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Assessment on the Use of the Suinn-Lew Asian Self Identity Acculturation Scale in Health Studies of Asian Immigrant Populations

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Abstract. The most widely used measure of acculturation among Asians populations is the Suinn-Lew Asian Self-Identity Acculturation Scale (SL-ASIA). **Purpose**: This systematic review aims to: (a) describe population characteristics and methodology used in health studies assessing acculturation, as measured by the SL-ASIA; (b) evaluate the use of the SL-ASIA in the included studies; (c) summarize associations between acculturation, as measured by the SL-ASIA, and health outcomes; and (d) provide recommendations for future research. **Methods:** An electronic search was conducted using PsycINFO and MEDLINE. Studies using the SL-ASIA in the context of mental or physical health outcomes in Asian adult populations were included, for a total of 14 studies. **Results:** Most studies were conducted with Chinese, Korean, and Vietnamese immigrants, with the majority being foreign-born. All studies used cross-sectional designs with convenience sampling. More than half used a modified version of the scale, and less than half used a translated version. Psychometric properties and pilot testing of modified/translated versions of the SL-ASIA were underreported. Most findings on the relationship between acculturation, as measured by the SL-ASIA, and health are consistent with research in other immigrant populations. **Conclusions**: Future studies should include underrepresented groups for a more representative picture of Asian immigrant health, and follow established methodologies for translations of the SL-ASIA. Associations drawn between health and acculturation from the use of the SL-ASIA will facilitate understanding of within-group Asian immigrant differences in the adaptation process, and identify at-risk populations.

Keywords. Asian, Health, Immigrants, Acculturation, Measures.

1. Introduction

Asian Americans are one of the fastest-growing ethnic groups in the United States. In 2010, there were approximately 17.3 million residents of Asian descent in the U.S., which comprised about 6% of the total U.S. population (U.S. Census, 2010). Recent estimates indicate that by 2050, there will be approximately 41 million Asian Americans in the U.S., with a considerable proportion being foreign-born. The 150-year history of Asian immigration to the U.S. and the current number of overseas-born Asian Americans have resulted in an increasingly diverse Asian American population. Among this population, Chinese, Filipino, and Asian Indians make up the largest subgroups, followed by Vietnamese, Korean, and Japanese immigrants (U.S. Census, 2010). Nevertheless, there are at least 30 other Asian subgroups in the U.S., each with their own language, values, culture, and immigration history (Sue & Sue, 1995). The diversity across Asian American subgroups has also resulted in a population that

varies greatly in health outcomes (Nguyen & Bornheimer, 2014).

Despite the diversity of the Asian-American population, Asians remain one of the least understood ethnic groups in terms of health disparities. Widespread belief in the "model minority" stereotype, which makes the imprecise assumption that Asian immigrants are immune to health conditions prevalent among other minority groups, may partially account for the limited health disparities research among Asian subgroups (Lee, 2012). Although research suggests that, as a group, Asian Americans fare better health-wise than their Latino and Black counterparts (Bates, Acevedo-Garcia, Alegria, & Krieger, 2008; Woodward, Taylor, Bullard, Aranda, Lincoln, & Chatters, 2012), these conclusions are likely misleading given that disparities within Asian subgroups are often overlooked (Holland, 2012). Disparities in health outcomes are also evident by nativity status, with foreign-born Asians differing from their U.S.-born counterparts on various health outcomes. For example, U.S.-born Asians have higher prevalence of mental disorders when compared to the foreign-born, while mortality rates for breast cancer are higher among the foreign-born when compared to those born in the U.S. (Takeuchi et al., 2007; Gomez et al., 2010). Additional research is needed to identify and better understand health disparities among Asian subgroups.

One process that may account for health disparities among Asian immigrants is acculturation. Acculturation, that is, the change experienced as a result of coming into contact with a different culture, is an important construct of study in psychological research of immigrants (Ponterotto, Baluch, & Carielli, 1998; Sam & Berry, 2010). Acculturation has been identified as both a risk and a protective factor in Asian immigrant health. For instance, increased acculturation to Western culture has been associated with lower risk of psychological distress and clinical depression in Asian college students, but also with higher smoking rates for Asian women (Hwang & Ting, 2008; An, Cochran, Mays, & McCarthy, 2008y; Li, Kwon, Weerasinghe, Rey, & Trinh-Shevrin, 2013). Given the variable relationship between acculturation and health, additional research is needed to examine the effects of acculturation on health, as well as how and why these effects vary across Asian subgroups.

