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Acculturation Strategies and Symptoms of Depression: The Mediators of Atherosclerosis in South Asians Living in America (MASALA) Study

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Abstract

Using latent class analysis, we previously identified three acculturation strategies employed by South Asian immigrants in the US. Members of the *Separation* class showed a preference for South Asian culture over US culture, while members of the *Assimilation* class showed a preference for US culture, and those in the *Integration* class showed a similar preference for South Asian and US cultures. The purpose of this study was to examine associations between these acculturation strategies and symptoms of depression, a common yet underdiagnosed and undertreated mental disorder. We used data from the Mediators of Atherosclerosis in South Asians Living in America (MASALA) study (n=856). Data were collected between October 2010 and March 2013 in the San Francisco Bay Area and Chicago. Depressive symptoms were assessed using the CES-D Scale. Applying a simple new method to account for uncertainty in class assignment when modeling latent classes as an exposure, we found that respondents in the *Separation* class had more depressive symptoms than those in the *Integration* class, but only after taking into account self-reported social support (b=0.11; p=0.05). There were no differences in depressive symptoms among those in the *Assimilation* class vs. those in the *Integration* class (b=

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−0.06; p=0.41). Social support may protect against elevated symptoms of depression in South Asian immigrants with lower levels of integration into US culture.

Keywords

acculturation; symptoms of depression; South Asian immigrants; United States

Research on acculturation and mental health has become increasingly common [1, 2], but prior work has been criticized for (1) failure to define key concepts, such as culture; (2) conceptualization of acculturation as a unidimensional process, whereby maintenance of one's heritage culture and adoption of one's host culture are seen as opposite ends of a single continuum; and (3) overreliance on simplistic markers of acculturation, such as nativity or years in the US [3–6]. To overcome these limitations, the current study built on our prior work [25], which used latent class analysis (LCA) to identify *acculturation strategies* [7] employed by South Asian immigrants – part of the fastest-growing major ethnic group in the US [8]. Given that more than three-quarters of South Asian people in the US are foreign-born [8], acculturation could potentially be an important determinant of health outcomes for this population. Thus, the aim of the current study was to examine associations between acculturation strategies and symptoms of depression – a common yet underdiagnosed and undertreated mental disorder that is associated with reduced quality of life, disability, and even premature death [9, 10] – in a community-based sample of South Asian immigrants in the US.

The acculturation strategies framework

In this analysis, we defined culture as the symbolic and learned aspects of human groups or societies, including language, beliefs, attitudes, values, norms, and behaviors [11]. Drawing on Berry's work, we defined acculturation as the process of cultural and psychological change that occurs when members of two or more cultural groups interact [12]. The acculturation framework developed by Berry hypothesizes the existence of four acculturation strategies, including integration, assimilation, separation, and marginalization [7]. The integration strategy is used when individuals maintain their heritage culture and adopt elements of the host culture; the assimilation strategy is used when immigrants reject their heritage culture but embrace the host culture; the separation strategy is used when individuals maintain their heritage culture and reject the host culture; and the marginalization strategy is used when immigrants reject both the heritage and host cultures [7]. In contrast to unidimensional models of acculturation, which tend to equate acculturation with assimilation, Berry's framework recognizes that identification with one's heritage culture exists on a separate continuum from identification with the host culture.

We have previously reported that South Asian immigrants in the Mediators of Atherosclerosis in South Asians Living in America (MASALA) study used the separation, assimilation, and integration strategies [25]. Members of the *Separation* class showed a preference for South Asian culture over US culture; members of the *Assimilation* class showed a preference for US culture over South Asian culture; and those in the *Integration* class showed a similar preference for South Asian and US cultures.

Acculturation strategies and mental health

A recent meta-analysis of 22 published and unpublished studies examining acculturation strategies and mental health revealed that the integration strategy was most beneficial to mental health, followed by the assimilation and separation strategies, while the marginalization strategy was least beneficial [1]. Berry has argued that the integration strategy is most adaptive because it incorporates protective factors at multiple levels, such as the absence of discrimination at the societal level, involvement in two cultural communities at the group level, and a flexible personality at the individual level [7]. Thus, we hypothesized that South Asian immigrants using the integration strategy would have fewer symptoms of depression than those using the assimilation strategy or the separation strategy. To our knowledge, only one previous study has examined acculturation strategies and mental health among South Asian immigrants in the US, and this study focused on college students [13].

