1	2	3	4	5
15. I prefer eating my own cultural foods rather than American foods	1	2	3	4	5
16. It is important to me to cook my cultural foods together with others	1	2	3	4	5
17. I miss eating my foods from back home	1	2	3	4	5

15. Psy-Flex

- Gloster et al. (2021) –

The questions refer to your experiences in the last seven days.

Item	Very often	Often	From time to time	Seldom	Very seldom
1. Even if I am somewhere else with my thoughts, I can focus on what's going on in important moments.	5	4	3	2	1
2. If need be, I can let unpleasant thoughts and experiences happen without having to get rid of them immediately.	5	4	3	2	1
3. I can look at hindering thoughts from a distance without letting them control me.	5	4	3	2	1
Attention check: Please select 'seldom' for this item.	5	4	3	2	1
4. Even if thoughts and experiences are confusing me I can notice something like a steady core inside me.	5	4	3	2	1
5. I determine what's important for me and decide what I want to use my energy for.	5	4	3	2	1
6. I engage thoroughly in things that are important, useful, or meaningful to me.	5	4	3	2	1

16. Brief Perceived Cultural Distance Scale (BPCDS)

- Demes & Geeraert (2014) –

Think about your home country and the United States. In your opinion, how different or similar these two countries are in terms of …

Item	1 = very similar	2	3	4	5	6	7 = very different
1. Climate (temperature, rainfall, humidity)	1	2	3	4	5	6	7
2. Natural environment (plants and animals, pollution, scenery)	1	2	3	4	5	6	7
3. Social environment (size of the community, pace of life, noise)	1	2	3	4	5	6	7
4. Living (hygiene, sleeping practices, how safe you feel)	1	2	3	4	5	6	7
5. Practicalities (getting around, using public transport, shopping)	1	2	3	4	5	6	7

Item	1 = very similar	2	3	4	5	6	7 = very different
6. Food and eating (what food is eaten, how food is eaten, time of meals)	1	2	3	4	5	6	7
7. Family life (how close family members are, how much time family spend together)	1	2	3	4	5	6	7
8. Social norms (how to behave in public, style of clothes, what people think is funny)	1	2	3	4	5	6	7
9. Values and beliefs (what people think about religion, politics, what people think is right or wrong)	1	2	3	4	5	6	7
10. People (how friendly people are, how stressed or relaxed people are, attitudes toward foreigners)	1	2	3	4	5	6	7
11. Friends (making friends, amount of social interaction, what people do to have fun and relax)	1	2	3	4	5	6	7
12. Language (learning the language, understanding people, making yourself understood)	1	2	3	4	5	6	7

17. Multidimensional Scale of Perceived Social Support (MSPSS)

- Zimet et al. (1988) –

We are interested in how you feel about the following statements. Read each statement carefully. Indicate how you feel about each statement.

Item	Very Strongly Disagree	Strongly Disagree	Mildly Disagree	Neutral	Mildly Agree	Strongly Agree	Very Strongly Agree
1. There is a partner who is around when I am in need	1	2	3	4	5	6	7
2. There is a partner with whom I can share joys and sorrows	1	2	3	4	5	6	7
3. My family really tries to help me	1	2	3	4	5	6	7
4. I get the emotional help and	1	2	3	4	5	6	7

Item	Very Strongly Disagree	Strongly Disagree	Mildly Disagree	Neutral	Mildly Agree	Strongly Agree	Very Strongly Agree
support I need from my family							
5. I have a partner who is a real source of comfort to me	1	2	3	4	5	6	7
6. My friends really try to help me	1	2	3	4	5	6	7
7. I can count on my friends when things go wrong	1	2	3	4	5	6	7
8. I can talk with my family about my problems	1	2	3	4	5	6	7
9. I have friends with whom I can share my joys and sorrows	1	2	3	4	5	6	7
10. There is a partner in my life who cares about my feelings	1	2	3	4	5	6	7
11. My family is willing to help me make decisions	1	2	3	4	5	6	7
12. I can talk with my friends about my problems	1	2	3	4	5	6	7

18. Demographic variables

I. What is your birthdate?
   - Month: _____
   - Day: _____
   - Year: _____

II. Please indicate your sex assigned at birth:
   - Male
   - Female
   - Other (Please specify): _____
   - Prefer not to say

III. What gender do you identify with the most? (e.g., female, genderfluid, male, non-binary, etc.) _____

IV. What race/ethnicity do you identify with the most? (e.g., Asian, White/European, African, Aboriginal, etc.) _____

V. What type of degree are you pursuing at Bowling Green State University?
   - Undergraduate
   - Graduate
   - Other (Please specify):
   - No degree