Of major concern to the study of acculturation is that acculturation is a complex construct that is hard to measure. As such, differing conceptualizations of acculturation lead to differing methods of measurement, and in turn produce inconsistent conclusions regarding the relationship between acculturation and health (Hunt, Schneider, & Comer, 2004). Additionally, despite growing attention to the effect of acculturation on health outcomes, concerns about the conceptualization and psychometric properties of self-report measures used to assess acculturation among Asian populations remains (Ponterotto et al., 1998). An important first step to identify the relationship between acculturation and health among Asian subgroups involves the use of valid and reliable measures. While proxy variables, such as nativity status and years since immigration, are often used to measure acculturation, their use can be problematic in that it relies on the assumption that acculturation can be inferred from the amount

of exposure to a host country (Ryder, Alden, & Paulhus, 2000). In response, researchers have developed multidimensional measurements of acculturation to better capture the depth and breadth of the acculturation experience. The most widely used instrument to assess acculturation among Asian immigrants is the Suinn-Lew Asian Self-Identity Acculturation Scale (SL-ASIA; Suinn, Ahuna, & Khoo, 1992). Developed in response to the limited number of tests available for use with Asians Americans, developers initially intended the SL-ASIA for use within the context of planning counseling interventions (Suinn, Rickard-Figueroa, Lew, & Vigil, 1987). However, the SL-ASIA is now used for multiple research purposes, including the study of health among Asian populations.

The SL-ASIA holds several advantages over other measures of acculturation in the health literature. First, as a multidimensional scale, the SL-ASIA better captures the depth and breadth of the acculturation experience that proxy measures could not (Abe-Kim, Okazaki, & Goto, 2001; Choi & Harachi, 2002; Liu, Pope-Davis, Nevitt, & Toporek, 1999; Suinn, 1994). Second, the SL-ASIA has a 5th grade Flesch-Kincaid reading level, and the literal meaning of the questions asked is clearly understood, which makes the measure easy and appropriate for use with disadvantaged Asian immigrant subgroups. Third, the SL-ASIA has generally good psychometric properties (Johnson, Wall, Guanipa, Terry-Guyer, & Velasquez, 2002; Ponterotto et al., 1998; Lee, Lee, Rankin, Alkon, & Weiss, 2005; Suinn et al., 1987; Suinn et al., 1992). Fourth, the SL-ASIA has been commonly used as a model measure in the development of other Asian acculturation scales (e.g., Asian American Multidimensional Acculturation Scale; Gim Chung, Kim, & Abreu, 2004), as well as in the validation of other acculturation measures (e.g., Asian Values Scale; AVS; Kim, Atkinson, & Yang, 1999). Thus, as the most widely used measure of acculturation in Asian populations, an examination of the SL-ASIA (versus other measures of acculturation) is beneficial and necessary to improve the comprehensibility, and thus the applicability, of the health literature.

2. SL-ASIA: Description and Review of Psychometric Properties

In its original form, the SL-ASIA is a 21-item multiple-choice scale used to assess acculturation using self-report (Suinn et al., 1992). Modeled closely after the Acculturation Rating Scale for Mexican Americans (ARSMA; Cuellar, Harris, & Jasso, 1980), responses to items in the SL-ASIA are given on a rating scale from 1 (high Asian identification) to 5 (high Western identification). The measure renders a total mean score, with higher scores denoting higher acculturation to the Western culture. Five "theoretically" based questions have been added to the scale to further assess various aspect of acculturation including values, behavioral competencies, and self-identity, as well as provide an additional way to categorize responses in a bidirectional way, that is, to provide a way to measure adherence to both Asian and Western cultures (Suinn et al., 1992; Liu et al., 1999).

Pertaining to the psychometric properties of the 21-item

SL-ASIA, a previous review of 22 studies found this measure to have good readability and writing quality, adequate internal consistency, and satisfactory test-retest reliability over a short time (Hsueh, Garcini, Zhou, Malcarne, & Klonoff, 2014; Ponterotto et al., 1998). The coefficient alphas reported in previous studies have been found to be in the satisfactory to good range, with variations from a low of .68 (Lese & Robbins, 1994) to a high of .94 (Lee et al., 2005). Also, the SL-ASIA has been found to have good face, concurrent, and structural validity. Specific to concurrent validity, scores on the SL-ASIA have been strongly associated with native language (Ownbey & Horridge, 1998), generation status (Kim et al., 1999), country of origin (Johnson et al., 2002; Abe-Kim et al., 2001), years lived in the U.S. (Chen & Kennedy, 2005; Johnson et al., 2002), younger age of arrival to the U.S., younger age upon stating school in the U.S., length of time living in a non-Asian neighborhood, greater number of years attending school in U.S., and higher identification with Western values (Ownbey & Horridge, 1998). Also, supporting evidence has been found for the five-factor structure of the SL-ASIA with the dominant factor being reading, writing, and cultural preferences followed by preferred associations (Abe-Kim et al., 2001; Choi & Harachi, 2002; Suinn et al., 1992). This suggests that acculturation as measured by the SL-ASIA is mostly associated with language ability and language preferences, followed by ethnic interaction.

3. Purpose of Study

This review aims to: (a) describe population characteristics and methodology used in health studies assessing acculturation, as measured by the SL-ASIA, among Asian immigrant populations, (b) evaluate the use of the SL-ASIA in the included studies, and (c) summarize associations of interest between acculturation, as measured by the SL-ASIA, and various health outcomes. This information will be useful to emphasize areas in need of research, as well as to identify strengths and areas for potential improvement in the measurement of acculturation and the use of the SL-ASIA in health studies of Asian populations.