DATA AND METHODS

Data

From October 2010 to March 2013, the MASALA study enrolled 906 community-dwelling individuals (46% women; 98% foreign-born) in the San Francisco Bay Area and the greater Chicago area who self-identified as having South Asian ancestry. Detailed study methods have been described elsewhere [14]. Briefly, this study was population-based, with random sampling of households with South Asian surnames from the desired geographic locations. Individuals were eligible for the study if they were aged 40–84 years and free from physician-diagnosed cardiovascular disease. Persons were excluded if they could not speak and/or read English, Hindi, or Urdu. The institutional review boards at the University of California, San Francisco and Northwestern University approved the study protocol, and all study participants provided written informed consent.

Measures

Symptoms of depression were assessed with the Center for Epidemiologic Studies Depression (CES-D) Scale [15]. Respondents reported how often they experienced 20 symptoms, such as poor appetite, trouble concentrating, and talking less than usual, within the past week (0=rarely or none of the time-3=most or all of the time). Higher scores on the CES-D scale indicate higher levels of psychological distress.

Twelve indicators of acculturation were used to identify acculturation strategy classes [25]. First, respondents were asked to report how much they wish the following traditions from South Asia would be practiced in America (1=absolutely-5=not at all): (1) performing religious ceremonies or rituals; (2) serving South Asian sweets for ceremonies or rituals; (3) fasting on specific occasions; (4) living in a joint family; (5) having an arranged marriage; (6) having a staple diet of chapatiis, rice, daal, vegetables, and yogurt; and (7) using spices for healing and health [16]. Next, respondents were asked to report how often they fast (1=two or three times per week-6=almost never or never), what foods they normally eat at home and in restaurants (1=only South Asian food-6= never eat at home/in restaurants), how

often their family shops at South Asian grocery stores or markets (1=two or three times per week-5=almost never or never), and which country or culture most of their friends belong to (1=only South Asian-5=only other ethnic groups).

Potential confounders of the association between acculturation strategies and symptoms of depression included age, gender, marital status, religion, education, occupation, per capita household income,[1] country of birth, percentage of life lived in the US, English language proficiency, and antidepressant use, defined as current use of one or more of the following medications: selective serotonin reuptake inhibitors (SSRIs), selective serotonin and norepinephrine reuptake inhibitors (SNRIs or SSNRIs), tricyclic and tetracyclic antidepressants, and monoamine oxidase inhibitors (MAOIs). Discrimination and social support were conceptualized as either potential confounders *or* potential mediators of the association between acculturation strategies and depressive symptoms. Due to the cross-sectional nature of the study, we were unable to determine whether discrimination and support were predictors of acculturation strategies (in which case they would be potential confounders of the association between acculturation strategies and depressive symptoms) or outcomes of acculturation strategies (in which case they would be potential mediators). Discrimination was assessed with the 9-item Everyday Discrimination Scale [17]. The social support scale was created by summing responses to six questions [18]. Respondents were asked to report how often (1=none of the time-5=all of the time) they had: (1) someone available to listen to them; (2) someone available to give them advice; (3) someone available to show them love and affection; (4) someone available to help with chores; (5) someone available to provide emotional support; and (6) as much close contact as desired with a confidant.

Plan of analysis

The original data set consisted of observations from 906 individuals. We excluded 19 subjects who were born in the US and 31 subjects with missing values on one or more variables used in our analysis (final n=856). We compared the complete case data with the one containing missing values in terms of descriptive statistics and comparability.

As described above, we previously used LCA, a technique for identifying unobservable subgroups within a population [19], to identify groups of individuals that were similar based on cultural attitudes and behaviors [25]. Model fit statistics, including the BIC and AIC, were used along with contextual theory to determine the number of classes in the data (see Table S1 for more information about the classes). LCA was conducted using the poLCA package in the statistical software R [20].

We regressed symptoms of depression on the acculturation strategy classes identified in the latent class model. Model 1 controlled for potential confounders, including age, gender, marital status, religion, education, occupation, per capita household income, country of

[1]Annual family income was measured on a sixteen-point scale, from less than $5,000 (1) to $250,000 or more (12). To calculate per capita income, we divided the midpoint of each category ($275,000 for the upper category) by the number of people supported by the income, including individuals who live outside the household.

birth, percent of life lived in the US, English language proficiency, and current antidepressant use. Model 2 additionally controlled for discrimination and social support.