VI. How long have you been a student at Bowling Green State University?
   - Less than 1 year
   - 1 year
   - 2 years
   - 3 years
   - 4 years
   - 6 years
   - 7 years or more

VII. Where do you live?
   - On-campus
   - Off-campus housing in Bowling Green, Ohio
   - Off-campus housing outside of Bowling Green, Ohio
     i. (Please specify City and State): _____
   - Other (Please specify):

VIII. When did you arrive in the United States for your studies?
   - Month of arrival: _____
   - Year of arrival: _____

IX. Financial well-being (item from I COPPE Scale): This set of questions pertains to your economic status. The top number ten represents the best your life can be. The bottom number zero represents the worst your life can be. When it comes to your economic situation, on which number do you stand now?
   - 10
   - 9
   - 8
   - 7
   - 6
   - 5
   - 4
   - 3
   - 2
   - 1
   - 0

X. What is your primary source of food?
   - I primarily cook my own meals
   - I primarily eat/order food from on-campus dining options
   - I primarily eat/order food from off-campus restaurant
   - Other (Please specify): _____

XI. Do you currently have a Meal Plan at BGSU?
   - Yes
   - No

XII. Do you have a kitchen that you can use where you currently live?

- Yes
- No

XIII. Do you currently own a car in the United States?
- Yes
- No

XIV. Have you lived in any countries other than your home country and the United States for a year or more?
- Yes
- No

19. English Proficiency

- Ying & Han (2008) -

Your ability to read/write/speak/understand English is …

1. very poor
2. poor
3. average
4. good
5. excellent

20. Brief Acculturation Orientation Scale

- Demes & Geeraert (2014) –

Please rate your agreement with the following statements

Item	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly disagree
Home culture							
1. It is important for me to have friends from my home country	1	2	3	4	5	6	7
2. It is important for me to take part in my home country's traditions	1	2	3	4	5	6	7
3. It is important for me to hold on to my home country's characteristics	1	2	3	4	5	6	7

Item	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly disagree
4. It is important for me to do things the way people from my home country do	1	2	3	4	5	6	7
U.S.							
1. It is important for me to have American friends	1	2	3	4	5	6	7
2. It is important for me to take part in American traditions	1	2	3	4	5	6	7
3. It is important for me to develop my American characteristics	1	2	3	4	5	6	7
4. It is important for me to do things the way American people do	1	2	3	4	5	6	7

21. U.S. Household Food Security Survey Module: Six-Item Short Form
- Blumberg et al. (1999) –

These next questions are about the food you have eaten in the last 12 months and whether you were able to afford the food you need. Below are several statements that people have made about their food situation. For these statements, please indicate whether the statement was <u>often</u> true, <u>sometimes</u> true, or <u>never</u> true for you in the last 12 months.

1. The food that I bought just didn't last, and I didn't have money to get more.	Often true	Sometimes true	Never true	Don't know	
2. I couldn't afford to eat balanced meals.	Often true	Sometimes true	Never true	Don't know	

3 & 4. In the last 12 months, did you ever cut the size of your meals or skip meals because there wasn't enough money for food?	Yes, almost every month	Yes, some months but not every month	Yes, only 1 or 2 months	No	Don't know
5. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?	Yes	No	Don't know		
6. In the last 12 months, were you ever hungry but didn't eat because there wasn't enough money for food?	Yes	No	Don't know		
Attention check: Please select 'yes' for this item.	Yes	No	Don't know		

22. Cultural Food Security

- Wright et al. (2021b) -

I. Since starting college, have you experienced the inability to purchase the foods that you used to eat at home?
   - Yes
   - No

II. Did the inability to purchase your traditional food happen within the last three years?
   - Yes
   - No

23. Food Preference

On a scale of 1 to 5 (1 = not at all; 5 = very much) ...

I. how much do you like eating your **home culture foods**? 1 – 2 – 3 – 4 – 5
II. how much do you like eating **American foods**? 1 – 2 – 3 – 4 – 5

24. Do you follow any eating style that restricts your choices (e.g., vegetarian, hallal, etc)?

- Yes
- No

25. End of survey

Thank you for completing this survey! You will be entered into a raffle to win one of the twenty $10 and fifteen $20 Amazon gift cards if you met all requirements specified in the consent form at the beginning of the survey (e.g., passing the attention checks, Captcha verification, and completing 75% of the survey). You will receive the gift card via email.

Please enter your BGSU email address below, if you would like to be included into the raffle to win a gift card: _____