4. Methods

Methodology used in this review is based on guidelines from the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Liberati, et al., 2009). This review includes peer-reviewed studies reporting quantitative data gathered from the use of the SL-ASIA scale in health studies. Inclusion criteria were that the study: (a) was published in English; (b) included the assessment of mental health and/or physical health outcomes as the outcomes of interest; and (c) were exclusive to adult samples. For parsimony, studies including paired parent-child samples were excluded. Also excluded were psychometric reviews and studies of measurement development.

For the initial selection of studies, a literature search using two databases (i.e., PsycInfo and Medline) was done. Relevant article searched were limited to peer-reviewed studies, and the last search was conducted in January 2014. Terms

selected for the search were SL-ASIA OR Suinn-Lew Asian Self-Identity Acculturation. A total of 42 articles were identified. Titles, abstracts, and in some cases the complete text were screened for eligibility. Nine articles met inclusion criteria, and five additional articles were identified from additional sources, including reference lists of eligible articles. Thus, 14 studies were included (See Figure 1).

Data was collected using a standardized data abstraction form. Information on study design, purpose of study, sample characteristics, application of a theoretical framework, use of the SL-ASIA, health outcomes assessed, summary of findings, and study limitations were abstracted from eligible studies. Data were entered and analyzed using SPSS V21.
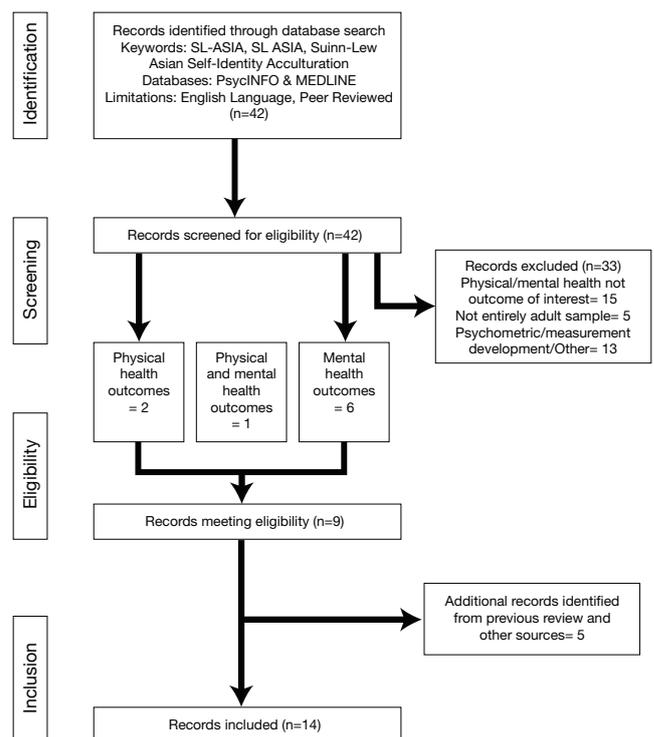
Figure 1. Summary of Article Screening and Eligibility

5. Results

5.1 Participant Characteristics

Individuals of Chinese (31%), Korean (31%), and Vietnamese (26%) origin represented the majority of participants in the included studies, with other Asian subgroups representing the remaining 12% (i.e., Indian, Hmong, Filipino, Cambodian, Japanese). Participants ranged from 17 to 78 years, with the majority reporting a mean age > 30 years. Pertaining to sex, five studies included women only, and of studies varying in sex, the majority included more women than men. Most studies were limited in providing detailed sociodemographic information on the participants, including educational level. Of studies reporting on educational level (8 of 14), half were conducted with college populations. Pertaining to immigration characteristics, the majority of participants were foreign-born (n=1771; 74%), but only few studies reported

on relevant immigration related characteristics. Of the few studies reporting mean age of arrival to the U.S., this ranged between 23 and 30 years, while the mean length of time in the U.S. ranged from 4 to 18 years. Only two studies reported on language preference, with the majority of participants (approximately 68%) reporting preference for using an Asian language (Chen et al., 2012; Lee et al., 2013). Participant characteristics are detailed in Table 1.

5.2   Study Design Characteristics

All of the included articles used a cross-sectional design, as well as convenience sampling, including snowball and purposive sampling. None of the reviewed studies used random sampling. Also, the majority of the studies were conducted exclusively in the U.S. (86%), with most data collected in the West (n=5), followed by the Northeast (n=4) and the Midwest (n=2). For studies of physical health, all but one reported collection of health data through a combination of in-person structured interviews, self-report questionnaires, and collection of anthropometric measures. Mental health studies were more varied in terms of data collection methods used, with the most prevalent being mail-in surveys and telephone interviews. None of the reviewed studies included the collection of objective data, such as medical records or clinician administered assessments. Few studies provided information on the cooperation/response rate, and among those that did, the rates ranged from 31% to 92%. Lowest participation was reported in a study that recruited participants from university English-as-second-language (ESL) courses, as well as from Korean community organizations (Jackson et al., 2006). The highest cooperation rate was reported in a study that recruited participants through religious sites across different states (Dodani & Dong, 2011). Study design characteristics of the included studies are detailed in Table 2.