Rather than assigning respondents to a single class based on their most likely latent class membership, we took a simulation based approach where at each iteration we randomly generated subject-specific class assignments from a multinomial distribution with the estimated three-class probability vector from the LCA. For example, if the estimated probability for subject 10 was (0.73, 0.19, 0.08) for falling into the *Assimilation, Integration*, and *Separation* classes, respectively, we generated multiple datasets where 73% of the time subject 10 fell in the *Assimilation* class, 19% of the time in the *Integration* class, and 8% of the time in the *Separation* class. We repeated this random generation for each of the 856 subjects and created a pseudo dataset. We then regressed the outcome on the class variable generated in a given dataset using multivariate linear regression adjusting for confounders. We repeated this process for 1000 pseudo datasets and reported the average estimates for regression coefficients along with adjusted standard errors for those estimates [21]. For comparison purposes, we also examined models that used the maximal probability class as the true class. Linear regression analyses were conducted using R version 3.2.1.

RESULTS

Table 1 presents the baseline characteristics for the full analytic sample and by acculturation strategy classes. Overall, respondents reported few symptoms of depression. CES-D score was highest in the *Separation* class (mean=9.4, SD=8.2; median=7, IQR=10), followed by the *Integration* class (mean=7.6, SD=7.0; median=6, IQR=8) and the *Assimilation* class (mean=6.2, SD=5.9; median=5, IQR=7).

Table 2 presents the results of weighted regression models, which take into account the uncertainty of class assignment in the LCA. As shown in Model 1 of Table 2, acculturation strategy classes were not associated with depressive symptoms after adjusting for potential confounders. In Model 2, we controlled for discrimination and social support. Discrimination (b=0.04, $p<0.001$) was positively associated with CES-D score, while social support (b=−0.08, $p<0.001$) was inversely associated with symptoms of depression. After adjusting for these potential confounders or mediators, respondents in the *Separation* class experienced more symptoms of depression (b=0.11, p=0.05) than those in the *Integration* class. The coefficient for the *Separation* class increased from 0.09 (p=0.51) to 0.11 (p=0.05) after adjusting for discrimination and social support, providing evidence of either negative confounding or inconsistent mediation. To determine which variable was responsible for the change in coefficient for the *Separation* class from Model 1 to Model 2, we added each potential mediator to Model 1 separately (results not shown) and found that social support accounted for the observed effect.

Supplementary Table S2 presents the results of unweighted regression models, which do not take into account the uncertainty of class assignment in the LCA. Although results were substantively equivalent, some minor changes in effect estimates and p-values were observed in the unweighted models. While some beta coefficients increased slightly, others decreased. A similar pattern was observed for p-values.

Given that CES-D score was skewed, we performed sensitivity analyses examining log-transformed CES-D score as the outcome. The models produced equivalent results, and model fit was better for the raw score. Thus, we chose to present results for the raw CES-D score. In additional sensitivity analyses, we examined a dichotomous measure of depressive symptoms in which risk for major depression was defined as CES-D score greater than or equal to 16 or current use of antidepressants. In the fully adjusted model, persons in the *Separation* class had higher odds of elevated depressive symptoms compared to those in the *Integration* class, but the odds ratio was not statistically significant (OR=1.29; 95% CI: 0.62, 2.99; p=0.50).

DISCUSSION

Between 2000 and 2010, the South Asian population was the fastest growing major ethnic group in the US, with a growth rate of 81% [8]. Given that more than three-quarters of South Asian people in the US are foreign-born [8], acculturation – the process of cultural and psychological change that occurs when members of two or more cultural groups interact [12] – could potentially be an important determinant of health outcomes for this population. The current study built on our prior work [25], which used LCA to identify *acculturation strategies* in a population-based sample of South Asian immigrants in the US. We hypothesized that respondents using the integration strategy would have fewer symptoms of depression than those using the assimilation strategy or the separation strategy. In fully adjusted models, we found that members of the *Separation* class had more symptoms of depression than those in the *Integration* class, but there were no differences in depressive symptoms between persons in the *Assimilation* class vs. the *Integration* class.

