


A Systematic Review of Physical Health Consequences and Acculturation Stress Among Latinx Individuals in the United States

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Biological Research for Nursing
2021, Vol. 23(3) 362-374
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DOI: 10.1177/1099800420968889
journals.sagepub.com/home/brn



Abstract

The health of Latinx immigrants decays over time and across generations. Acculturation stress influences decays in behavioral and mental health in this population, but the effect on physical health outcomes is less understood. This systematic review synthesizes findings from 22 studies that examined the influence of acculturation stress on physical health outcomes among Latinx populations in the United States. The Society-to-Cell Resilience Framework was used to synthesize findings according to individual, physiological, and cellular levels. There is mounting evidence identifying acculturation stress as an important social contributor to negative physical health outcomes, especially at the individual level. More research is needed to identify the physiological and cellular mechanisms involved. Interventions are also needed to address the damaging effects of acculturation stress on a variety of physical health conditions in this population.

Keywords

Hispanic Americans, acculturation, psychological stress, health

Immigrants appear to be healthier than the general population upon arrival to the United States (US), a phenomenon often described as the Immigrant Paradox, but their health significantly declines over time and across generations (Antecol & Bedard, 2006; Cho et al., 2004). For example, in a cross-sectional survey of legal immigrants in the US, those who had lived in the US for 1–5 years and 6–10 years had greater odds of reporting a decline in health ($AOR = 2.61$ and $AOR, 4.83$ respectively) than those who were in the US for less than 1 year (Lee et al., 2013). Other studies have demonstrated that second-generation and third-generation immigrants report worse physical and mental health outcomes than first-generation immigrants (Acvedo-Garcia et al., 2010; Lommel & Chen, 2016; Velasco-Mondragon et al., 2016).

The Latinx population (gender inclusive term for individual of Latin American descent living in the US) is an important immigrant group to consider as they comprise 18% of the total US population and represent 46% of immigrants to the US (US Census Bureau, 2016). The decay in health over time among Latinx immigrants in the US has resulted in disparities in obesity, hypertension control, mortality from diabetes, and mortality from liver disease as compared to non-Latinx White Americans (Centers for Disease Control and Prevention, 2015). Researchers have examined several explanations for declining health patterns among Latinx immigrants over time.

One explanation is that as Latinx immigrants acculturate to their new environment in the US, they begin to engage in more risky behaviors that can contribute to a decline in health, such as substance abuse, risky sexual behaviors, violence, and poorer mental health (Gonzalez-Guarda et al., 2011). Other studies have suggested that acculturation to the US contributes to declining mental and physical health outcomes such as depression, obesity, diabetes, cardiovascular disease, and all-cause mortality among Latinx immigrants to the US (Dey & Lucas, 2006; Goldman, 2016; Kaestner et al., 2009; Kaplan et al., 2004; L. Torres & Rollock, 2007). Some have found that stress associated with the process of acculturating to the US (i.e., acculturation stress) may explain the relationship between

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acculturation and health outcomes among Latinx immigrants (Finch et al., 2004; Koinis-Mitchell et al., 2011).

Acculturation stress within the context of the Latinx immigrant's experience consists of the exposure (i.e., stressor) and response (i.e., stress) to a series of common conditions that occur before, during, and after immigration. These experiences can include discrimination, economic and occupational hardship, language barriers, limited access to healthcare, changes in the dynamics and culture of the family, and trauma (Cervantes et al., 2016; Li, 2016). Undocumented Latinx immigrants can be particularly vulnerable to the exposure and consequences of these intersecting stressors (Ornelas et al., 2020). When acculturation stress is measured comprehensively, including economic and occupational, discrimination, immigration, and family/cultural domains, it has been found to be a robust predictor of the substance abuse, intimate partner violence, HIV risk, and depression syndemic, co-occurring epidemics that have synergistic effects on marginalized communities, for both Latinx males and females (Gonzalez-Guarda et al., 2016, 2012). Indeed, many studies have identified an association between acculturation stress and negative psychological and behavioral health outcomes among immigrant and Latinx populations (Cervantes et al., 2016; d'Abreu et al., 2019; Lai et al., 2017; Vega et al., 1998). However, less is known about the physical health consequences associated with acculturation stress among Latinx immigrants.

Chronic exposure to stress among racial and ethnic minority groups is a well-documented social determinant of health. Research has demonstrated that chronic exposure to stress can interfere with physiologic stress responses, resulting in increased wear and tear on the body (i.e., allostatic load); additionally, individuals may adopt unhealthy behaviors to cope with chronic stress, ultimately resulting in the development of disease (Djuric et al., 2008). An emerging body of research is exploring how disparities in chronic stress exposure, such as facing discrimination or living in resource-deprived neighborhoods, contribute to disparities in health among racial and ethnic minorities (American Psychological Association, 2017). For example, there is evidence for a relationship between chronic stress and disparities in depression, cancer, and cardiovascular disease among African Americans. The link between stress and physical health outcomes has also been supported among Latinx populations. For example, discrimination stress has been found to have a negative effect on both mental and physical health outcomes, such as depressive symptoms and high blood pressure among Latinx immigrants (Cano et al., 2015; A. M. Ryan et al., 2006; Siordia & Covington-Ward, 2016).

