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Culture and Healthy Eating: The Role of Independence and Interdependence in the U.S. and Japan

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Abstract

Healthy eating is important for physical health. Using large probability samples of middle-aged adults in the U.S. and Japan, we show that fitting with the culturally normative way of being predicts healthy eating. In the U.S, a culture that prioritizes and emphasizes independence, being independent predicts eating a healthy diet (an index of fish, protein, fruit, vegetables, reverse-coded sugared beverages, and reverse-coded high fat meat consumption; Study 1) and not using food as a way to cope with stress (Study 2a). In Japan, a culture that prioritizes and emphasizes

interdependence, being interdependent predicts eating a healthy diet (Studies 1 and 2b). Further, reflecting the types of agency that are prevalent in each context, these relationships are mediated by autonomy in the U.S. and positive relations with others in Japan. These findings highlight the importance of understanding cultural differences in shaping healthy behavior and have implications for designing health-promoting interventions.

Keywords

culture; independence; interdependence; healthy eating

A healthy diet is important for physical health (e.g., Willett, 1994; Willett & Stamper, 2013). Yet a major challenge for those hoping to promote a better diet is the question of what factors support and encourage healthier eating. Health promotion research has linked a range of personal, psychological, informational, and environmental factors to what people eat (e.g., Capacci et al., 2012; De Ridder, De Vet, Stok, Adrianse & DeWit, 2012; Ikeda et al., 2011; Michie, Abraham, Whittington, McAteer, & Gupta, 2009; Wasank, Payne, & Shimuzu, 2010). Access to healthy food, good information about why some foods are healthier than others, pro-healthy food attitudes and norms, and peers who enjoy healthy food are all important. A less obvious but potentially powerful factor that could facilitate a healthy lifestyle is the relative degree of attunement or fit between people and their cultural contexts (De Leersnyder, Mesquita, Kim, Eom, & Choi, 2014; Oyserman, Fryberg, & Yoder, 2007; Uchida, Kitayama, Mesquita, Reyes & Morling, 2008). Cultural norms provide guidelines about the “right,” “true,” and “good” ways to live and to be (Shweder, 2003). People who adhere to their relevant cultural norms tend to experience better life outcomes, including health and well-being (e.g., Kitayama, Karasawa, Curhan, Ryff, & Markus, 2010). Drawing on data from two large probability samples, we pose the novel question: will acting in the culturally appropriate way—being independent in the U.S. or interdependent in Japan—predict healthier eating habits? Although culture takes many forms, we focus on the mainstream culture of national origin.

Cultural Differences in the Emphasis on Independence and Interdependence

The U.S. and Japan are cultural contexts that promote different normatively appropriate ways to think, feel, and act (Kitayama, Duffy, & Uchida, 2007; Markus & Kitayama, 1991). In mainstream America, independence is the foundational schema for thought and behavior and the signature of nearly all that is good, true, and beautiful (Shweder, 2003). Whether the question is what to do as a nation, why to buy a car, where to go to college, how to raise a child, or how to be an effective, happy person, the answer often implicates independence. Multiple practices, policies, products, and institutions prioritize and promote independence, and agency derives from free choice and the expression of personal preferences, intentions, and goals (Markus & Kitayama, 2003). Consequently, agency is linked with autonomy, and enjoyable or intrinsically motivated actions are those that are free from others’ influence (Hamedani, Markus, & Fu, 2013; Markus & Kitayama, 2003; Markus & Conner, 2014; Miller, 2003). We suggest that, because of this powerful association between appropriate

behavior and independence in the U.S, good outcomes—that is, positive, productive, moral, and healthy outcomes—will be associated with being independent.

In mainstream Japan, however, interdependence is the foundational schema for thought and action and the mark of what is "good," "true," and "beautiful" (Doi, 1973; Lebra, 2004; Markus & Kitayama, 2003; Markus & Conner, 2014). Being a "good" government official, teacher, student, priest, parent, or person requires recognizing one's fundamental interdependence. People should strive to maintain harmonious relationships, meet obligations, and adjust their behavior to accommodate others' needs and perspectives and the situational expectations and norms. Products and practices become popular and effective because they allow people to fit in, follow trends, and be part of the encompassing interpersonal whole (Markus & Kitayama, 2010; Riemer et al., 2014). Interdependence is culturally prioritized, promoted, and rewarded, and individual agency is linked with maintaining connections to others and fulfilling social roles and obligations (Markus, Uchida, Omoregie, Townsend, Kitayama; 2006; Miller, 2003). Because of this powerful association between appropriate behavior and interdependence in the Japanese context, good outcomes—that is, positive, productive, moral, and healthy outcomes—will be associated with being interdependent.

Cultural Fit

Fit, attunement, or a match between individuals and their environment or cultures confers benefits in many domains (e.g., O'Reilly, Chatman, & Caldwell, 1991; Stephens, Markus, & Fryberg, 2012). People whose behavior fits well with their cultural context's norms tend to experience good or pleasant feelings (De Leersnyder et al., 2014; Fulmer et al., 2010; Kitayama & Markus, 2000). We suggest that, in both the U.S. and Japan, fitting the culturally normative model by being independent or interdependent will also be associated with a "healthy" lifestyle.

Research has not yet explored the links between independent and interdependent models of the self and healthy eating in the U.S. and Japan. However, some work suggests that having a sense of autonomy, which is emphasized in independent cultural contexts, predicts healthy behavior in Western cultural contexts, whereas strong relationships, which are emphasized in interdependent cultural contexts, do so in East Asian cultural contexts. For example, people in the U.S. and Europe who set their own personal standards and report greater autonomous motivation are more likely to engage in a range of health-promoting practices such as exercising, eating nutritious food, and adhering to recommended medication use (Ng et al., 2012).

In contrast, in Japan, where interdependence is valued and rewarded, relationships may be particularly important, perhaps more so than autonomy and personal control, in affording healthy eating habits. Interdependent people may have stronger relationships that support healthy and desirable eating practices. Consistent with this hypothesis, in Japan, family support predicts adherence to cancer screening recommendations, reduced alcohol and tobacco use, and consumption of a traditional diet (Honda & Kagawa-Singer, 2006; Tsutsumi, Tsutsumi, Kayaba, & Igarashi, 1998). Similarly, a study in Korea, another

interdependent cultural context, found that elderly people exercised more and ate healthier when they lived with family, rather than alone (Sok & Yun, 2011).

Healthy Eating in the U.S. and Japan

We argue that people who fit in with their culture will behave in ways that are "good." Importantly, both mainstream U.S. and Japan view healthy eating as the "right" and "good" way to behave. Many Americans struggle to actually eat a healthy diet regularly. However, examples such as the First Lady's "Let's Move!" campaign (http://www.letsmove.gov/eat-healthy); the addition of menu sections that highlight healthier options at national chains such as Applebee's, Ruby Tuesday, and Chili's; and the domination of healthy cookbooks on bestseller lists (Bean, 2014) suggest that healthy eating is a valued goal. In Japan, the traditional diet is very healthy (Willett, 1994), and the country has increasingly focused on maintaining and promoting healthy eating amid rising concerns about the Western dietary influences. For example, Japan recently added new initiatives to a longstanding school lunch program to help schoolchildren develop proper, nutritious eating habits (Tanaka & Miyoshi, 2012).