To our knowledge, this was the largest study to date to examine acculturation strategies as a predictor of mental health outcomes and only the second study to focus on South Asian immigrants in the US [1]. Based on the results of a prior meta-analysis [1], we expected to find that South Asian immigrants using the integration strategy would have fewer symptoms of depression than those using the assimilation strategy or the separation strategy. Contrary to expectations, we found that those in the *Assimilation* class – characterized by a preference for US culture over South Asian culture – had similar levels of depressive symptoms as those in the *Integration* class – characterized by a similar preference for South Asian and US cultures. While we expected that the integration strategy would be most beneficial to mental health because it incorporates protective factors, such as less discrimination at the societal level, involvement in two cultural communities at the group level, and a flexible personality at the individual level [7], individuals in the *Assimilation* class had substantially higher per capita household income and were more likely to have a bachelor's degree than those in the *Integration* class. Given that socioeconomic status (SES) is inversely associated with symptoms of depression [22], this might help explain why those in the *Assimilation* class did not have increased symptoms of depression compared to those in the *Integration* class. Although we adjusted for income and education in our models, failure to adjust for other measures of SES, such as wealth, could have resulted in residual confounding. Furthermore, we were unable to adjust for place of education, which could be an important marker of family social position and resources. Other potential unmeasured confounders include acculturative stress and social network characteristics, such as network density, which may

be associated with both acculturation strategies and depressive symptoms. Consistent with expectations, results indicated that those in the *Separation* class – characterized by a preference for South Asian culture over US culture – experienced more symptoms of depression than those in the *Integration* class – but only after taking into account self-reported social support. Although we expected that involvement in two cultural communities would be associated with higher levels of support, we found that members of the *Separation* class reported higher levels of social support than those in the *Integration* class.

Limitations, Strengths, and Directions for Future Research

Due to the cross-sectional design of the study, we were unable to ascertain temporal order between acculturation strategies and social support and were, therefore, unable to determine whether support was a negative confounder or inconsistent mediator of the association between acculturation strategies and symptoms of depression [23]. While South Asian immigrants with more supportive relationships may have felt less inclined to integrate into mainstream US society (↑ support ➔ ↓ integration), those who employed the integration strategy may have formed relationships with weak ties outside the South Asian community that provided less intensive social support (↑ integration ➔ ↓ support). To better understand why respondents in the *Separation* class reported higher levels of social support than those in the *Integration* class, longitudinal data on the process of acculturative change are needed.

Other study limitations include the lack of data on personality factors, such as flexibility, that may be causally related to both acculturation strategies and symptoms of depression [7], as well as limited generalizability. Given the average age (over 55), percentage of life lived in the US (just under 50%), and educational attainment (nearly 60% completed more than a bachelor's degree) in our San Francisco- and Chicago-based sample, it is unclear whether results from this study are generalizable to the entire population of South Asian immigrants in the US, including younger immigrants, those who moved to the US more recently, those with lower levels of education, and those who live in areas with fewer South Asian residents.

A key strength of this study was the use of a multidimensional model of acculturation, which recognizes that identification with one's heritage culture exists on a separate continuum from identification with the host culture. While some critics have argued that Berry's framework implicitly assumes that heritage and host cultures are internally homogenous and non-overlapping [6], we contend that South Asian immigrants in the US are likely to encounter differences in the *predominant* language, beliefs, attitudes, values, norms, and/or behaviors in their country of birth compared to their country of residence [25]. In this way, immigrants from South Asia are likely to experience opportunities for acculturation; and, as demonstrated here, the acculturative strategies that they employee in response to these opportunities have implications for psychological well-being. In the future, data from the MASALA study could also be used to examine the physical health consequences of acculturation strategies used by South Asian immigrants.

Another key strength of this study was the use of multiple questions about acculturation, some of which were based on the results of focus group interviews conducted with South Asian Indians in the US [24]. Questions included attitudes about the practice of South Asian traditions in the US, frequency of fasting, foods normally eaten at home and in restaurants,

frequency of shopping in South Asian markets, and ethnic composition of friendship networks. Language usually spoken at home was not available but will be available with ongoing MASALA data collection. Finally, we demonstrated a simple new method to account for uncertainty in class assignment when modeling latent classes as an exposure.

Conclusions

The current study found that, given the same level of social support, South Asian immigrants in the US who expressed a relatively high degree of preference for South Asian culture over US culture reported more symptoms of depression than those who expressed a similar level of preference for South Asian and US cultures. Results suggest that social support is an important protective factor for mental health among South Asian immigrants in the US. Mental health professionals and other medical providers who serve this population should be aware of the importance of establishing and maintaining supportive social networks, particularly among those with lower levels of integration into US culture. To better understand why respondents in the *Separation* class reported higher levels of social support than those in the *Integration* class, longitudinal data on the process of acculturative change are needed.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Baseline characteristics for MASALA Study participants by acculturation strategy*