A body of evidence synthesis research exists documenting the relationships between chronic stress and physical health outcomes in the general population. Numerous systematic reviews and meta-analyses have reported associations among chronic stress and "wear and tear" on the body as evidenced by shortened telomere length (Mathur et al., 2016; Oliveira et al., 2016; Schutte & Malouff, 2016), blunted cortisol awakening response (CAR; Fogelman & Canli, 2018), inflammatory biomarkers (Coelho et al., 2014; T. V. Johnson et al., 2013),

and cellular damage (Picard & McEwen, 2018). Others have documented the impact of sources of chronic stress on physical health outcomes such as metabolic syndrome (Bergman et al., 2014), hypertension (Sparrenberger et al., 2009), and broad indicators of poor health such as self-reported health status, acute and recurrent infections, body mass index (BMI), hospitalization (Spencer et al., 2013). Additionally, sources of chronic psychosocial stress which may be particularly impactful among racial and ethnic minorities (i.e., discrimination) have been consistently linked to increased hypertension risk (Dolezsar et al., 2014; Hill & Thayer, 2019). Others have reported on the contribution of allostatic load to health and health disparities (Beckie, 2012). Combined, these reviews support the detrimental impact that stress has on health, especially among racial and ethnic minority groups and other vulnerable populations.

There has also been recent attention to understanding links between acculturative stress and behavioral health disparities among Latinx immigrants. Existing evidence syntheses have focused on characterizing the constructs of acculturation and acculturative stress (Bekteshi & Kang, 2018; Caplan, 2007; Kuo, 2014; McDermott-Levy, 2009; Page, 2006). Notably, one of these reviews focused on describing the protective and risk factors associated with acculturative stress (Bekteshi & Kange, 2018). There has also been some focus on understanding the impact of acculturation, but not acculturative stress, on mental health symptoms (Alhasanat & Guirgescu, 2017). Despite the notable efforts undertaken to explore the impact of acculturative stress, little is known about the role that acculturation stress specifically plays in influencing physical health outcomes among the Latinx population in the US. To our knowledge, there are no published systematic reviews or meta-analyses documenting the impact of acculturative stress on physical health. The purpose of this paper is to address this critical need by systematically reviewing the literature exploring the physical health consequences associated with acculturation stress among Latinx individuals. More specifically, we sought to answer the following question: Are Latinx individuals with higher levels of acculturation stress more likely to experience poor physical health than Latinx with lower levels of acculturation stress?

Society-to-Cell Resilience Framework

The Society-to-Cell Resiliency Framework (Szanton & Gill, 2010) was used to guide this systematic review (see Figure 1). The Society-to-Cell Resiliency Framework is an ecological model that helps to identify the response to stress present across multiple levels – societal, community, family, individual, physiological, and cellular. In the context of this systematic review, we applied this framework to explore the impact that stressors present in the societal, community, and individual level have on the potential manifestation of this stress at the individual (e.g., disease, condition, or self-reported symptoms), physiological (e.g., elevated cortisol levels), and cellular level (e.g., epigenetic changes). Additionally, given the focus of resilience

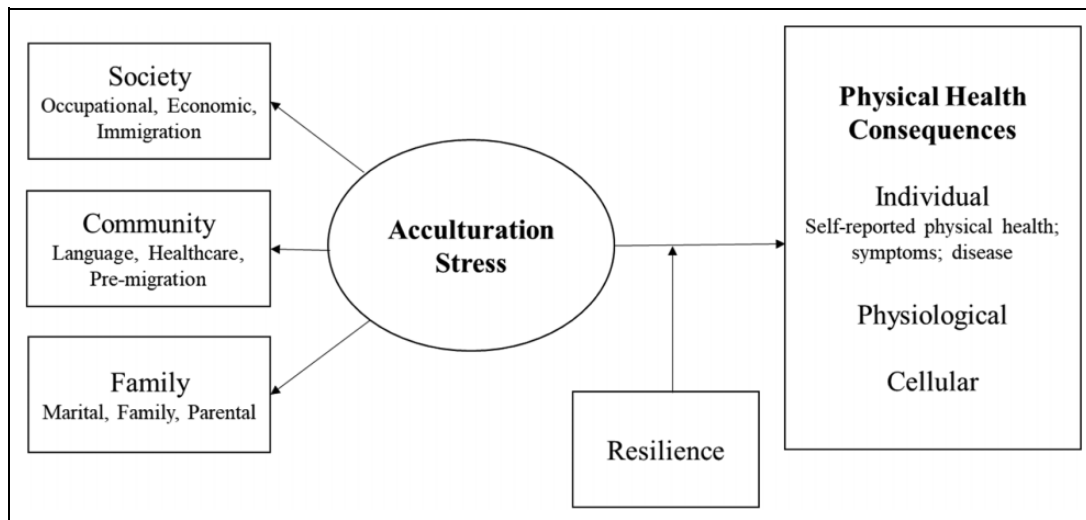


Figure 1. Framework guiding systematic review. *Source:* Adapted from the Society-to-Cell Resilience Framework (Szanton & Gill, 2010).

of this framework, we will also synthesize factors that help Latinx communities resist, rebound, or recover from challenges in life related to acculturation.

Method

Search Strategy

This systematic review is reported according to the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009). A research librarian (JC) designed the search strategy in consultation with the research team and then performed the searches in 4 databases: PubMed, Cumulative Index of Nursing and Allied Health Literature Plus with Full Text (EBSCOhost), APA PsycInfo (EBSCOhost), and Scopus. The librarian searched the databases from their dates of inception through the last search date of May 22, 2020.

