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Acculturative stress is associated with trajectory of anxiety symptoms during pregnancy in Mexican-American women

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Abstract

Over half of pregnant women report anxiety symptoms and these symptoms may be precipitated by stressful experiences. Anxiety rates may be higher in Mexican-American women who experience socio-cultural stressors, such as acculturation, acculturative stress and discrimination. However, the role of such stressors on the trajectory of anxiety symptoms across pregnancy is not yet known. Mexican-American women ($n = 151$) completed surveys across pregnancy about acculturation, acculturative stress, perceived discrimination, and state anxiety. Multilevel modeling found that acculturation (Anglo orientation, $b = 0.050$, $SE = 0.379$, $t(137.561) = 0.134$, $p = 0.894$; Mexican orientation, $b = 0.775$, $SE = 0.692$, $t(133.424) = 1.121$, $p = 0.264$) and perceived discrimination ($b = -1.259$, $SE = 0.921$, $t(137.489) = -1.367$, $p = 0.174$) were not associated with the trajectory of anxiety symptoms. However, acculturative stress, even while controlling for perceived stress, was associated with high levels of anxiety symptoms that were elevated early in pregnancy ($b = -0.045$, $SE = 0.022$, $t(135.749) = -2$, $p = 0.047$). This work highlights the unique role of acculturative stress in risk for prenatal anxiety in early pregnancy.

Keywords

Pregnancy; Immigrant; Anxiety; Acculturation

1. Introduction

Investigating the underlying contributors to prenatal anxiety symptoms is important (Meades & Ayers, 2011) as 52% of women report an increase in symptoms of anxiety during pregnancy (Anxiety and Depression Association of America, 2009). Experiencing anxiety during pregnancy is particularly detrimental as it is associated with pregnancy complications (Kurki, Hiilesmaa, Raitasalo, Mattila, & Ylikorkala, 2000), postnatal depression (Coelho, Murray, Royal-Lawson, & Cooper, 2011) and adverse offspring development, including preterm birth, low birth weight (Dayan et al., 2006; Kalantaridou et al., 2010), and impaired fetal head and abdominal growth (Henrichs et al., 2010). Moreover, these problems extend into childhood as exposure to prenatal anxiety is a salient risk factor for emotional and behavioral problems in offspring (Glover, O'Connor, & O'Donnell, 2010). However, the underlying causes of prenatal anxiety are still not clear.

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Mexican-American women may experience elevated rates of prenatal anxiety as they are exposed to high levels of psychosocial stressors. These stressors include being single, of low socioeconomic status (Bernstein, 2007; Williams, Mohammed, Leavell, & Collins, 2010) and having low social support as well as a lack of access to culturally competent prenatal care (Bryant, Worjolah, Caughey, & Washington, 2010). In fact, individuals born in Mexico relative to those born in the United States (U.S.) of Mexican descent, are more likely to suffer from mood, anxiety, and substance disorders consistently more so than Cuban, Puerto Rican and other Latino subgroups (Alegría et al., 2008). The Latino population has significant heterogeneity amongst the subgroups with differences in demographic data which may influence health disparities (Vega, Rodriguez, & Gruskin, 2009). For example, overall Latinos have low levels of health care coverage (Rosenberg, Handler, Rankin, Zimbeck & Adams, 2007), but Mexican-Americans have had consistently low rates over recent years (40-34% insured; Motel & Patten, 2012; Rutledge & McLaughlin, 2008). In addition, Mexican-Americans compared to other Latino subgroups are more likely to be younger, have one of the lowest rates of college completion, below average rates of English proficiency and earn below the median household income (Motel & Patten, 2012). Lastly, Mexican-Americans have historically had the lowest rate of prenatal care amongst the Latino subgroups (Osterman & Martin, 2011). Indeed, these psychosocial challenges have been found to be associated with higher prenatal anxiety symptoms (Leach, Pyser & Fairweather-Schmidt, 2015; Pagel, Smilkstein, Regen, & Montano, 1990) and may place Mexican-Americans at risk for experiencing mental health symptoms during pregnancy.