Furthermore, in both cultural contexts, eating behavior is closely bound up with the culturally normative way of being. In the mainstream U.S., cultural ideas and practices foster an association between healthy eating and the independence of the self. Mealtimes are sites for the cultivation of independence—for taking control, making choices, and expressing personal preferences. The U.S. Department of Agriculture's (2011) website www.choosemyplate.gov offers guidelines that encourage people to eat healthy by making smart choices and "tak[ing] control" of what they eat. Parents of "picky eaters" are advised to avoid a "battle of wills" and to foster children's independence by regularly exposing children to multiple healthy options so that children eventually select them autonomously (e.g., Carruth et al., 1998; Galloway, Fiorito, Francis & Birch, 2006). These findings draw on Western theories and research, which demonstrate how the perception and possibility of autonomous control, rather than external constraint, enhance intrinsic motivation (e.g., Deci & Ryan, 1985; Hendy, Williams, & Camise, 2005). For example, one study found that children consumed more vegetables during lunch when cafeteria staff gave them a choice of which vegetable to eat (Perry et al., 2004).

In Japan, the association between healthy food and realizing the interdependence of the self is culturally shaped and grounded in multiple ideas and practices that reflect and foster this link. For example, mealtimes are sites for the cultivation of interdependence. The Japanese Farm Ministry's site offers guidelines ("shishinn") that advise people to eat healthier by "cherishing a close family atmosphere" while preparing and eating meals (Ministry of Agriculture, Forestry and Fisheries, 2007). The guidelines also emphasize other facets of interdependence such as balance and self-improvement. At school, over 90% of Japanese children participate in a longstanding national lunch program deemed essential for fostering healthy minds and bodies. The program aims "to enrich school life and promote a spirit of cooperation by instilling proper dietary habits" (Tanaka & Miyoshi, 2012, p. 155). At lunchtime, children serve each other, arrange and clean the tables, learn the proper mealtime

greetings and manners, and "develop a sense of gratitude" (Tanaka & Miyoshi, 2012, p. 155).

Current Research

Our primary goal was to explore the relationship between fit with one's cultural context and healthy eating in the U.S. and Japan. We hypothesized that people who are independent in the U.S. and interdependent in Japan would eat a healthier diet. Although cultural fit will likely afford healthy eating for multiple reasons, in each context, we tested a mediator that reflected the sources of agency prevalent there, namely autonomy in the U.S. and positive relations with others in Japan (Markus & Kitayama, 2003; Miller, 2003).

Study 1

In Study 1, we tested our hypotheses using the Midlife in the U.S. II (MIDUS II) and Midlife in Japan (MIDJA) studies.

Methods

Participants—U.S. respondents were a subset from the Midlife in the United States II project (MIDUS II), a follow-up survey of MIDUS participants recruited as part of a national probability sample through random digit dialing. The MIDUS II survey included a telephone interview and a self-administered questionnaire. A subset of the MIDUS II respondents visited one of three General Clinical Research Centers overnight for the collection of health behavioral and biological data. Participants at the University of Wisconsin were admitted to the UW Clinical and Translational Research Core (UW-CTRC). The current research is based on 1051 respondents (477 males, 574 females; M_{age} = 55.27 years, age range = 34 to 84 years; 92.9% European American) who responded to all eating behavior measures.

Japanese respondents were a subset from the Midlife in Japan I (MIDJA I) project, which recruited a randomly selected sample from the Tokyo metropolitan area and included a self-administered questionnaire. A subset visited a medical clinic near the University of Tokyo and provided health behavioral and biological data. The current analyses included 367 respondents (162 males, 205 females; M_{age} = 53.99 years, age range = 30 to 79 years) for whom eating behavior data were available.[1]

Healthy Eating Index—The eating behavior measures were collected as part of the clinic visit. A healthy eating index was computed partly following the Alternate Healthy Eating Index (AHEI) proposed by McCullough et al. (2002) and modified by Chiuve et al. (2012). This index predicts risk for chronic disease, especially cardiovascular disease (McCullough & Willett, 2006; McCullough et al., 2002; Chiuve et al., 2012). Of the AHEI's eleven components, MIDUS/MIDJA measures allowed us to compute six: sugar-sweetened beverages, vegetables, fruit, non-meat protein (e.g., nuts, tofu), beef and high fat meat (a

[1]Because we used the publicly available existing data sets, the sample size was determined prior to and independently from this project.

proxy measure for red meat), and fish (a proxy measure for long-chain (n-3) fatty acids EPA + DHA).[2]

Specifically, respondents rated how often they eat fish, beef or high fat meat, and non-meat protein foods on a scale of *never* (1), *less than once per week* (2), *1 to 2 times per week* (3), *3 to 4 times per week* (4), to *5 or more times per week* (5). Respondents also reported how many sugared beverages they drink (1 = none, 2 = less than 1 glass/day, 3 = 1–3 glasses/day, 4 = 4–6 glasses/day, 5 = 7 or more glasses/day).

To assess vegetable and fruit consumption in MIDUS, respondents reported how many *servings* of fruit and vegetables they eat on an average day (1 = none, 2 = less than 1 serving/day, 3= 1–2 servings/day, 4 = 3–4 servings/day, 5 = 5 or more servings/day). In MIDJA, fruit and vegetable consumption were asked as separate questions. In addition, in MIDJA, respondents were asked how many *kinds* of fruit and vegetables they eat on an average day (1 = none, 2 = less than 1 kind/day, 3 = 1–4 kinds/day, 4 = 5–9 kinds/day, 5 = 10 or more kinds/day). To control for these measurement differences, we standardized the healthy eating index within each culture (see below).

To compute the healthy eating index, we first reverse coded as appropriate and summed the six MIDJA items (i.e., reverse-coded high fat meat, fish, non-meat protein, fruit, vegetable, and reverse-coded sugared beverage) and the five MIDUS items (i.e., reverse-coded red meat, fish, vegetable protein, fruit and vegetable, and reverse-coded sugared beverage).

Psychosocial Variables—The following measures were collected as part of the self-administered questionnaires completed before their clinic visit, except for self-construal measures, which were collected during the clinic visit for MIDUS.

Self-construal: The independent self-construal measure included 7 items (e.g., “I am comfortable with being singled out for praise or rewards”; αs = .94 for Americans, .62 for Japanese). The interdependent self-construal measure included 10 items (e.g., “If people in my family fail, I feel responsible”; αs = .96 for Americans, .71 for Japanese; Singelis, 1994). Both measures used a 7-point scale, from *strongly disagree* to *strongly agree*. Responses were averaged to compute separate independence and interdependence scores.