5.3   Theoretical Frameworks of Acculturation and its Measurement

Half of the studies provided a theoretical framework of acculturation for their study, with acculturative stress theory being the most widely used (5 of 14 studies). About a third of the studies (n=4) did not provide any descriptives for the acculturation level of their sample, and among those studies that did, methods for reporting acculturation levels varied widely. Of studies that reported acculturation level, most used a unidimensional framework to report acculturation scores, that is, the scores provided reflected a measure of acculturation towards Western culture only, without reference to preservation of the Asian culture. None of the included studies reported acculturation scores from a bidirectional or multidirectional perspective. Almost half (6 of 14) studies reported acculturation levels categorically. Methods of labeling categories included by identity (i.e., "Asian identified, biculturally identified, Western identified" and "Asian, bicultural, American") and by level ("low, high"; "low, medium-high"; "low-medium, medium-high"). Also, three studies reported acculturation level as a continuous

variable, specifically in the form of mean scores. One more study grouped participant scores by quarter percentiles (i.e., 0%-25%; Chen et al., 2012).

5.4   Use and Adaptations of the SL-ASIA

5.4.1 Non-translated modified versions.

Of non-translated modified versions used (n=5), four were shortened versions of the SL-ASIA that ranged from 1-item scale (Baker et al., 2012) to 19-item scales (Haudek et al., 1998). One study used the 26-item scale as recommended by Suinn (1994), but did not report acculturation levels of the sample (Jackson et al., 2006). Only 2 of 5 studies that used non-translated modified versions of the SL-ASIA provided a rationale for the use of the modified scale over the original. Reasons given for using modified versions included interest in the use of a single question used to assess self-identity, and the exclusion of one question that was not found to be predictive of acculturation. Also, only one study described the methodology used in shortening the scale (Haudek et al., 1998), and only one more tested and reported on the psychometric properties of the modified version (Edrington et al., 2010). One study did not specify whether a modified or an original version was used.

5.4.2 Translated versions of the original scale.

Three studies used translated versions of the original scale, with two reporting methodology used in the translation, which included translation by a native speaker and committee review (Shim & Shwartz, 2008; Foss, 2001). Translations of the original SL-ASIA were administered in Korean (n=1), Vietnamese (n=1), and Indian-Gujarati (n=1). Only one study reported having pilot tested a translated version in Vietnamese, and reported the Cronbach's alpha to be .91 (Foss, 2001).

5.4.3 Translated versions of modified scales.

Three studies used translated modified versions of the SL-ASIA, with all studies reporting on the methodology used in the translation of the measure. Two studies used translation by an expert committee (i.e., bilingual speakers, multi-lingual healthcare specialists), and one used translation by a native speaker. Translated, modified scales were administered in Vietnamese (n=1) and Chinese (n=2). Only one study reported having pilot tested the translated, modified version (Yang & Wang, 2011). Of studies reporting on the reliability of translated, modified versions (2 of 3), Cronbach's alphas ranged from .84 to .87, which are similar to reliability scores reported for the original English version scale (.88 and .91; Suinn, 1987; 1992). One study added 19 items to the original scale to create a 40-item scale to assess acculturation in a Vietnamese immigrant population living in Taiwan, but no information was included on the modification rationale or the process used to lengthen the scale (Yang & Wang, 2011).

5.5 Associations of Acculturation and Physical Health

Studies of physical health examined type 2 diabetes and coronary artery disease (n=1), obesity (as measured by BMI) (n=1), self-rated health (n=1), and pain characteristics/pain interference (n=1). Higher acculturation to Western culture was associated with risk of type 2 diabetes in a South Asian sample, as well as to obesity among Chinese and Vietnamese immigrants (Dodani & Dong, 2011; Chen et al., 2012).In the aforementioned study, the strength of the association between acculturation and obesity varied by gender and ethnic subgroup, with a stronger association observed among men when compared to women, and among Chinese participants when compared to their Vietnamese counterparts (Chen et al., 2012). Also, a study found higher acculturation to Western culture was associated with increased self-reported good health among Chinese, Korean, and Vietnamese immigrants (Lee et al., 2013). Consistent with this finding, a study of Vietnamese immigrants living in Taiwan found higher acculturation to the host country was associated with better health-related quality of life, including physical functioning and vitality. Likewise, another study showed higher acculturation to Western culture to be associated with lower pain intensity and less pain interference in daily life functioning among Chinese immigrants (Edrington et al., 2010).