Mexican-American women are also exposed to sociocultural stressors related to adaptation to U.S. mainstream culture (Calzada, Huang, Covas, Ramirez, & Brotman, 2015). These sociocultural stressors include acculturation, the multidimensional process of psychological and cultural changes when interacting between two or more cultures (Sam & Berry, 2010), acculturative stress, the stress associated with the process of acculturation (Berry, 2005, 2006), and perceived discrimination, negative attitudes or unfair treatment towards a particular group (Williams, Neighbors, & Jackson, 2003). However, the role of these processes in perinatal mental health is not clear. Acculturation has been the cultural process most addressed in maternal mental health in Latinas (Beck 2006; Campos, Schetter, Walsh, & Schenker, 2007; Davila, McFall, & Cheng, 2009; Heilemann, Frutos, Lee, & Kury, 2004; Ruiz et al., 2012). The underlying theoretical framework of acculturation suggests those who are acculturating bring cultural and psychological characteristics with them to the new host culture (Berry, 2003). The compatibility and/or incompatibility of customs, values, or beliefs between the native and host culture associated with the process of acculturation can be classified as stressors and thus impact mental health (Berry, 2006). Further, the affective perspective of acculturation involves the emotional aspects of the acculturation process and emphasizes emotional well-being (Acevedo, 2000) and may contribute to psychological symptoms in the perinatal period. Most studies have focused on the role of acculturation in perinatal depression (Davila et al., 2009; Heilemann et al., 2004; Ruiz et al., 2012) with mixed results (Beck, 2006; D'Anna-Hernandez, Aleman, & Flores, 2015). These inconsistencies may be due to the use of proxy measures for acculturation, including variables such as birthplace, years in the host country, or language (Ortega, Rosenheck, Alegria, & Desai, 2000; Ruiz et al., 2012). Even within the same study, there are conflicting

results. For example, post-partum depression was augmented in women who spent their childhoods in the U.S. relative to Mexico, however, their place of birth was not related to depression levels (Heilemann et al., 2004). Furthermore, high levels of acculturation, as measured by English proficiency and generation status, has been associated with higher anxiety during pregnancy; however, this relationship was not found when continuous measures of Latino and Anglo acculturation were used (De Mendoza, Harville, Theall, Buekens, & Chasan-Taber, 2016). Previous findings fail to interpret the possible barriers and challenges that Mexican-Americans may or may not face due to language preference or birthplace (Hunt, Schneider, & Comer, 2004; Thomson & Hoffman-Goetz, 2009; Valencia-Garcia, Simoni, Alegría, & Takeuchi, 2012). Thus, there is a need to investigate acculturation beyond the proxy measures as acculturation as an interactive and multidimensional process in which individuals may modify their own beliefs and experiences when interacting between cultures (Abraído-Lanza, Echeverría, & Flórez, 2016; Cabassa, 2003). One study has used a continuous measures of acculturation on the distinct, but related concept of pregnancy-related anxiety and found Mexican orientation to be associated with an increase in symptoms (Campos et al., 2007). While informative, this study focused on pregnancy-specific anxiety, not more general state anxiety symptoms, and was limited to early pregnancy. A more global assessment of maternal anxiety symptoms throughout all of pregnancy is needed to shed light to the possible role of the continuous multidimensional concept of acculturation on maternal mental health.

As acculturation is associated with adaptation to stress (Caplan, 2007), current research has shifted focus to acculturative stress as a risk factor contributing to mental health disorders (Chae, Park, & Kang, 2014; Fortuna et al., 2016; Sirin, Ryce, Gupta, & Rogers-Sirin, 2013). According to the minority stress theory, experiencing stress due to marginalized status is associated with psychological distress (Meyer, 2013). Previous research suggests acculturative stress directly relates to psychological adjustment and distress (Driscoll & Torres, 2013; Thoman & Surís, 2004) and been suggested to be the underlying source of adverse mental health outcomes in the Mexican-American population (Crockett et al., 2007). As acculturative stress and general life stress have both been associated with increased risk for depressive symptoms in Mexican-American pregnant women (), other psychological problems related to stress, such as symptoms of anxiety, may emerge when experiencing acculturative stress. In non-pregnant Mexican-American samples, high levels of acculturative stress have been linked with symptoms of anxiety (Crockett et al., 2007; Hovey & Magaña, 2000; Revollo, Qureshi, Collazos, Valero, & Casas, 2011). However, the relation of acculturative stress to symptoms of anxiety in pregnant Mexican-American women is unknown.