Autonomy and Positive Relations with Others: To index the types of agency associated with independence and interdependence, we used the Autonomy and Positive Relations with Others subscales of the Psychological Well-Being scale of positive functioning (Ryff, 1989).[3]

[2]Other AHEI components are whole grains, alcohol consumption, *trans* fats, polyunsaturated fatty acids and sodium (Chiuve et al., 2012). Although MIDUS/MIDJA also asked about “whole grain” consumption, we excluded it because this question included rice in MIDJA. Furthermore, the AHEI (Chiuve et al., 2012) assigned high scores to moderate alcohol consumption (0.5–2.0 drinks/day for men and 0.5–1.5 drinks for women) and lower scores to lower and higher alcohol consumption. We also excluded this component, due to different drink sizes and tolerance levels in Japan and the U.S. (Merikangas, 1990; Wolff, 1973).

[3]Some research has found gender differences in independence and interdependence (Cross & Madson, 1997) and eating behavior (Wardle et al., 2004). However, gender did not interact with culture and independence or interdependence to predict healthy eating. Specifically, for gender × culture × independence, $b = -.14$, $SE = .16$, $t(1394) = 0.89$, $p = .39$, and for gender × culture × interdependence, $b = -.17$, $SE = .19$, $t(1394) = 0.91$, $p = .36$.

The Autonomy subscale included 7 items (e.g., "My decisions are not usually influenced by what everyone else is doing"). The Positive Relations with Others subscale included 7 items (e.g., "Maintaining close relationships has been difficult and frustrating for me," reverse coded). Both scales used a 7-point scale, from *strongly disagree* to *strongly agree*. Responses were summed to compute an autonomy score (αs = .69 for Americans, .71 Japanese) and a positive relations with others score (αs = .78 for Americans, .79 Japanese).

Demographic Variables—The self-administered questionnaire included age, gender, education (1 = 8th grade/junior high school, 2 = some high school, 3 = high school graduate/G.E.D., 4 = 1+ year of college, no degree, 5 = two-year college degree/vocational school, 6 = 4/5 year college graduate, and 7 = graduate school)[4], and marital status (married vs. not married), which were included as control variables.

Health Markers—Diet has been linked to risk of coronary heart disease, often assessed by measures such as body fat and serum cholesterol (e.g., Shekelle et al., 1981; Willett, 1994). Thus, we examined our healthy eating index's association with waist-to-hip ratio (WHR), as a measure of body fat, and high-density lipoprotein (HDL) cholesterol levels, which are strongly associated with reduced risk of coronary heart disease (Stampfer, Sacks, Salvini, Willett, & Hennekens, 1991), to assess its validity. To assess HDL cholesterol, blood samples were collected at the clinic. HDL levels were assayed both in Tokyo and in a diagnostic testing lab in the U.S. (Meriter Lab, Madison, WI) to ensure that the values would be comparable to those obtained for American participants. HDL cholesterol was log-transformed to adjust for a skewed distribution. WHR was winsorized at three standard deviations from the mean to reduce the effect of two extreme outliers.

Results

Descriptive Analyses—First, we assessed descriptive statistics (see Table 1) and checked the validity of the healthy eating index across cultures. American respondents had more education than Japanese respondents, $t(1409) = 5.58$, $p < .001$. American respondents also scored higher on independent self-construal, $t(1414) = 10.12$, $p < .001$, interdependent self-construal, $t(1414) = 11.40$, autonomy, $t(1415) = 17.46$, $p < .001$, and positive relations with others, $t(1415) = 17.40$, $p < .001$. These differences likely reflect Americans' tendency to perceive the self in a more positive light than East Asians do (Heine, Lehman, Markus, & Kitayama, 1999), and that participants likely used their cultural group as a reference (Heine, Lehman, Peng, & Greenholtz, 2002).

Regarding eating behavior, Japanese respondents consumed more non-meat protein, $t(1416) = 4.44$, $p < .001$, fish, $t(1416) = 16.79$, $p < .001$, and sugared beverages $t(1416) = 4.22$, $p < .001$, than American respondents. American respondents consumed high fat meat more frequently, $t(1416) = 3.43$, $p < .001$. Due to measurement differences across cultures, we did not compare fruit and vegetable consumption values.

[4]Culture predicted eating habits even though eating variables were standardized within each culture because American respondents scored higher than Japanese respondents on independent and interdependence self-construal measures, both of which positively predicted healthier eating habits.

Finally, Japanese respondents had lower WHRs than American respondents, $t(1414) = 11.11$, $p < .001$ and higher HDL cholesterol levels, $t(1406) = 13.73$, $p < .001$.

Validity of Healthy Eating Index—To check the healthy eating index's validity across cultures, we ran hierarchical multiple regression analyses using health markers as outcomes. First, in Model 1, demographic variables, culture, and the healthy eating index were entered. The healthy eating index predicted lower WHR, $b = -0.05$, *S.E.* = 0.02, $t(1399) = 2.81$, $p = .005$, and higher HDL cholesterol, $b = 0.02$, *S.E.* = 0.003, $t(1392) = 5.72$, $p < .001$. Second, to examine if these associations differed across cultures, the culture × healthy eating index interaction was entered. Neither interaction was significant, ps > .5, suggesting that the healthy eating index predicts health markers equally across cultures.

Cultural Moderation of the Link between Self-Construal and Healthy Eating—To test our first hypothesis that independence would predict healthy eating habits more in the U.S. than in Japan, whereas interdependence would predict healthy eating habits more in Japan than in the U.S., we ran a series of hierarchical multiple regression analyses using the healthy eating index as the outcome (Table 2). Demographic variables were entered in Model 1, followed by independent and interdependent self-construal in Model 2, and the culture × independent self-construal and culture × interdependent self-construal interactions in Model 3.

First, in Model 1, older, female, and more educated respondents reported eating healthier, $b = 0.019$, *S.E.* = 0.002, $t(1404) = 8.97$, $p < .001$, 95% CI = [.015, .023], $r_p = .23$ for age; $b = 0.45$, *S.E.* = 0.05, $t(1404) = 8.61$, $p < .001$, 95% CI = [.34, .55], $r_p = .22$ for gender; and $b = 0.09$, *S.E.* = 0.02, $t(1404) = 5.97$, $p < .001$, 95% CI = [.06, .13], $r_p = .16$ for education. In Model 2, independent self-construal and culture predicted healthier eating habits, $b = 0.11$, *S.E.* = 0.03, $t(1401) = 3.40$, $p = .001$, 95% CI = [.05, .18], $r_p = .09$ for independent self-construal; and $b = -0.15$, *S.E.* = 0.06, $t(1401) = 2.45$, $p = .014$, 95% CI = [−.27, −.03], $r_p = -.07$, for culture.[5] Importantly, those associations between self-construal and healthy eating habits were moderated by culture in Model 3, $b = 0.21$, *S.E.* = 0.08, $t(1399) = 2.56$, $p = .011$, 95% CI = [.05, .36], $r_p = .07$ for the culture × independence interaction; and $b = -0.22$, *S.E.* = 0.09, $t(1399) = 2.30$, $p = .021$, 95% CI = [−.40, −.03], $r_p = -.06$ for the culture × interdependence interaction.