5.6 Associations of Acculturation and Mental Health

Studies of mental health examined disordered eating (n=4), depression (n=2), stress (n=2), overall mental health (n=2), self-esteem (n=1), self-rated well-being (n=1), and anxiety (n=1). Lower acculturation to Western culture was associated with lower overall mental health in Asian Americans (Iwamasa & Kooreman, 1995), increased distress among Chinese immigrants (Lee et al., 2005), and higher anxiety among Vietnamese and Hmong immigrant women (Foss, 2001). Similarly, a study of Vietnamese immigrants living in Taiwan found lower acculturation to the host country was associated with lower health-related quality of life, including decreased self-reported mental health (Yang & Wang, 2011). However, the association between acculturation and distress was not supported in a sample of Korean immigrants (Shim & Shwartz, 2008). The association between acculturation and self-rated well-being was also not supported among a diverse sample of Asian immigrants (Baker et al., 2012). Likewise, two additional studies did not find a relationship between acculturation and mental health outcomes, specifically depression, among Korean and Chinese immigrants (Baker et al., 2012; Davis & Katzman, 1999). Additional results pertaining to mental health showed that higher acculturation to Western culture was associated with disordered eating in Chinese females, although this effect was not found among males (Davis & Katzman, 1999). The effects of acculturation to Western culture and disordered eating were not found in studies of other Asian subgroups, including Korean, Japanese, Filipino, Vietnamese, and Chinese immigrants (Jackson et al., 2006; Haudek et al., Yoshimura, 1995). One more study

did not support the association between acculturation and self-esteem in sample of Chinese immigrants (Davis & Katzman, 1999). Results of the included studies are detailed in Table 3.

6. Discussion

Given the rising trend of Asian immigration to the U.S. and worldwide, there is a need to better understand how immigration-related processes, including acculturation to a host country, affect health among different Asian subgroups. An initial step to improve the study of acculturation and health among Asian populations is to ensure the adequate measurement of acculturation, which includes the proper use of psychometrically sound scales. This review summarized the quality of health studies assessing acculturation among Asian immigrant populations, as measured by the SL-ASIA, and provided an overview on the use of this measure in health studies.

Pertaining to sampling, results showed that there is limited diversity in the samples of the included studies, particularly regarding ethnic subgroup, sex, age, and socioeconomic status. Future studies should aim to oversample underrepresented groups, including Southeast and Indian Asians, as well as provide detailed descriptions of participants belonging to more than one Asian subgroup. Likewise, future studies should aim to include more balanced samples in terms of sex, as to facilitate exploring possible interaction effects. Studies including participants from community samples rather than college students could also be valuable to understand the association of acculturation and health in the general Asian immigrant population. Moreover, given the relevance of acculturation to the immigration experience, there is a need for studies to report on relevant immigration-related characteristics of participants, such as length of time in the U.S., age upon arrival, country where highest level of education was attained, and migration patterns, in order to (a) identify differences in the acculturation experience and their associated health effects across Asian subgroups, and (b) validate acculturation measures used, including the SL-ASIA. Increasing the diversity of participants in studies of health and acculturation is essential to develop a more representative picture of Asian immigrant health.

In regards to methodology, it is important to note that all of the included studies used cross-sectional designs, which although useful for exploratory purposes, they provide limited information to the understanding of how acculturation impacts health overtime. Additional studies that incorporate the use of longitudinal designs are needed to better understand health changes as immigrants acculturate to life in the new country. Longitudinal designs provide the benefit of baseline data as a point of comparison, and are especially important in the evaluation of health changes (Moon & Twigg, 1988). Also, recent studies are needed to examine how recent changes to the health care system and the growing Asian American population affects the relationship between acculturation and health.

Regarding measurement, acculturation is often assessed through the use of proxy measures, which may be insufficient to adequately capture the multidimensionality and

Table 1. Participant Characteristics

Mental Health Outcomes					
Study	Setting/ Location	Asian Immigrant Sample (% Sex)	Sample Characteristics	Acculturation Categories	Immigration-related characteristics
Jackson et al., 2006	US (MA) & Korea	*N*=204 Korean n=204 (F=100%)	Age range=NR, *M*=22.8 *SD*=3.7 ≥ HS=NR	NR	Foreign-born=18.1% *M* age at arrival=23.3 *M* years since immigration=NR
Baker et al., 2012	US (Northeastern)	*N*=96 Chinese n=40 Korean n=26 Vietnamese n=8 Cambodian n=7 Mixed Asian n=5 Other Asian n=10 (F=59%, M=41%)	Age range=NR, *M*=19.57 *SD*=2.09 ≥ HS=100%	Low 58.3% Medium 20.8% High 20.8%	Foreign-born=61.5% *M* age at arrival=NR *M* years since immigration=NR
Iwamasa & Kooreman, 1995	US (Midwest)	*N*=90 Ethnicity n=NR (F=48.9%, M=51.1%)	Age range=NR, *M*=20.1 *SD*=NR ≥ HS =100%	Low-Med 50% Med-High 50%	Foreign-born=NR *M* age at arrival=NR *M* years since immigration=NR
Lee et al., 2005	US (CA)	*N*=55 Chinese n=55 (F=54.5%, M=45.5%)	Age range=18-43, *M*=31.5, 33.4[a] *SD*=4.6, 4.8[b] ≥ HS=90.9%	NR	Foreign-born: 97% *M* age at arrival=NR *M* years since immigration=NR
Haudek et al., 1998	US (CA)	*N*=25 Ethnicity n=NR (F=100%)	Age range=NR, *M*=18.8 *SD*=1.05 ≥ HS=100%	NR	Foreign-born=NR *M* age at arrival=NR *M* years since immigration=NR
Davis & Katzman, 1999	US (CA)	*N*=197 Chinese n=197 (F=47.2%, M=52.8%)	Age range=17-28, *M*=20.5 *SD*=2.14 ≥ HS=100%	High 42.6% Low 48.2%	Foreign-born=90% *M* age at arrival=NR *M* years since immigration=NR
Foss, 2001	US	N=30 Hmong n=15 Vietnamese n=15 (F=100%)	Age range=17-43, M=NR SD=NR ≥ HS=NR	NR	Foreign-born=NR M age at arrival=NR M years since immigration=NR
Shim & Shwartz, 2008	US (Midwest)	*N*=118 Korean n=118 (F=58.5%, M=41.5%)	Age range=18-64, *M*=32 *SD*=1.3 ≥ HS=87.5%	NR	Foreign-born=77.2% *M* age at arrival=NR *M* years since immigration=NR
Yoshimura, 1995	US (West Coast)	N=31 Japanese n=10 Chinese n=9 Korean n=6 Filipino n=4 Vietnamese n=2 (F=100%)	Age range=NR, *M*=35.5 *SD*=6.0 ≥ HS=NR	NR	Foreign-born=35.5% *M* age at arrival=NR *M* years since immigration=NR