The search was initially performed in PubMed using a combination of keywords and MeSH terms and then translated into the other databases. Concepts for the Latinx population, acculturation, and stress were included. The complete PubMed search strategy was as follows: (“hispanic americans”[MeSH Terms] OR Hispanic[tiab] OR Hispanics[tiab] OR “Spanish American”[tiab] OR “Spanish Americans”[tiab] OR Latinx[tiab] OR Latina[tiab] OR Latinas[tiab] OR Latino[tiab] OR Latinos[tiab] OR Mexican[tiab] OR Mexicans[tiab] OR Chicana[tiab] OR Chicanas[tiab] OR Chicano[tiab] OR Chicanos[tiab] OR “Puerto Rican”[tiab] OR “Puerto Ricans”[tiab] OR Cuban[tiab] OR Cubans[tiab] OR Dominican[tiab] OR Dominicans[tiab] OR “South American”[tiab] OR “South Americans”[tiab] OR “Central American”[tiab] OR “Central Americans”[tiab]) AND (Acculturation[mesh] OR Accultur*[tiab]) AND (“Stress, Psychological”[mesh] OR “stress, physiological”[mesh] OR Stress[tiab] OR stresses[tiab] OR stressor[tiab] OR stressors[tiab] OR stressed[tiab] OR stressing[tiab] OR stressful[tiab] OR suffering[tiab] OR

anguish[tiab] OR anguished[tiab] OR distress[tiab] OR distresses[tiab] OR distressed[tiab] OR distressing[tiab])) NOT (Editorial[ptyp] OR Letter[ptyp] OR Case Reports[ptyp] OR Comment[ptyp]). No language or date filters were applied. This systematic review did not involve human subjects research and therefore did not require approval from the institutional review board.

Article Selection

The references identified from the search process were imported into Covidence© (Veritas Health Innovations) and duplicates were removed. Two reviewers independently reviewed titles and abstracts. Relevant articles were then obtained, and the full-text of these articles were reviewed according to our inclusion criteria. Published research was included if the study: 1) Consisted of a sample of primarily Latinx participants (>50% of participants) or analyzed their results according to Latinx ethnicity; 2) measured an independent variable that was described as acculturation stress; 3) included an outcome variable that can be classified as a physical health consequence on the individual (i.e., presence of disease or symptoms), physiological (e.g., elevated blood glucose or salivary cortisol), or cellular level (e.g., DNA methylation); and 4) was conducted in the US. Conference presentations, book chapters, published abstracts, editorials, letters, case reports, and qualitative research studies were excluded.

Two independent screeners (RG and DB) completed the full-text screening of articles for inclusion. When conflicts arose regarding inclusion or exclusion of articles, the screeners engaged in discussion to reach consensus. Following full-text screening, 2 other co-authors (AS and GN) assessed the quality of the articles using quality assessment tools of the National Heart, Lung, and Blood Institute of the National Institutes of Health (NIH) for quality assessments of Observational Cohort and Cross-Sectional Studies, Case Control Intervention Studies,

Table 1. Data Extraction Table.

Authors	Sample	Methods	Results
Ai & Lee (2021)	Latinx adults from diverse countries across the US (N = 1,427)	Cross-sectional survey measuring acculturative stress, discrimination, and BMI	Discrimination was positively related to BMI, while acculturative stress was negatively associated with BMI.
Alcántara et al. (2019)	Latinx adults from diverse countries of origin in 4 metropolitan cities (N = 1,192)	Cross-sectional survey measuring acculturative stress, ethnic discrimination, insomnia, sleep duration, sleep efficiency, and sleep variability.	Acculturative stress was associated with self-reported insomnia symptoms. Employment status moderated relationship between acculturative stress and insomnia symptoms, such that the relationship is stronger among unemployed compared to employed individuals. Acculturative stress and ethnic discrimination were not associated with sleep duration, efficiency, or variability.
Alcántara et al. (2017)	Latinx adults from diverse countries of origin in 4 large metropolitan cities (N = 5,313)	Cross-sectional survey measuring acculturative stress, insomnia, daytime sleepiness, and sleep duration	Acculturative stress was positively associated with insomnia symptoms and daytime sleepiness. In full model, acculturative stress was only related to daytime sleepiness.
Balcazar et al. (1997)	Pregnant women of Mexican heritage in Arizona (N = 500)	Cross-sectional survey measuring acculturative stress and birth outcomes	No significant relationships between acculturative stress and birth outcomes
Cariello et al. (2019)	Latinx immigrants from diverse countries of origin living in southeastern urban city and surroundings (N = 202)	Cross-sectional survey measuring acculturation stress, discrimination, anxiety, enculturation, and physical health	Acculturative stress and discrimination had direct effects on physical health, as well as indirect effects through anxiety
D'Alonzo et al. (2019)	Premenopausal women of Mexican heritage in New Jersey (N = 59)	Case-control survey measuring acculturative stress and allostatic load	For US women, acculturative stress was not associated with total allostatic load score but was associated with waist-to-hip ratio.
Ehlers et al. (2010)	Adults with Mexican heritage in California (N = 294)	Cross-sectional survey measuring acculturation stress and sleep quality	Individuals who did not report acculturative stress had better sleep quality and took less time to fall asleep than those who reported acculturative stress.
Finch et al. (2001)	Adults with Mexican heritage in California (N = 3,012)	Cross-sectional survey measuring acculturation stress, acculturation, social support, and perceived physical health	Language conflict was negatively associated with perceived physical health. English language acculturation and instrumental social support were positively associated with perceived physical health.
Finch & Vega (2003)	Adults with Mexican heritage in California (N = 3,012)	Cross-sectional survey measuring acculturation stress, acculturation, social support, religiosity, and perceived physical health	Discrimination stress, language conflict, and legal stress were positively associated with self-report of fair/poor physical health. English language use, religious support seeking, presence of emotional support person, instrumental support, and having family in US were negatively associated with report of fair/poor physical health.
Finch et al. (2004)	Mexican migrant farm workers in California (N = 999)	Cross-sectional survey measuring acculturation, acculturation stress, social support, religiosity, and perceived physical health	Individuals living the US for >10 years and experiencing language conflict reported worse physical health. Instrumental support and spiritual beliefs were positively associated with perceived physical health.