As depicted in Figure 1, independent self-construal predicted healthier eating in the U.S., simple slope $b = 0.16$, *S.E.* = 0.04, $t(1399) = 4.18$, $p < .001$, 95% CI = [.08, .23], $r_p = .11$, but not in Japan, simple slope $b = 0.05$, *S.E.* = 0.05, $t(1399) = 0.11$, $p = .91$, 95% CI = [−.09, .10], $r_p = .003$. In contrast, interdependent self-construal predicted healthier eating habits in Japan, simple slope $b = 0.22$, *S.E.* = 0.08, $t(1399) = 2.77$, $p = .006$, 95% CI = [.06, .38], r_p

[5]The alphas for these 3-item self-construal scales were low, possibly because each item taps into a different facet of independence or interdependence. To test whether particular scale items might drive the effects observed in Study 2a, we conducted additional analyses in which all 3 items measuring independent self-construal (rather than their composite) were simultaneously entered into the regression equation. Both "I act in the same way no matter who I am with" and "I enjoy being unique and different from others in many respects" predicted the use of food to cope with stress (ps <.001), but "Being able to care for myself is a primary concern for me." did not ($p = .15$). Furthermore, although the alphas are low, the effects using these scales are robust. This 3-item measure of independent self-construal and the measure of using food to cope with stress are included in another wave of MIDUS (MIDUS III). In these MIDUS III data, independent self-construal significantly predicted the use of food to cope with stress, controlling for demographics and interdependent self-construal, $p < 001$.

= .07, but not in the U.S., simple slope $b = -0.05$, *S.E.* = 0.07, $t(1399) = 0.69$, $p = .49$, 95% CI = [−.19, .09], $r_p = -.02$.

Because working class contexts have also been associated with interdependence (Stephens et al., 2014) and less healthy eating habits (e.g., Darmon & Drewnowski, 2008), in the Western world, we also tested whether social class differences in the U.S. drove the present findings. Although the culture × education interaction was significant, $b = 0.09$, *S.E.* = 0.04, $t(1398) = 2.42$, $p = .015$, both the culture × independence interaction, $b = 0.19$, *S.E.* = 0.08, $t(1398) = 2.39$, $p = .017$, and the culture × interdependence interaction, $b = -0.22$, *S.E.* = 0.09, $t(1398) = 2.32$, $p = .021$, remained significant. Thus, although social class tends to predict healthier eating in the U.S. than in Japan, such a relationship does not explain the cultural moderation of associations between self-construal and healthy eating.

Mediators of the Link between Self-Construal and Healthy Eating—Next, we tested our second hypothesis that sense of autonomy would mediate the link between independence and healthy eating in the U.S. and positive relations with others would mediate the link between interdependence and healthy eating in Japan. We ran the pertinent mediation analyses separately for each culture, controlling for demographic variables and either independent or interdependent self-construal (Figure 2). Additionally, we also tested whether the opposite type of agency (positive relations in the U.S. and autonomy in Japan) would mediate the link in the respective culture. We used a bootstrap approach to obtain 95% bias-corrected confidence intervals (bcCI) for the size of the indirect effects (Preacher & Hayes, 2008). If a bcCI does not include zero, the indirect effect is considered to be significantly different from zero.

In the U.S., the bootstrap procedure testing autonomy as a mediator of the independence – healthy eating relationship yielded a 95% bcCI that did not include zero (.01, .09). The equivalent bootstrap analysis, testing positive relations with others as a mediator, yielded a 95% bcCI that included zero (−.01, .03), suggesting that positive relations did not mediate the link. In Japan, the bootstrap procedure testing positive relations with others as a mediator of the interdependence – healthy eating relationship yielded a 95% bcCI that did not include zero (.02, .13). The corresponding bootstrap analysis, testing autonomy as a mediator, yielded a 95% bcCI that included zero (−.13, .01). Thus, the indirect effect was not significant for autonomy. These results suggest that autonomy partially mediates the relationship between independence and healthy eating in the U.S. and that positive relations with others partially mediates the link between interdependence and healthy eating habits in Japan.

Discussion

In two large probability samples, these results provide initial evidence that independence predicts healthy eating in the U.S. but not Japan, whereas interdependence predicts healthy eating in Japan but not the U.S. Furthermore, these relationships are mediated by autonomy and positive relations with others, respectively, reflecting the models of agency prevalent in these two cultural contexts. To strengthen these conclusions, we next attempted to replicate our findings.

Study 2a

To test the robustness of the effects observed in Study 1, we sought to replicate these findings in additional waves of the MIDUS and MIDJA studies. Data on comparable items were not yet available for both countries. Thus, for Study 2, we ran our analyses separately in the U.S. (Study 2a) and Japan (Study 2b).

Methods

Participants—American respondents were from the MIDUS II refresher sample. They were recruited via landline random digit dial sampling, age-targeted list sampling, or random cell-phone sampling. The MIDUS Refresher included a self-administered questionnaire from which our measures of interest were taken. 2607 respondents (1220 males, 1387 females; M_{age} = 52.15 years, age range = 23 to 76 years; 84% European American) completed this questionnaire. See Table 3.

Measures—In this MIDUS survey, due to space constraints, independent self construal was measured with 3 items (e.g., "I act the same way no matter who I'm with," α = .32) and interdependent self-construal was measured with 3 items (e.g., "My happiness depends on the happiness of those around me," (α = .43).[6] These items were different from those used in Study 1 but, like those in Study 1, they were drawn from the Singelis's (1994) Self-Construal Scales. Autonomy and Positive Relations with Others were assessed exactly as in Study 1 (αs = .72 and .79, respectively). The same demographic covariates were included as in Study 1.

This survey assessed participants' tendency to use food to cope with stress but did not include questions on frequency of eating different types of food, as in the survey used in Study 1. Using food to cope with stress has been linked to eating high fat and sugary foods, obesity, and poor health (Epel et al., 2004; Oliver et al., 2000; Tsenkova, Boylan, & Ryff, 2013). Participants rated the extent to which "I eat more of my favorite foods to make myself feel better" and "I eat more than I usually do" captured how they typically coped with stress from 1 (*a lot*) to 4 (*not at all*). Ratings, which were correlated (r = .82, p < .001), were reverse coded and averaged so that higher scores indicate greater use of food to cope.

Results

To test our first hypothesis that independence would predict healthy eating habits, we ran a series of hierarchical multiple regression analyses (Table 4). Demographic variables were entered in Model 1 and independent and interdependent self-construal in Model 2. In Model 1, older, male, and more educated respondents used food to cope with stress less, b = −0.14,

[6]While longitudinal biological data are not yet available in both countries, we were able to test the indirect effect of independence or interdependence on WHR and HDL cholesterol, via healthy eating using participants in Study 1. The 95% bcCI for the indirect effect of independence on WHR via healthy eating did not include zero in the U.S. (−.002, −.0001) but did in Japan (−.0006, .002). In contrast, the 95% bcCI for the indirect effect of interdependence on WHR via healthy eating did include zero in the U.S. (−.0006, .0004) but did not in Japan (−.004, −.0002). Similarly, the 95% bcCI for the indirect effect of independence on HDL cholesterol via healthy eating did not include zero in the U.S. (.002, .006) but did in Japan (−.004, .002). In contrast, the 95% bcCI for the indirect effect of interdependence on HDL cholesterol via healthy eating did include zero in the U.S. (−.002, .002) but did not in Japan (.0007, .009). These analyses control for demographic variables and either independent or interdependent self-construal (whichever was not the primary variable of interest).