Physical Health Outcomes					
Study	Setting/ Location	Asian Immigrant Sample (% Sex)	Sample Characteristics	Acculturation Categories	Immigration-related characteristics
Dodani & Dong, 2011	US (GA, KA, MO)	*N*=159 Indian n=159 (F=46%, M=54%)	Age range=35-65, *M*=53.1 *SD*=10.3 ≥ HS=NR	Low 26% High 67.7%	Foreign-born=NR *M* age at arrival=NR *M* years since immigration=NR
Chen et al., 2012	US (MD)	*N*=877 Korean n=282 Chinese n=297 Vietnamese n=268 (F=58.2%, M=41.8%)	Age range=18-56+, *M*=45 *SD*=13.47 ≥ HS=33.6%	NR	Foreign-born=97% Mean age at arrival=30 Years since immigration=NR
Lee et al., 2013	US (DC)	*N*=863 Korean n=290 Chinese n=298 Vietnamese n=275 (F=58.5%, M=41.5%)	Age range=NR, *M*=45 *SD*=NR ≥ HS=33.6%	Low 31% Medium 47.4% High 22%	Foreign-born=NR *M* age at arrival=NR *M* years since immigration=NR
Edrington et al., 2010	US (CA)	N=50 Chinese n=50 (F=68%, M=32%)	Age range=39-78, M=62.6 SD=11.7 ≥ HS=NR	NR	Foreign-born=78% M age at arrival=NR M years since immigration=18
Physical and Mental Health Outcomes					
Yang & Wang, 2011	Taiwan	*N*=203** Vietnamese n=203 (F=100%)	Age range=20-39, *M*=27.4 *SD*=4.6 ≥ HS=NR	Low 82.5% Medium and high 14.8%	Foreign-born=100% *M* age at arrival=NR *M* years since immigration=4.3

[a]Descriptives reported separately for females and males.
[b]Asian immigrant population living abroad.
AA=Asian American
NA=Not applicable
NR=Not reported
≥ HS= % with high school education and above

Table 2. Study Design Characteristics

	Mental Health Outcomes						
Study	Study Design & Recruitment	Theoretical Framework	Method of Data Collection	Year of Data Collection & Response Rate	Translated	Translation Version, Process	Modified SL-ASIA (besides translation)
Jackson *et al.*, 2006	Cross-sectional Convenience	Acculturative Stress, Westernization, Native Influence	Self-report mail-in survey	2002NR	No	NA	5 Questions added
Baker *et al.*, 2012	Cross-sectional Convenience	Acculturative Stress	Electronic (e-mail, website)	NR NR	No	NA	Shortened Scale
Iwamasa & Kooreman, 1995	Cross-sectional Convenience	NR	Self-report mail-in survey	NRNR	No	NA	NA
Lee *et al.*, 2005	Cross-sectional Convenience	ICU Parental Stress Framework, Asian American Assimilation Model	In-person structured interview	NRNR	Yes	Translation by native speaker	5 Questions added
Haudek *et al.*, 1999	Cross-sectional Convenience	Acculturative Stress	In-person structured interview, self-report survey	NRNR	No	NA	Shortened Scale
Davis & Katzman, 1999	Cross-sectional Convenience	NR	Self-report mail-in survey	NRNR	No	NA	NA
Foss, 2001	Cross-sectional Purposive/ Snowball	Belsky's Determinants of Parenting, Bridges' Stages of Transition	In person interview	NRNR	Yes	Translation by expert committee	NA
Shim & Shwartz, 2008	Cross-sectional Convenience	Acculturative Stress	Self-report mail-in survey	NR31%	Yes	Translation by native speaker	NA
Yoshimura, 1995	Cross-sectional Purposive	NR	Telephone interview, Self-report mail-in survey	NRNR	No	NA	NA