(continued)

Table 1. (continued)

Authors	Sample	Methods	Results
Garcia et al. (2017)	Adults of Mexican heritage in Texas ($N = 89$)	Cross-sectional survey measuring acculturation, acculturative stress, self-reported health, and cortisol activation response (CAR)	Acculturative stress and CAR were negatively related to self-reported health. CAR values were positively related to self-reported health after controlling for covariates. There was a significant acculturative stress \times time interaction indicating that blunted/lower CAR was observed in those reporting higher acculturative stress. The relationship between level of acculturative stress and self-reported health was partially mediated by CAR.
Kimbro et al. (2012)	Adults from Mexican, Cuban, and Puerto Rican Heritage across the US ($N = 2,522$)	Cross-sectional survey measuring acculturation, acculturative stress, discrimination, family cultural conflict, negative social exchanges, co-ethnic ties, neighborhood trust, social support, and self-rated health	Spanish language dominance was associated with poorer self-reported health than being bilingual for Cubans and Puerto Ricans, but not Mexicans. More experiences of discrimination were associated with better self-rated health only for Mexicans. Negative social exchanges were associated with better self-rated health among Cubans and Mexicans, but not Puerto Ricans. Positive social support and remitting money to relatives was associated with better self-rated health only among Cubans.
Koinis-Mitchell et al. (2011)	Children and caregivers of Dominican and Puerto Rican heritage in Rhode Island ($N = 232$)	Cross-sectional survey measuring acculturative stress, family cohesion, social networks, asthma severity, and asthma morbidity	Caregiver nativity (island PR vs. DR) significantly predicted cultural stress and ED visits. Cultural stress predicted ED visits for asthma. Resiliency factors were not predictive of asthma outcomes.
Maldonado et al. (2018)	Latinx college students from diverse countries of origin in California ($N = 154$)	Cross-sectional survey measuring acculturative stress and inflammatory biomarkers	Acculturative stress was not associated with C-Reactive Protein (CRP) or Interleukin 1.
Marchante-Hoffman (2018)	Latinx children ages 7–17 from diverse countries of origin in Florida ($N = 152$)	Cross-sectional survey measuring acculturative stress, somatic symptoms, sleep problems, BMI, and blood pressure	Acculturative stress was positively associated with somatic symptoms and sleep problems. Acculturative stress was negatively associated with BMI, but not associated with blood pressure. Relationship between exposure to trauma and somatic symptoms was moderated by acculturative stress, such that the relationship between trauma and somatic symptoms was significant for those who had higher levels of acculturative stress, but not significant for those with low levels.
Munoz Diaz (2015)	Latinx adults aged 45–75 from diverse countries of origin in 4 large metropolitan cities ($N = 3,132$)	Longitudinal survey measuring acculturative stress and self-reported physical health	Acculturative stress was not significantly associated with physical health.
Potochnick et al. (2019)	Latinx youth aged 8–16 years and parents in 4 large metropolitan cities ($N = 1,362$)	Cross-sectional survey measuring parent and child acculturative stress and child BMI	Neither parent nor child acculturative stress moderated the relationship between household food insecurity and child BMI. Effect of acculturative stress on BMI was not examined.

(continued)

Table 1. (continued)

Authors	Sample	Methods	Results
Ro & Bostean (2015)	Latinx adults from diverse countries of origin across US ($n = 1,356$ Latinx participants)	Cross-sectional survey measuring level of acculturation, acculturative stress, interpersonal discrimination, ethnic identity, family cohesion, and BMI.	Among men, English proficiency and acculturative stress were not associated with BMI. Among women, family cohesion, discrimination, and acculturative stress were associated with BMI. The relationship between acculturation and BMI among women was partially mediated by acculturative stress; with longer time in the US, Latina women report lower acculturative stress, which is associated with higher BMI.
Rodriguez Diaz (2017)	Latinx adults in Illinois and Florida ($N = 58$; $n = 15$ Latinx)	Cross-sectional survey measuring acculturative stress, sleep, BMI, and metabolic syndrome indicators	Latinx ethnicity did not moderate the relationship between acculturative stressors and health outcomes.
Simmons & Limbers (2019)	Latinx middle and high school students in Texas ($N = 168$)	Longitudinal survey measuring acculturative stress and BMI change over time	BMI at time one and discrimination stress subscale at time 1 were positively associated with BMI change over time.
L. Torres et al. (2018)	Latina women ($N = 18$)	Cross-sectional survey measuring acculturative stress, diurnal cortisol, and CAR	Diurnal cortisol levels and CAR were not associated with acculturative stress. Low acculturative stress group showed a higher CAR than high acculturative stress group. There was a time by acculturative stress group interaction with a flatter diurnal cortisol curve among the high acculturative stress group compared to low acculturative stress group.
Waldman et al. (2019)	Latinx immigrants of various countries of origin across the US ($N = 2,653$; $n = 1,346$ Latinx)	Cross-sectional survey measuring acculturative stress and disability	Self-care, mobility, and disability total score were positively related to acculturative stress.