S.E. = 0.04, $t(2529) = -3.69$, $p < .001$, 95% CI = [−.21, −.07], $r_p = -.07$ for age; $b = 0.80$, *S.E.* = 0.08, $t(2529) = 10.40$, $p < .001$, 95% CI = [.65, .95], $r_p = .20$ for gender; and $b = -0.08$, *S.E.* = 0.04, $t(2529) = -2.16$, $p = .03$, 95% CI = [−.16, −.007], $r_p = -.04$ for education. In Model 2, independent self-construal predicted less use of food to cope with stress, $b = -.24$, *S.E.* = 0.04, $t(2527) = -6.24$, $p < .001$, 95% CI = [−.31, −.16], $r_p = -.12$, while interdependent self-construal predicted more use of food to cope with stress, $b = .20$, *S.E.* = 0.04, $t(2527) = 5.27$, $p < .001$, 95% CI = [.12, .27], $r_p = .10$.

Next, we tested the second hypothesis, that autonomy would mediate the link between independence and using food to cope. We used the same bootstrap approach as in Study 1 (Preacher & Hayes, 2008). This procedure yielded a 95% bcCI that did not include zero (−.20, −.13), suggesting that autonomy does mediate the association between independence and using food to cope. As in Study 1, we also tested whether positive relations with others mediated the link between independence and using food to cope. This procedure yielded a 95% bcCI that did not include zero (−.10, −0.06), suggesting that positive relations with others also mediates the association between independence and using food to cope. When both autonomy and positive relations were entered simultaneously, both mediated the relationship between independence and the use of food to cope, 95% bcCI for autonomy (−.16, −.09), 95% bcCI for positive relations (−.08, −.03).

Discussion

Replicating the findings from Study 1, in the U.S., independence predicts a healthy eating behavior, and autonomy mediates this relationship. Although the use of a different healthy eating outcome (i.e., food to cope with stress, rather than the healthy eating index) might be construed as a limitation, it can also be seen as a strength because Study 2a extends the findings among Americans from Study 1 to a new healthy eating variable.

Notably, unlike in Study 1, interdependence predicts an unhealthy eating behavior, increased likelihood of eating to cope with stress. This suggests that construing oneself in a manner that the cultural context does not emphasize and support may sometimes have negative implications for healthy behaviors. Also unlike in Study 1, positive relations with others (in addition to autonomy) mediated the relationship between independent self-construal and the measure of healthy eating. This finding could have emerged because social support helps to reduce the frequency of the specific healthy eating behavior measured here (i.e., the use of food to cope with stress), perhaps by providing an alternate means of coping with stress (Laitinen, Ek, & Sovio, 2002; Thoits, 1995).

Study 2b

In Study 2b, we sought to replicate the equivalent effect for Japanese participants.

Methods

Participants—Respondents were Japanese participants from the MIDJA II biomarker sample. Respondents who had completed the MIDJA I survey were invited to participate in a second round of data collection. Of those, a subset (the present sample) visited a University of Tokyo medical clinic and provided health behavioral and biological data, including the

healthy eating measures. This left 315 respondents (150 males, 165 females; M_{age} = 58.80 years, age range = 34 to 85 years). Because these participants, like those in Study 1, were recruited from the pool of people who had completed the MIDJA I survey, many of them (74.0%) were the same participants as in Study 1. The remaining participants in the present study (26.0%) had completed the baseline MIDJA I survey but did not visit the clinic to report on their eating habits during MIDJA 1 and thus were not included in the Study 1 analyses.

Measures—All measures were assessed as in Study 1 (independent self-construal α = .60, interdependent self-construal: α = .72, autonomy α = .73, positive relations with others α = .60).

Results

To test our first hypothesis that independence would predict healthier eating, we ran a series of hierarchical multiple regression analyses (Table 4). Demographic variables were entered in Model 1, followed by independent and interdependent self-construal in Model 2.

In Model 1, older, female, and married respondents ate healthier, b = 0.26, *S.E.* = 0.06, $t(303)$ = 4.74, $p < .001$, 95% CI = [.16, .37], r_p = .26 for age, b = 0.49, *S.E.* = 0.11, $t(303)$ = 4.52, $p < .001$, 95% CI = [.28, .71], r_p = .26 for gender, and b = 0.28, *S.E.* = 0.12, $t(303)$ = 2.29, p = .02, 95% CI = [.04, .52], r_p = .15 for marital status. In Model 2, interdependent self-construal marginally predicted healthier eating, while independent self-construal did not, b = 0.10, *S.E.* = 0.06, $t(301)$ = 1.76, p = .079, 95% CI = [−.10, .11], r_p = .10 for interdependent self-construal, and b = .004, *S.E.* = 0.05, $t(301)$ = 0.08, p = .94, 95% CI = [−.10, .11], r_p = .005 for independent self-construal.

Next, we tested the second hypothesis, that positive relations with others mediated the link between interdependence and eating a healthy diet. We again used Preacher & Hayes's (2008) bootstrap procedure, which yielded a 95% bcCI that did not include zero (.01, .07). Thus, positive relations with others mediated the association between interdependence and eating a healthy diet. We also tested whether autonomy mediated the link between interdependence and healthy eating, but the 95% bcCI included zero (−.08, 0.004), suggesting that it did not.

Discussion

We again find that in Japan, interdependence predicts healthy eating, and positive relations with others mediates this relationship. These findings thus point to the robustness of the conclusion that people who are interdependent in Japan eat a healthier diet, in part because of their emphasis on important relationships.

General Discussion

With large samples in two countries, we show that fitting in with one's culturally mandated way of being—being independent in the U.S. or interdependent in Japan— is associated with eating a healthy diet. Furthermore, reflecting the types of agency prevalent in these cultural contexts, different psychosocial factors mediate the relationships in the two cultural

contexts. This research is consistent with other work showing that fitting into one's culture shapes the healthiness of one's food consumption (Guendelman, Cheryan, & Monin, 2011; Oyserman et al., 2007; Rozin, 2005; Ruby & Heine, 2012) and is important for well-being (De Leersnyder et al., 2014; Kitayama et al., 2010; Uchida, et al., 2008). It is also the first to link cultural fit with a specific healthy behavior. In fact, healthy eating may be one mechanism through which cultural fit promotes health over time, an idea that could be tested using longitudinal biological data from these participants in the future.[7] Although a large literature shows that social and psychological characteristics influence behavior, we have shown that the same healthy behavior is predicted by different psychosocial factors in different cultural contexts. This idea —that what shapes or motivates behavior is culturally dependent— is a key insight for anyone interested in understanding or intervening to change behavior. In addition, our findings highlight the importance of studying relationships among key variables (e.g., independence or interdependence and eating), rather than comparing these variables' mean levels, as a way of understanding meaningful cross-cultural differences.