Physical Health Outcomes							
Study	Study Design & Recruitment	Theoretical Framework	Method of Data Collection	Year of Data Collection & Response Rate	Translated	Translation Version, Process	Modified SL-ASIA (besides translation)
Dodani & Dong, 2011	Cross-sectional Purposive/ Snowball	NR	In person interview, anthropometric measurement, self-report questionnaire	NR92%	Yes	NR	NA
Chen *et al.*, 2012	Cross-sectional Convenience/ Snowball	NR	In person interview, anthropometric measurement, self-report questionnaire	2009-2010NR	No	NA	Shortened Scale
Lee *et al.*, 2013	Cross-sectional Convenience/ Snowball	NR	In person interview, anthropometric measurement, self-report questionnaire	2009-2010NR	No	NA	Shortened Scale
Edrington *et al.*, 2010	Cross-sectional Convenience	NR	In person interview, anthropometric measurement, self-report questionnaire	NR76%	Yes	Translation by expert committee	Shortened Scale
Physical and Mental Health Outcomves							
Yang & Wang, 2011	Cross-sectional Convenience	Acculturative Stress	In person interview	2006-2007NR	Yes	Translation by expert committee	19 Questions added

NA=Not Applicable
NR=Not Reported

Table 3. Associations Between Acculturation and Health Outcomes

Mental Health Outcomes		
Study	Health Outcome	Association of Acculturation and Health Outcome
Jackson *et al.*, 2006	Disordered eating	No relationship
Baker *et al.*, 2012	Well-being	No relationship
Iwamasa & Kooreman, 1995	Mental health	Lower acculturation associated with lower mental health scores
Lee *et al.*, 2005	Stress	Higher acculturation associated with less stress
Haudek *et al.*, 1999	Disordered eating	No relationship
Davis & Katzman, 1999	Disordered eating	Higher acculturation associated with higher disordered eating scores
Foss, 2001	Post-traumatic stress	Lower acculturation associated with higher anxiety
Shim & Shwartz, 2008	Distress	No relationship
Yoshimura, 1995	Disordered eating	No relationship
Physical Health Outcomes		
Dodani & Dong, 2011	Coronary artery disease, type 2 diabetes	Higher acculturation associated with risk of type 2 diabetes
Chen *et al.*, 2012	BMI	Higher acculturation associated with higher BMI
Lee *et al.*, 2013	Self-rated health	Higher acculturation associated with better self-rated health
Edrington *et al.*, 2010	Pain intensity, pain interference	Lower acculturation associated with increased pain intensity/ interference
Physical and Mental Health Outcomes		
Yang & Wang, 2011	Self-rated mental well-being, self-rated physical well-being	Lower acculturation correlated with decreased mental and physical health scores

complexity of this construct. A more appropriate alternative is the use of psychometrically sound multiple-item scales that measure different aspects of acculturation, such as the SL-ASIA. Given differences in the cultural and contextual experiences of Asian-American subgroups, which likely result in qualitatively distinct acculturation processes across groups, the SL-ASIA is often adapted for use with different populations. Most of the included studies used adapted versions of the SL-ASIA, including modified and translated versions. Among studies using modified versions of this scale, few provided a rationale for the modification and only one study pilot tested the modified version and reported on its psychometric properties. Reducing or adding questions to the SL-ASIA may invalidate its equivalence to the original 21-item scale. As a result, it is recommended that future studies using modified versions of the SL-ASIA: (a) provide a rationale to justify that the modification being done is aimed to provide cross-cultural equivalence for the use of this measure with the target population; (b) conduct pilot testing to assess the psychometric properties of the modified version with the target population; and (c) report on its psychometric properties, as well as assess how they compare to those of the original version.

Also, some studies used translated versions of the SL-ASIA. However, of studies reporting the inclusion of foreign-born Asians, only a few reported on whether they provided participants with a choice for using a translated or an English version of the measure. If participants are not proficient in English, linguistic barriers may keep them from adequately comprehending questions. This could result in confounded results, which may not accurately reflect true associations. Future studies including foreign-born participants should always provide participants with a choice for the use of translated versions of measures, as well as report quantitative data on participants' language preference. Future studies would benefit from conducting prior formative research, which is crucial in studies of immigrant populations, to inform best practices for the intended study, including language preference (i.e., prevalent dialects when relevant) and average proficiency of the target population. Moreover, although most studies that used translated versions of the SL-ASIA reported on the translation methods used, the descriptions provided were insufficient to determine the quality of the translation process. Consistent with established and methodologically sound procedures, it is recommended that future translations of the SL-ASIA follow the 10-step translation process as outline by Geisinger (1994). This process includes: (a) translating and adapting the measure by a bilingual, expert team, (b) group review of the translated version by a bilingual, expert team, (c) adapting the measure based on comments by reviewers, (d) pilot-testing the translation, (e) field-testing the translated-instrument, (f) standardizing the scores, (g) performing validation research, (h) developing a manual or user guide for the measurement, (i) training users, and (j) collecting reaction from users.