Note. BMI = Body Mass Index; CAR = Cortisol Awakening Response; CRP = C Reactive Protein; CRH = Corticotrophin Releasing Hormone; CVD = Cardiovascular Disease; DR = Dominican Republic; EBV = Epstein Barr Virus; ED = Emergency Department; NTD = Neural Tube Defect; P:E Ratio = Progesterone Estradiol Ratio; PR = Puerto Rico; SES = Socioeconomic Status; US = United States.

and Controlled Intervention Studies (National Heart, Lung, and Blood Institute, 2014). All tools assessed the internal validity and risk of bias using similar items. These authors reviewed each of the included studies to reach consensus on the corresponding quality appraisal items. Each item was rated “yes,” “no,” or “other” (i.e., cannot determine; not applicable; not reported), and based on these results, overall quality ratings were derived for each study. When conflicts arose regarding individual items on the aforementioned tools, the screeners engaged in discussion to reach consensus. One article was rated an overall quality of “good.” Twenty-one articles were rated as “fair,” and no articles were rated as “poor” (see Online Appendix).

Data Extraction and Analysis

Data was independently extracted by 2 authors (AS and GN) using a data collection form designed by the research team.

This form contained fields to collect information on the authors, study purpose, study design, sample and setting, measures of stress and resiliency, measures of physical health consequences, and main study findings. The Society-to-Cell Framework was used to structure data analysis. Findings regarding acculturative stressors and physical health consequences were synthesized across studies and placed into categories based upon their levels in the Society-to-Cell Framework and specific physical conditions that were examined within these levels (see Table 1).

Results

Description of Studies

Twenty-two articles were selected for inclusion in this systematic review (see Figure 2). Research on the physical health

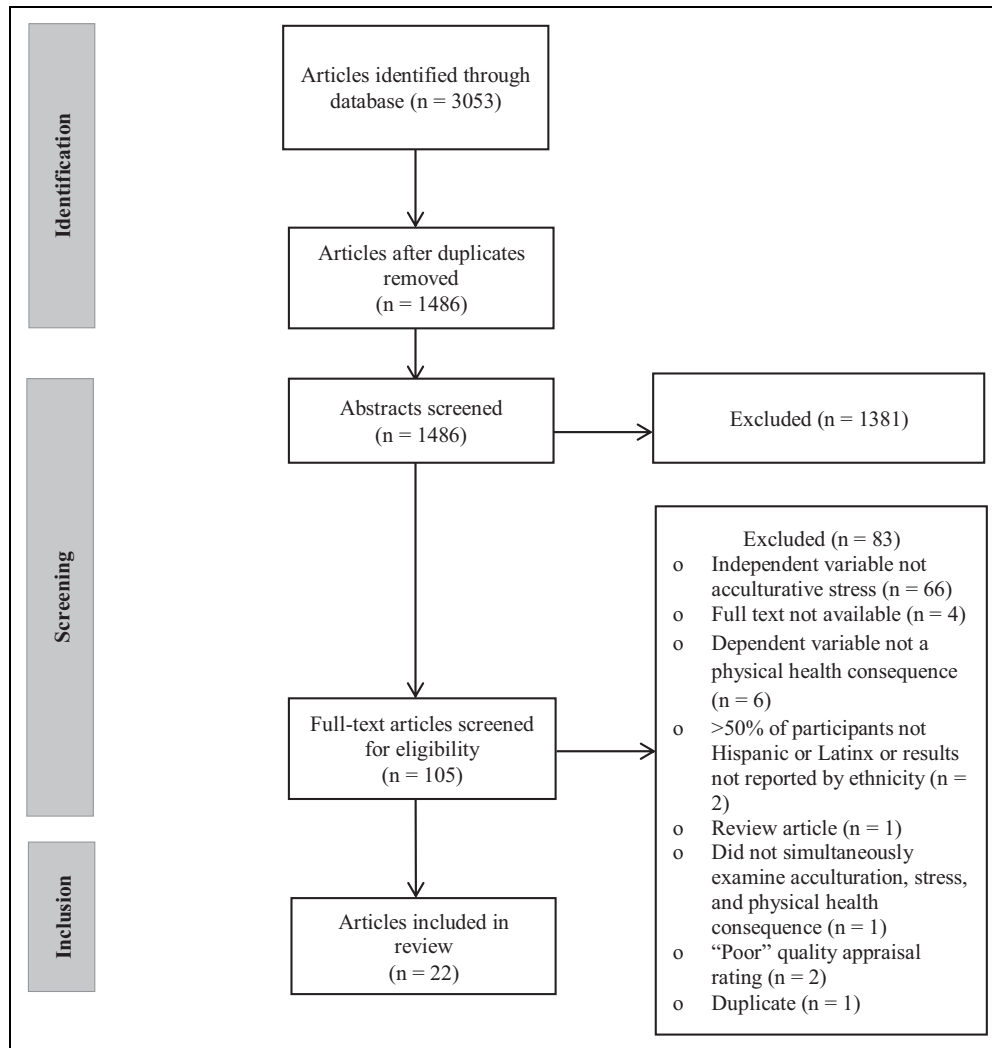


Figure 2. PRISM flow diagram acculturation stress and physical health outcomes literature among Latinx.