Notably, these findings are correlational. We highlight one theoretically plausible direction of causation, namely that independence or interdependence makes a healthy diet possible. However, these factors likely reinforce each other. Success in eating healthy food may renew and strengthen one's sense of agency. Americans who succeed in eating healthy may feel a greater sense of autonomous agency and, thus, independence. Similarly, in Japan, preparing and eating healthy meals together may foster stronger relationships and more interdependence.[8] In addition, third variables, such as traditionalism in Japan, might shape both independence or interdependence and healthy eating.

Another limitation is that the variables were all self-reported, which could reflect participants' ideal, rather than actual, eating habits, or their perceptions of their independence or interdependence, rather than observable behavioral differences. Future research would benefit from additional assessments of independence and interdependence and behavioral measures of eating.

Independence and behavior

Our findings highlight the similarities between independence and interdependence in their relationship to eating, but independence and interdependence may also relate to eating in different, yet important, ways. Specifically, independence, which emphasizes individual expression and the norm of going against the norm, leaves room for a wider range of behaviors to be acceptable than does a norm of interdependence, which involves meeting

[7]Consistent with the idea that these processes progress in multiple causal directions, we did find that in Study 1, among Americans, the 95% bcCI of the indirect effect of healthy eating on independent self-construal via autonomy did not include zero, (.02, .07), and among Japanese the 95% bcCI of the indirect effect of healthy eating on interdependent self-construal via positive relations did not include zero, (.01, .07). Similarly, in Study 2a, the 95% bcCI of the indirect effect of the use of food to cope with stress on independent self-construal via autonomy did not include zero, (−.06, −.04). In Study 2b, the 95% bcCI of the indirect effect of healthy eating on interdependent self-construal via positive relations did not include zero, (.01, .09). These analyses control for demographic variables and either independent or interdependent self-construal (whichever was not the primary variable of interest).

[8]We selected these mediators to closely reflect the agency that would facilitate healthy eating in these contexts. Furthermore, they were relatively parallel/equivalent to each other. However, testing other measures, such as sense of control (Lachman & Weaver, 1998) in the U.S. or spousal support in Japan, yielded equivalent results.

others' expectations of what is "good" and "right" (Gelfand et al., 2011; Riemer et al., 2014). Although, on balance, independence predicts healthy eating in the U.S., in some cases, it may predict extremes in behavior—either very healthy or very unhealthy eating. Independence could make many Americans more willing to customize their meals to fit their own healthy eating goals (e.g., to request dressing on the side or adopt certain dietary preferences, such as no gluten). However, an independent approach to eating might also foster frequent snacking or eating unhealthy foods to satisfy cravings or soothe negative moods, when healthy eating is not one's salient goal. Consequently, independence might most effectively promote healthy eating when delicious, nutritious foods and other healthy outlets for stress are available.

The availability of healthy food may also play a role in how or to what extent independence facilitates healthy eating. In U.S. environments where healthy food is less available, independent people might eat the healthier options among those that *are* available. In fact, their independence may enable them to violate any unhealthy eating norms. However, it is also possible that independent people with less access to healthy food could be more frustrated, give up on healthy eating, and seek out other, more accessible, ways to assert their independence. Independence would thus most effectively promote healthy eating when healthy food is plentiful.

National Differences in Healthy Behaviors

In addition to the light it sheds on within country differences, understanding independence and interdependence may help to explain the greater prevalence of unhealthy food and obesity in the U.S., relative to Japan (World Health Organization, 2014). Some Americans blame obese people for their food choices and see restricting unhealthy food, or working to ensure access to high quality healthy food for all as paternalistic (see Thaler & Sunstein, 2008). The independent American emphasis on autonomy and personal responsibility likely underlies these views (Brownell, 1991; Savani, Stephens, & Markus, 2011). In contrast, Japan's greater emphasis on responsibility to others and its interdependent understanding that social and structural factors shape behavior may help ensure that healthy food is relatively available to everyone. Furthermore, the interdependent Japanese practice of eating when the situation calls for it (i.e., at mealtimes), rather than when one personally chooses, may be a healthier way of eating (Hawks, Madanat, Merrill, Goudy, Miyagawa, 2003).

Notably, although the Japanese diet is very healthy, other unhealthy behaviors such as smoking and getting little sleep are more common in Japan than in the U.S. or other developed countries (Ng et al., 2014; Organization for Economic Cooperation and Development, 2009). An understanding of independence or interdependence may help to illuminate the sources of these disparities. With eating, in Japan, what is "good" in the sense of being nutritionally healthy is also "good" in the sense of being descriptively or prescriptively normative. This is not the case with smoking or sleeping. In Japan, sleeping more than others can signal that one is not diligent (i.e., has not stayed up to work or study; Steger, 2006), and smoking may be seen as traditional or normatively appropriate, especially among men. Because Japan is a culture that places especially great importance on adherence

to norms (Gelfand et al., 2011), Japanese who are interdependent might be reluctant to quit smoking or sleep more.

Together, the analyses of independence, interdependence, and multiple behaviors (i.e., eating, smoking, sleeping) suggest that in order to understand whether cultural fit will promote a specific healthy behavior, it is important to recognize the social meaning attached to that behavior. If cultural fit predicts a greater sense of culturally appropriate agency, as we have argued, it should facilitate at least some other types of "good" or "healthy" behavior as well. In interdependent cultural contexts, where fitting in with the norm is emphasized, this relationship might be limited to, or especially strong for, behaviors that are culturally valued. In independent cultural contexts where autonomy is especially valued, the relationship might be especially strong where there are opportunities to express this independence.

Within Culture Differences

Differences in predictors of healthy eating might exist within, as well as between, national cultures. Within the U.S., there are some contexts, such as working class or African American contexts, where interdependence is highly valued (Stephens, Markus, & Phillips, 2014; Brannon, Markus, & Taylor, 2015). For these groups, a combination of independence and interdependence could most effectively predict healthy eating. Within Japan, older people tend to engage in healthy eating habits more than younger people (Ministry of Health and Welfare, 2008). Although the increasing Westernization of young people's diets is likely a large contributor to age differences (Kagawa, 1978), differences in relational resources might also be playing a role.

Implications for Promoting Desirable or Healthy Behavior

Journalist Andrea Lee, in a comparison of Americans and Italians, calls Americans "alimentary anarchists," connoting the cultural understanding that good eating involves a lack of constraint and a sense of freedom. In contrast, the Japanese idiom "eating rice out of the same pot," which refers to the comradeship among those who have lived or worked together, connotes the cultural understanding that eating and relationships go together. Our findings offer data to support these culturally divergent understandings of how to eat well. In independent contexts, promoting healthy eating may mean offering many healthy food options, offering multiple ways to fit healthy eating into busy schedules, or other efforts that promote and accommodate independence. In interdependent contexts, it will mean sharing healthy recipes, cooking healthy meals that family members enjoy, eating together, and other efforts that link eating healthy to connecting, fitting in and maintaining strong relationships. More broadly, the most effective health promotion efforts will be those that make eating a healthy diet something that people can do easily and naturally in the course of thinking, feeling, and acting in the culturally appropriate way.