	Full Sample (n=856)	Integration (n=464)	Assimilation (n=194)	Separation (n=198)
CES-D score	7.7 (7.1)	7.6 (7.0)	6.2 (5.9)	9.4 (8.2)
Age, years	55.4 (9.3)	55.3 (9.2)	55.3 (9.5)	55.7 (9.7)
Women	393 (45.9%)	195 (42.0%)	103 (53.1%)	95 (48.0%)
Marital Status				
Married	779 (91.0%)	432 (93.1%)	167 (86.1%)	180 (90.9%)
Single, divorced, or widowed	77 (9.0%)	32 (6.9%)	27 (13.9%)	18 (9.1%)
Religion				
Hinduism/Jainism	636 (74.3%)	375 (80.8%)	126 (64.9%)	135 (68.2%)
Other Religion	172 (20.1%)	80 (17.2%)	30 (15.5%)	62 (31.3%)
No religious affiliation	48 (5.6%)	9 (1.9%)	38 (19.6%)	1 (0.5%)
Education				
Less than bachelor's degree	96 (11.2%)	34 (7.3%)	13 (6.7%)	49 (24.7%)
Bachelor's degree	247 (28.9%)	137 (29.5%)	41 (21.1%)	69 (34.8%)
More than bachelor's degree	513 (59.9%)	293 (63.1%)	140 (72.2%)	80 (40.4%)
Occupation				
Unemployed	136 (15.9%)	69 (14.9%)	24 (12.4%)	43 (21.7%)
Employed	603 (70.4%)	334 (72.0%)	140 (72.2%)	129 (65.2%)
Retired	117 (13.7%)	61 (13.1%)	30 (15.5%)	26 (13.1%)
Per capita household income, in $10,000s	3.7 (2.7)	3.7 (2.4)	5.0 (3.1)	2.3 (2.4)
Country of Origin				
India	729 (85.2%)	405 (87.3%)	167 (86.1%)	157 (79.3%)
Other	127 (14.8%)	59 (12.7%)	27 (13.9%)	41 (20.7%)
Percentage of life lived in the US	48.5 (16.5)	48.2 (15.3)	55.3 (15.2)	42.4 (18.0)
English language proficiency				
Speak English poorly or fairly	110 (12.9%)	37 (8.0%)	4 (2.1%)	69 (34.8%)
Speak English well or very well	746 (87.1%)	427 (92.0%)	190 (97.9%)	129 (65.2%)
Current antidepressant use	21 (2.5%)	12 (2.6%)	2 (1%)	7 (3.5%)
Discrimination	15.1 (6.1)	15.5 (5.7)	14.6 (6.4)	14.9 (6.4)
Social support	24.9 (4.9)	24.8 (4.8)	24.7 (5.3)	25.3 (4.9)

*Values represent mean (SD) or n (%).

Table 2

Association between acculturation strategies and symptoms of depression by weighted linear regression (n=856)

	Model 1		Model 2	
	Beta (SE)	**p-value**	**Beta (SE)**	**p-value**
Acculturation Strategies (Integration)				
Assimilation	−0.09 (0.08)	0.45	−0.06 (0.07)	0.41
Separation	0.09 (0.09)	0.51	0.11 (0.07)	0.05
Age	−0.01 (0.00)	0.10	−0.00 (0.00)	0.13
Female sex (Male)	0.06 (0.06)	0.41	0.01 (0.07)	0.79
Religion (Hinduism/Jainism)				
Other religion	0.16 (0.08)	0.04	0.10 (0.08)	0.19
None	−0.18 (0.14)	0.21	−0.20 (0.13)	0.10
Education (More than bachelor's degree)				
Less than Bachelor's degree	0.27 (0.12)	0.03	0.27 (0.09)	0.01
Bachelor's degree	0.26 (0.09)	<0.001	0.22 (0.07)	<0.001
Occupation (Employed)				
Unemployed	0.17 (0.09)	0.06	0.22 (0.07)	<0.001
Retired	0.24 (0.12)	0.05	0.23 (0.11)	0.03
Per capita household income, in $10,000s	−0.01 (0.11)	0.65	−0.00 (0.01)	0.88
Born in other South Asian country (Born in India)	0.02 (0.10)	0.82	−0.02 (0.09)	0.90
Percentage of life lived in US	0.00 (0.00)	0.67	0.00 (0.00)	0.79
English language proficiency (Speak English well or very well)				
Speak English fairly well or poorly/not at all	0.13 (0.11)	0.34	0.11 (0.12)	0.45
Currently using antidepressant (Non-user)	0.53 (0.20)	0.02	0.29 (0.19)	0.09
Discrimination			0.04 (0.00)	<0.001
Social support			−0.08 (0.01)	<0.001

Note: Reference category is in parentheses.