Another complex issue in the assessment of acculturation is the widespread variation in how acculturation scores are reported. This was evident in the included studies, which varied widely depending on how scores were computed, that is,

as categorical (i.e., acculturation categories) or continuous variables (i.e., mean acculturation scores). The inconsistencies in how scores were reported made it difficult to compare results across studies, which is necessary to draw conclusions. According to the original scale, the SL-ASIA provides a total mean score, with higher scores reflecting higher levels of acculturation to Western culture. Nevertheless, current trends in the assessment of acculturation suggest that measures should provide information on acculturation from a bi-directional or multidimensional perspective, that is, report on acculturation to the Western culture, as well as preservation of the native culture. As a result, it is recommended that future studies consider incorporating the use of the additional five "theoretically" based questions that Suinn (1994) added to the end of the original SL-ASIA. These added questions assess values, behavioral competencies, and self-identity, as well as provide additional ways to categorize responses in a bidirectional way (Liu, Pope-Davis, Nevitt, & Toporek, 1999). The use of these added questions could facilitate the classification of subjects in multi-dimensional and orthogonal ways, including simultaneous Western and Asian identification. Future studies using these added questions should evaluate and report the psychometric properties of this longer version of the SL-ASIA. Reaching consensus on how to report scores for the SL-ASIA will allow for easier interpretation of results across studies in order to make more accurate generalizations on the association of acculturation and specific health outcomes among Asian immigrant populations.

Findings from physical health studies, specifically in regards to diabetes and obesity, were consistent with research in other immigrant populations. For example, higher obesity and diabetes rates were found to be associated with longer residence (a proxy measure of acculturation) in Mexican immigrant populations living in the U.S. (Sanghavi Goel, McCarthy, Phillips, Wee, 2004; Argeseanu Cunningham, Ruben, & Venkat Narayan, 2008). Similarities in immigrant physical health findings suggest that the immigration experience, including the acculturation process, have important health implications. Additional research is needed to better understand how the acculturation process affects health over time. This information is necessary for the development of internventions and policy among Asian immigrant populations. Similarly, the relatively few physical health studies included in this review highlight the need for additional studies to identify the association of acculturation and other important health outcomes, including those related to sexual health, infectious diseases, and cancer, among others.

Regarding mental health, the associations found between acculturation and mental health were mostly inconclusive, with some studies finding higher acculturation to Western culture to be associated with decreased mental health, and others finding no association. Similarly, among studies exploring disordered eating, one found that higher acculturation to the Western culture was associated with disordered eating, although this association was not supported in other studies. It is possible that inconsistencies in results across studies may stem from differences in versions of the SL-ASIA used, as well as in the diversity of the samples. To resolve the aforementioned inconsistencies, future studies should use consistent, comparable measures of acculturaiton and health, as well as reproduce studies with diverse and community samples. Moreover, it is recommended that additional studies explore the association of acculturation and culturally relevant concepts of distress (e.g., Cambodian *kyâl cup*, Chinese *shenjing shuairuo*; American Psychiatric Association, 2013), as well as that of acculturation and stress related disorders that may be associated to the immigration experience (e.g., adjustment disorder), in order to better contextualize the effect of acculturation on mental health among Asian subgroups. Additional research on acculturation and health among Asian immigrants is essential to understanding and address the complex health needs of this growing and diverse segment of the U.S. population. The effective integration of Asian immigrants into the communities they inhabit is essential to the health of the U.S. as a whole.

7. Limitations

Despite its contribution to the Asian immigrant health and acculturation literature, this review has some limitations. First, only studies of adult populations were included given that research on child and adolescent health and acculturation has largely focused on the impact of parent acculturation on child health. It is likely that the acculturation process of younger participants may differ to that of adult populations; thus, for parsimony only adult studies were included. Future studies should examine the association between child/adolescent health and acculturation. Second, only health outcome studies were included in this review, which limits the generalizability of findings across other types of health domains, such as health behaviors. A similar subsequent review is recommended to summarize associations found between acculturation, as measured by the SL-ASIA, and relevant health behaviors among Asian subgroups (e.g., use of health services), Third, comparison amongst studies was difficult due to differences in the reporting of acculturation levels, as well as the use of adapted versions of the SL-ASIA. Also, this study focus exclusively on the assessment of acculturation as measured by the SL-ASIA. Although there are other measures to assess acculturation among Asian populations, the SL-ASIA is the most widely used measure of acculturation in this population, and it has been previously found to have good psychometric properties. Finally, all of the included studies were cross-sectional in nature; thus, no causal inferences may be done from the included studies.

8. Conclusion

Effective and valid research stems from the appropriate and consistent use of measurements. These results emphasize the need for additional health outcomes studies with increased methodological rigor, more diverse immigrant samples, and use of methodologically sound translations of the SL-ASIA. This is essential to adequately identify the association between acculturation and various health outcomes relevant to Asian immigrants subgroups. Consistent with the literature on acculturation and health in the general population, the reviewed studies suggest that there are health effects of

acculturation among Asian populations, and that these effects vary across Asian subgroups and sex. Additional research is needed to resolve inconsistencies found across studies and to identify potential interaction effects of sex, age, and immigrant subgroups. As immigration trends continue into the future, the successful integration of these marginalized groups will increasingly depend on a comprehensive understanding of their health status and related health service needs.

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