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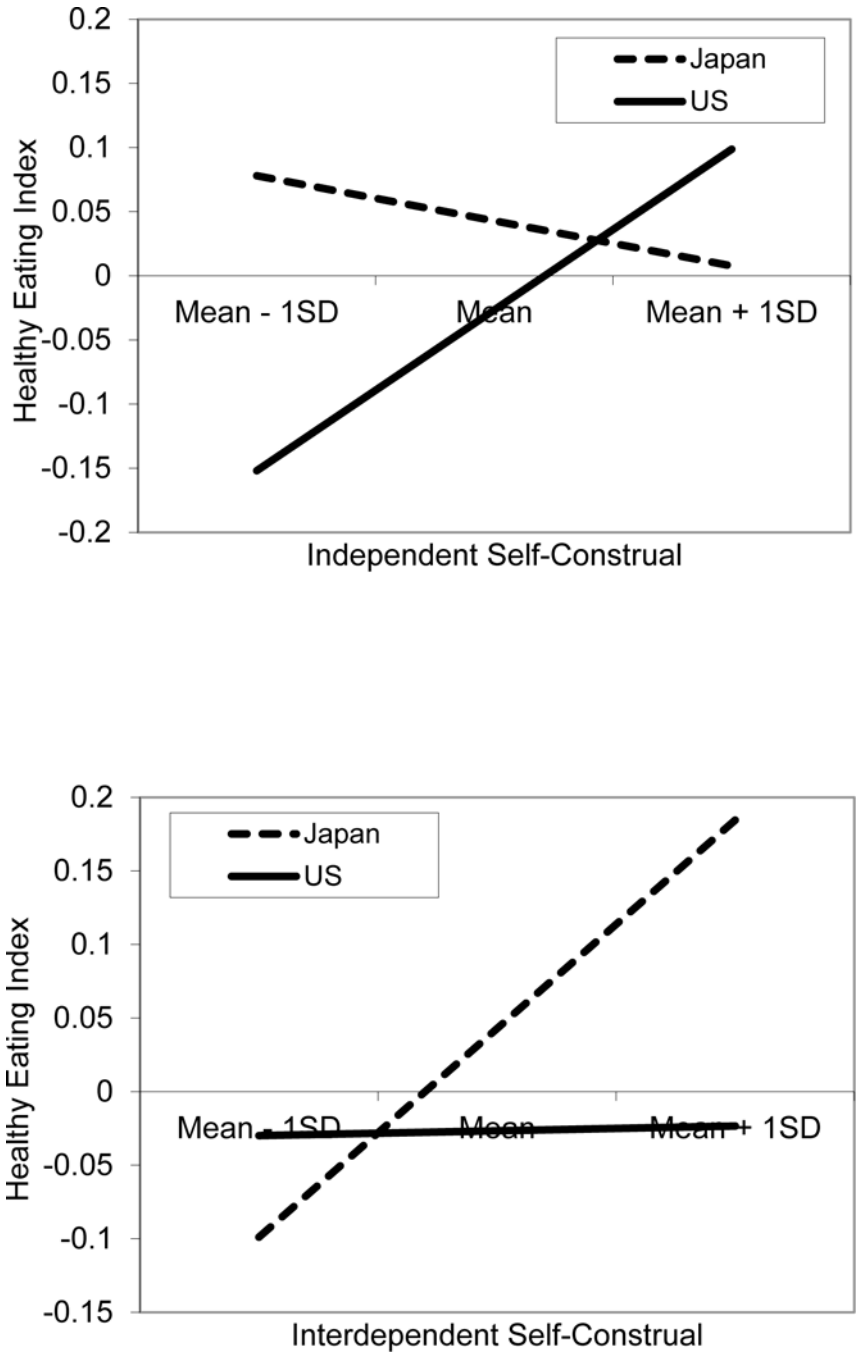

Figure 1.

Cultural moderation of the link between independent self-construal and healthy eating (top panel) and the link between interdependent self-construal and healthy eating (bottom panel), controlling for gender, age, education, and marital status.

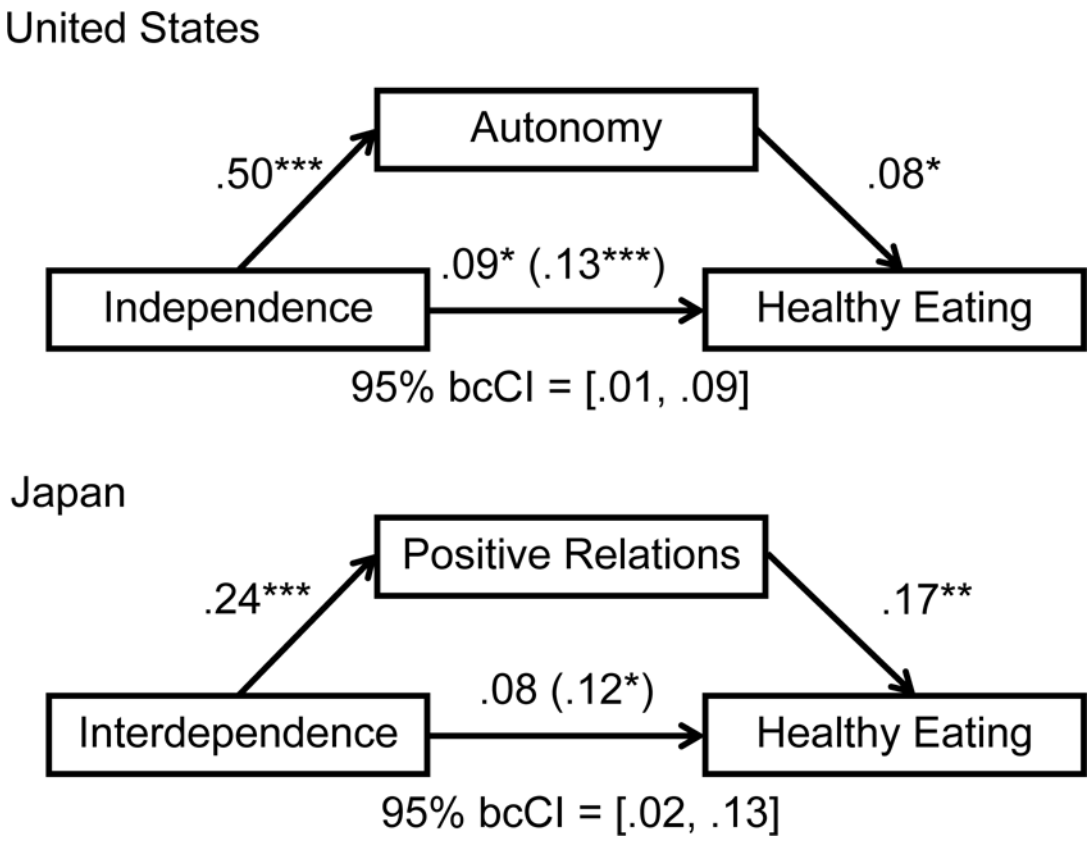

Figure 2.