consequences of acculturation stress among Latinx populations has increased over time with the majority of included studies being published in the past 5 years ($n = 16$). The majority of the articles were cross-sectional in design ($n = 37$), with a smaller proportion using case control ($n = 1$) and longitudinal designs ($n = 2$). The sample sizes ranged from 15 to 5,313 Latinx participants and included healthy adults ($n = 12$), adult women ($n = 3$), and youth ($n = 3$). The majority of studies included diverse samples of Latinx individuals ($n = 14$); however, there were a significant number of studies exclusively examining acculturation stress and physical health among individuals of Mexican origin ($n = 8$). The majority of research was also collected from samples in major Latinx receiving communities such as California, Texas, New York, and Florida, and a segment of these studies included national samples ($n = 7$). The majority of the studies addressed physical health consequences at the individual level ($n = 19$), followed by the physiological level ($n = 5$). There were no studies examining the physical health consequences of acculturation stress at the cellular level.

Individual Health

Studies examining the relationships between acculturation stress and physical health at the individual level examined associations across the lifespan including: 1) birth outcomes among pregnant women (Balcazar et al., 1997), 2) asthma and blood pressure among children (Koinis-Mitchell et al., 2011; Marchante-Hoffman, 2018), 3) BMI in children and adults (Ai & Lee, 2021; Marchante-Hoffman, 2018; Potochnick et al., 2019; Ro & Bostean, 2015; Rodriguez Diaz, 2017; Simmons & Limbers, 2019), 4) sleep (Alcantara et al., 2017, 2019; Ehlers et al., 2010; Marchante-Hoffman, 2018), 5) self-reported physical health (Cariello et al., 2019; Finch et al., 2001; Finch & Vega, 2003; Marchante-Hoffman, 2018; Rodriguez Diaz, 2017), and 6) disability among adults (Waldman et al., 2019).

Birth outcomes. One study examined the relationships between acculturation stress, within the context of acculturation

patterns, coping strategies, and social support (Balcazar et al., 1997). This study did not find any effects of these variables on previous pregnancy outcomes among pregnant Latinas, which included previous low birthweight, preterm delivery, fetal or neonatal deaths, and spontaneous abortion.

Asthma. One study examined the effect of acculturative stress, family cohesion, and social network on asthma severity and morbidity among children of Dominican and Puerto Rican heritage in Rhode Island (Koinis-Mitchell et al., 2011). Acculturation stress predicted emergency department visits for asthma. Acculturation stress mediated the relationship between the nativity of the caregiver and asthma morbidity as measured by emergency department visits related to asthma. In fact, caregivers who reported being born in Puerto Rico experienced higher levels of acculturation stress when compared to caregivers from the Dominican Republic and, in turn, were more likely to report asthma visits.

Blood pressure. One study examined the influence of acculturation stress on high blood pressure among children from diverse countries of origin in Florida. Acculturation stress was not found to influence blood pressure among children (Marchante-Hoffman, 2018). This may be because more time is needed to see an impact on this type of stress, especially if it persists throughout the lifespan.

BMI. BMI is one of the more studied health conditions within the context of acculturation among Latinx communities and functions as an important risk factor for development of cardiometabolic conditions. However, inconsistent relationships between acculturation, acculturation stress, and BMI have been noted in the literature. It appears that time in the US, generational status, and experience with discrimination are all positively associated with weight gain, BMI, and obesity (Ai & Lee, 2021; Ro & Bostean, 2015; Simmons & Limbers, 2019). However, when acculturation stress is considered within these models, these relationships appear more complex. Various studies have found that acculturation stress is inversely related to BMI among women and children (Marchante-Hoffman, 2018; Ro & Bostean, 2015). In a study examining mediators between time in the US and BMI, a significant indirect pathway through acculturation stress was noted for women but not for men (Ro & Bostean, 2015). Unlike what was hypothesized, acculturation stress was inversely related with BMI in this sample. In other words, the more time in the US, the less acculturation stress was experienced, and, in turn, this was associated with a higher BMI. The negative relationship between acculturation stress and obesity was also documented in other studies including a Mexican sample of Latinas (Ai & Lee, 2021) and children (Marchante-Hoffman, 2018; Potochnick et al., 2019). Nevertheless, one study found that acculturation stress was significantly and positively associated with waist-to-hip ratios among Mexican women in the US (D'Alonzo et al., 2019). This latter measure may be a more

reliable approach to measuring effects of stress in this population.

Sleep. Acculturation stress was consistently positively associated with sleep, including insomnia symptoms, sleepiness symptoms, sleep quality, and time to sleep, even when accounting for other related physical (e.g., cardiovascular disease) and psychological co-morbidities (e.g., depression) among both adults and children (Alcantara et al., 2017, 2019; Ehlers et al., 2010; Marchante-Hoffman, 2018). For example, in a study examining acculturation stress, ethnic discrimination, chronic stress, and self-reported sleep outcomes within the Community Health Study of Latinos, acculturation stress was the only variable that was significantly associated with daytime sleepiness (Alcantara et al., 2017). Employment status appears to further enhance the effects of acculturation stress on sleep. For example, in a study examining adults without a history of sleep disorders in the Study of Latinos, the relationship between acculturation stress and sleep was stronger among individuals who were unemployed than those who were (Alcantara et al., 2019).