Autonomy mediates the link between independent self-construal and healthy eating in the US (top panel). In Japan, positive relations with others mediate the link between interdependent self-construal and healthy eating (bottom panel). Numbers are unstandardized coefficients. Analyses controlled for gender, age, education, marital status, and independent or interdependent self-construal. The unstandardized coefficients for direct paths without controlling for a mediator are shown in parentheses. A 95% bcCI is a 95% bias-corrected confidence interval of the indirect effect. * $p < .05$, ** $p < .01$,*** $p < .001$.

Table 1

Descriptive statistics for demographic and psychosocial variables, eating behavior, and health markers for the American and Japanese participants in Study 1 (Total $N = 1420$)

	MIDUS			MIDJA		
	N	***M* (*SD*)**	**HEI *r***	***N***	***M* (*SD*)**	**HEI *r***
Demographic						
Age	1051	55.27 (11.79)	.14*	367	53.99 (13.94)	.30*
Gender	1051	1.55 (0.50)	.18*	367	1.56 (0.50)	.21*
Education	1048	4.96 (1.61)	.16*	363	4.41 (1.63)	−.07
Marital status	1051	0.72 (0.45)	.01	367	0.74 (0.44)	.03
Psychosocial Variables						
Independent self-construal	1050	5.18 (0.80)	.14*	366	4.70 (0.71)	−.01
Interdependent self-construal	1050	5.22 (0.60)	.05	366	4.80 (0.64)	.20*
Autonomy	1050	37.40 (6.68)	.12*	367	30.61 (5.57)	.08
Positive Relations with Others	1050	41.07 (6.81)	.14*	367	34.09 (6.02)	.23*
Eating Behavior						
Fruit and vegetables	1051	3.76 (0.84)	.56*	–	–	–
Fruit	–	–	–	367	2.41 (0.61)	.49*
Vegetable	–	–	–	367	3.46 (0.72)	.54*
Sugared beverages	1051	1.64 (0.98)	−.53*	367	1.88 (0.70)	−.45*
Non-meat protein	1051	3.70 (1.09)	.59*	367	3.98 (0.85)	.60*
Fish	1051	2.48 (0.83)	.49*	367	3.37 (0.90)	.66*
Beef or high fat meat	1051	2.88 (1.10)	−.59*	367	2.65 (0.95)	−.48*
Health Markers						
Waist-to-hip ratio+	1049	0.89 (0.10)	−.17*	367	0.83 (0.08)	−.14*
HDL cholesterol+	1041	54.67 (17.60)	.23*	367	70.91 (21.07)	.23*

Note. Gender (male = 1, female = 2); Marital status (not married = 0, married = 1); HEI = Healthy Eating Index;

* a significant correlation;

+ means and SDs based on original values are presented in the table, though winsorized waist-to-hip ratio and log-transformed HDL were used for correlation and analyses reported in the text.

Table 2

Hierarchical multiple regression predicting healthy eating index in Study 1

	Model 1 Demographics		Model 2 + Culture & Self-Construal		Model 3 + Interactions	
	***b* (*S.E.*)**	***p***	***b* (*S.E.*)**	***p***	***b* (*S.E.*)**	***p***
Age	.02 (.002)	.001	.02 (.002)	.001	.02 (.002)	.001
Gender	.45 (.05)	.001	.46 (.05)	.001	.45 (.05)	.001
Education	.09 (.02)	.001	.09 (.02)	.001	.09 (.02)	.001
Marital status	.10 (.06)	.08	.09 (.06)	.11	.10 (.06)	.08
Culture			−.15 (.06)	.014	−.08 (.53)	.88
Independent self-construal			.11 (.03)	.001	−.26 (.15)	.086
Interdependent self-construal			.06 (.04)	.16	.44 (.17)	.009
Culture × Independent self-construal					.21 (.08)	.011
Culture × Interdependent self-construal					−.22 (.09)	.021
R-square	.10		.11		.12	

Note. Culture (1 = Japanese, 2 = Americans), Gender (1 = male, 2 = female), Marital status (0 = not married, 1 = married).

Table 3

Descriptive statistics for demographic and psychosocial variables and eating behavior for the American participants in Study 2a (N = 2607) and Japanese participants in Study 2b (N = 315)

	MIDUS (Study 2a)			MIDJA (Study 2b)		
	N	***M* (*SD*)**	**Use Food to cope *r***	***N***	***M* (*SD*)**	**HEI *r***
Demographic						
Age	2607	52.15 (14.28)	−.08*	315	58.80 (12.92)	.24*
Gender	2607	1.53 (.50)	.21*	315	1.52 (.50)	.21*
Education	2604	5.06 (1.60)	−.05*	314	4.40 (1.65)	−.04
Marital status	2607	.65 (.48)	−.07*	314	.73 (.45)	.14*
Psychosocial Variables						
Independent self-construal	2588	5.32 (1.03)	−.10*	312	4.69 (.66)	.02
Interdependent self-construal	2588	4.61 (1.12)	.08*	311	4.80 (.62)	.16*
Autonomy	2589	36.85 (6.93)	−.27*	312	31.03 (5.28)	.07
Positive Relations with Others	2589	39.51 (7.15)	−.17*	315	33.92 (5.43)	.21*
Eating Behavior						
Fruit	–	–	–	315	2.44 (.62)	.46*
Vegetable	–	–	–	315	3.41 (.71)	.58*
Sugared beverages	–	–	–	315	1.83 (.70)	−.45*
Non-meat protein	–	–	–	315	4.03 (.90)	.65*
Fish	–	–	–	315	3.37 (.87)	.56*
Beef or high fat meat	–	–	–	313	2.81 (.88)	−.42*
Using food to cope	2555	3.88 (1.94)	–	–	–	–

Note. Gender (male = 1, female = 2); Marital status (not married = 0, married = 1); HEI = Healthy Eating Index;

* a significant correlation

Table 4

Hierarchical multiple regression predicting healthy eating index in Study 2a (Panel A) and Study 2b (Panel B)

Panel A. U.S. (Study 2a)

	Model 1 Demographics		**Model 2 + Culture & Self-Construal**	
	***b* (*S.E.*)**	***p***	***b* (*S.E.*)**	***p***
Age	−.14 (.04)	0.001	−.12 (.04)	0.001
Gender	.80 (.08)	0.001	.84 (.08)	0.001
Education	−.08 (.04)	0.03	−.10 (.04)	0.007
Marital status	−.10 (.08)	0.20	−.21 (.08)	0.009
Independent self-construal			−.24 (.04)	0.001
Interdependent self-construal			.20 (.04)	0.001
R-square	0.13		0.14	

Panel B. Japan (Study 2b)

	Model 1 Demographics		**Model 2 + Culture & Self-Construal**	
	***b* (*S.E.*)**	***p***	***b* (*S.E.*)**	***p***
Age	.26 (.06)	0.001	.25 (.06)	0.001
Gender	.49 (.11)	0.001	.48 (.11)	0.001
Education	.06 (.06)	0.31	.05 (.06)	0.33
Marital status	.28 (.12)	0.02	.25 (.12)	0.05
Independent self-construal			.004 (.05)	0.94
Interdependent self-construal			.10 (.06)	0.08
R-square	0.05		0.08	

Note. Gender (1 = male, 2 = female), Marital status (0 = not married, 1 = married).