Physical health. Various studies examined the influence of acculturation stress on overall self-reported physical health. The majority of these studies found that acculturation stress was related to poorer perceived physical or overall health (Cariello et al., 2019; Finch et al., 2001; Finch & Vega, 2003; Finch et al., 2004; Garcia et al., 2017). Finch and Vega (2003) examined the effect of multiple sources of acculturation stress concurrently (i.e., discrimination, language conflict, legal status). They noted while there was a cumulative effect of these acculturation stressors on physical health, legal status stress was the only acculturation stress-related variable that remained significant in an adjusted model. Others have also noted that unplanned or forced migration is also associated with poorer physical health for Latinx immigrants (J. M. Torres & Wallace, 2013). There was just one study included in this review that did not find a relationship between acculturation stress and self-reported physical health. However, this study did note effects of acculturation stress on cognitive domains associated with aging, such as word fluency, verbal learning, and psychomotor speed (Munoz Diaz, 2015).

There are a variety of protective factors that emerge from research examining the impact that acculturation stress has on physical health. These include social support, such as having more peers and family in the US, emotional and instrumental support, sense of control, remitting money to relatives, religious support, and spiritual beliefs (Finch et al., 2001, 2004; Kimbro et al., 2012). In fact, in a study of Mexican immigrants in California, religious support and instrumental support moderated the relationship between discrimination stress and self-rated physical health (Finch & Vega, 2003). However, the influence of language as a protective factor for physical outcomes remain unclear. Research has found that English proficiency is positively associated with self-reported physical health (Finch et al., 2001; Kimbro et al., 2012), but English

language use can also serve as a risk factor when used as a proxy for acculturation (Finch & Vega, 2003). It is important to note, however, that the nature of the relationship between language dominance and use and health outcomes differs across sub-groups. For example, in the study conducted by Kimbro et al. (2012), associations between being bilingual and overall self-rated health were documented for Cubans and Puerto Ricans, but not Mexicans.

Disability. One study in this review examined the influence of acculturation stress and disability among a national sample of Latinx immigrants from various countries of origin and found that acculturation stress was related to self-care, mobility, and disability (Waldman et al., 2019).

Physiological Health

The effects of acculturation stress on physiological health among Latinx was examined to a lesser extent and included allostatic load ($n = 1$), hormones ($n = 2$), and inflammatory markers ($n = 1$) as health outcomes.

Allostatic load. One study examined the influence of acculturation stress on allostatic load, a composite of biomarkers to assess the “wear and tear” of chronic stress on the body, among Mexican and Mexican immigrant women (D’Alonzo et al., 2019). Acculturation stress was not associated with total allostatic load (systolic and diastolic blood pressure, BMI, waist-to-hip ratio, total cholesterol, hemoglobin A1C, triglycerides and C-reactive protein). However, this was within a small sample of Mexican women ($N = 59$). Researchers did report a relationship between acculturation stress and waist-to-hip ratio.

Hormones. Two studies examined the roles that stress, cortisol, and other hormones play in influencing health among Latinx individuals. These studies suggest that there is a blunted cortisol awakening response (CAR) among adults with higher levels of stress or among individuals with a stronger Anglo orientation (Garcia et al., 2017; L. Torres et al., 2018). For example, Garcia et al. (2017) found that CAR mediated the relationship between acculturation stress and self-reported health in Mexican Americans, but this relationship was complex. Acculturation stress was inversely associated with CAR, indicating a blunted response. There was a significant acculturative stress and time interaction indicating that different levels of acculturation stress were associated with a unique CAR, with blunted CAR responses being associated with higher levels of acculturation.

Inflammatory markers. Only one study included in this review examined the association between acculturation stress and salivary inflammatory markers among Latinx college students in California. They did not find a relationship between acculturation stress and the inflammatory markers assessed which included C-Reactive Protein (CRP) and Interleukin 1 (Maldonado et al., 2018). However, they did note that CRP

moderated the relationship between acculturation stress and anxiety, whereas when CRP levels were low, there was a positive association between acculturation stress and anxiety symptoms. Other unmeasured stressors and inflammatory markers may also be involved.

Discussion

This systematic review synthesizes findings from 22 studies examining the influence of acculturation stress on physical health outcomes among Latinx populations. The Society-to-Cell Resilience Framework was used to synthesize findings according to individual, physiological, and cellular levels (Szanton & Gill, 2010). Overall, there is mounting evidence identifying acculturation stress as an important social contributor to negative physical health outcomes in this population, especially at the individual level. In fact, there are consistent findings supporting the associations between acculturation stress and poorer sleep outcomes and self-rated physical health among adults. Although studied to a lesser extent, similar trends were observed for the influence of acculturation stress on asthma among children and disability among older adults. Protective factors such as having strong family/social and religious support and spirituality serve to buffer the impact that acculturation stress has on physical health (Finch et al., 2001, 2004; Finch & Vega, 2003). There is preliminary evidence emerging describing the impact that acculturation and acculturation stress have on physiological health outcomes such as stress hormones, especially the CAR. Yet this literature is scant and includes a narrow examination on inflammatory cytokines and hormone levels, and no studies to date have examined effects on cellular outcomes. More research is needed to help delineate the physiological and cellular processes involved in linking acculturation stress to declines in health among Latinx over time and across generations.

The findings from this systematic review are consistent with the literature documenting the negative impact that acculturation stress has on behavioral and mental health outcomes (Cervantes et al., 2016; Gonzalez-Guarda et al., 2016), which can partly explain the decaying physical health pattern documented in this review. The findings from this review are also aligned with the findings from evidence syntheses documenting the biological impact of stress on inflammatory markers such as CAR (Coelho et al., 2014). More research is needed to determine if acculturation stress serves as a type of stress that impacts hormones, inflammatory markers, and cellular processes such as telomere shortening, as systematic reviews on other types of stressors have noted (Mathur et al., 2016; Schutte & Malouff, 2016). A recent study examining the relationship between acculturation and telomere length among pregnant women found that greater acculturation was associated with shorter telomeres (accelerated aging; Ruiz et al., 2017). However, this study did not include acculturation stress in their model. More research is needed to differentiate the physiological and cellular effects of acculturation and acculturation stress.

The direction in the relationship between acculturation stress and physical health outcomes documented among Latinx populations were observed differently for BMI. In fact, several studies documented that acculturation stress was inversely related to BMI, demonstrating that as individuals experienced more acculturative stress, they had lower BMIs (Marchante-Hoffman, 2018; Ro & Bostean, 2015). However, acculturation may be confounding the effect acculturation stress has on BMI, given the potential impact that acculturation has on behaviors related to BMI such as diet, nutrition, and physical activity. Nevertheless, there is much ambiguity in the literature regarding the effects of acculturation on diet and nutrition among Latinx immigrants in the US (Ayala et al., 2008; Perez-Escamilla, 2011), and stress has not been considered as part of this research. Additionally, neighborhood-level factors such as neighborhood poverty also influence these relationships (Abraido-Lanza et al., 2016). More research is needed to tease out the effects that acculturation, acculturation stress, neighborhood factors, and other stressors have on health behaviors, BMI, and other factors related to cardiometabolic health.

There are several limitations to be considered when interpreting the results from this systematic review. First, studies varied in how comprehensively they measured acculturation stress. For example, measures ranged from less than 10 items assessing the stress resulting from cultural adaptation (Vega et al., 1998) to the 59 items included in the Hispanic Stress Inventory (Cervantes et al., 2016), which measures acculturation stress according to immigration, occupation/economic, parental, marital, and family stress domains. The variation in these measures limited our ability to precisely assess the impact of specific types of acculturation stressors (e.g., discrimination vs. cultural) on physical health outcomes. Additionally, it appears that scholars use the terms “acculturation” and “acculturation stress” interchangeably, at times use proxies for acculturation, such as preferred language of survey and self-reported nativity, and often include analysis that tease out the effects of acculturation and the stress associated with this process. This limited these studies in examining the “the dynamic, interactive, and developmental nature of the acculturation process” (Garcia et al., 2017, p. 788) as it relates to physical health. Lastly, it appears that sex and country of origin may moderate the relationship between acculturation stress and physical health outcomes. For example, sex was found to moderate the relationship between acculturation stress and BMI (Ro & Bostean, 2015), and the influence of being bilingual on self-reported physical health was different for Puerto Rican and Dominican participants compared to Mexicans (Kimbrot et al., 2012). Because few studies analyzed their results according to sub-groups, we were unable to describe how acculturation stress effects may vary according to different identities.

Despite these limitations, the findings from this systematic review highlight the need for interventions to prevent exposure to acculturation-related stressors and reduce stress as a way to prevent decaying health in the Latinx population as they acculturate to US society. Various studies indicated that being

bicultural appears to be protective in reducing the impact that acculturation stress had on individual physical health (Kimbrot et al., 2012). Interventions that promote positive integration into US society while simultaneously encouraging Latinx individuals to maintain a positive ethnic and cultural identity of origin appears to be a promising approach. Additionally, being able to continue to support family in one’s country of origin (e.g., financial remittances) and receive support from family while in the US appears to be a positive social contributor to physical health (Finch et al., 2001, 2004). With this in mind, social policies should consider the population health effects that family separations can have on acculturative stress and subsequent health outcomes of Latinx immigrants. Lastly, there is emerging evidence for the effectiveness of mindfulness practices and acceptance-based therapies on positive coping and mental and physical health outcomes (D. Ryan et al., 2018; Soriano et al., 2009). These approaches appear appropriate in addressing the negative health effects of acculturation stress and should be adapted and tested with Latinx communities in the US, especially in subpopulations with the highest levels of stress.

Authors’ Note

The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Author Contributions

All authors contributed to the conceptualization of the manuscript. RGG was responsible for leading the systematic review. JC conducted the search and retrieved the articles. RGG and DB reviewed the manuscripts for inclusion. AS and GN extracted data and conducted the quality appraisal. RGG synthesized the results. All authors contributed to different sections of the manuscript and approved the final version.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: Research reported in this publication was supported by the National Institute on Minority Health and Health Disparities of the National Institutes of Health under Award Number R01MD012249.

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Supplemental Material

Supplemental material for this article is available online.

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