Perceived discrimination is another sociocultural stressor that may influence mental health in Mexican-American pregnant women. The minority stress theory also supports this notion, as stigmatization and unfair treatment due to minority status is related to psychological stress (Meyer, 2013). Frequent experiences of discrimination are associated with psychological distress (Sellers & Shelton, 2003), which may be a potential risk factor for anxiety (Dyrbye, Thomas, & Shanafelt, 2006). Furthermore, the sociocultural model of anxiety states that awareness of racism may influence the risk of the development of an anxiety disorder (Hunter & Schmidt, 2010), suggesting discrimination may play a role in

anxiety in vulnerable populations. As such, perceived discrimination is associated with higher levels of symptoms of anxiety in the African-American population (Broman, Mavaddat, & Hsu, 2000). However, the role of perceived discrimination on prenatal anxiety symptoms in Mexican-Americans is unknown. Experiencing discrimination is followed by depressive symptoms in Mexican-Americans (Finch, Kolody, & Vega, 2000; Torres & Ong, 2010) and associated with depressive symptoms in the first trimester in pregnant Mexican-American women (D'Anna-Hernandez et al., 2015). Yet, the relation of perceived discrimination and anxiety symptoms throughout pregnancy in Mexican-American women is yet known.

The current study aimed to determine the contribution of sociocultural stressors on prenatal anxiety symptoms in the vulnerable Mexican-American pregnant population. As general perceived stress has been associated with negative mental health outcomes among Mexican-American pregnant women (Fleuriet & Sunil, 2014), it is important to determine the distinct contribution of sociocultural stressors on prenatal anxiety apart from general stress. Thus, the current study investigated the potential unique roles of acculturation, acculturative stress, and perceived discrimination, while controlling for general perceived stress, on anxiety symptoms in pregnant Mexican-American women. It was hypothesized that pregnant women who report high levels of acculturation, acculturative stress, and perceived discrimination would report high levels of state anxiety symptoms across pregnancy. Investigating sociocultural stressors in the perinatal period may provide useful information for future obstetric intervention to optimize mother/child perinatal outcomes.

2. Method

2.1. Participants

A sample of 172 Mexican-American pregnant women were recruited at a local community clinic. Twenty one participants were not included in the study (12 withdrew from the study, 4 moved/transferred clinics, 3 miscarried, 1 did not return the clinic and 1 withdrew due to health complications). A final sample of 151 women were included in the analysis. The attrition rate of the current study (14%) is similar that of previous studies that report ~10–20% attrition in similar pregnant populations (D'Anna-Hernandez, Garcia, Coussons-Read, Laidenslager, & Ross, 2016; Lee et al., 2007). To be eligible to participate in the study, women were at least 18 years old, of Mexican descent, had a singleton pregnancy, were non-smoking and had no current tobacco, illicit, or prescription drug use. All participants completed a urine nicotine and illicit drug use test. Participants enrolled in the study when they were <15 weeks pregnant. Participant demographic information is included in Tables 1 and 2. All research participants provided written and informed consent and all procedures were approved by the Institutional Review Board.

2.2. Demographic questionnaires

In demographic questionnaires participants reported their age, years in the U.S., years of education, and income. Participants also reported their place of birth (0 = U.S./1 = Mexico), employment status (0 = Full time/1 = Part time/2 = Unemployed), language (0 = Spanish/1 =

English/2 = Bilingual), and marital status (0 = Married/1 = Living together, not married/2 = Separated/3 = Never married/4 = Divorced).

2.3. Maternal acculturation status

To measure participants' acculturation status, the Acculturation Rating Scale for Mexican-Americans-Revised (ARMSA-II) was used (Cuellar, Arnold, & Maldonado, 1995). The ARMSA-II is the most current relevant measure of acculturation (Beck, 2006). The ARMSA-II consists of 30-items for the Anglo Orientation Substance (AOS) and 18-items for the Mexican Orientation Subscale (MOS). The items from the scale range from 1 (Not at all) to 5 (Extremely often or almost always). The ARMSA-II has been used in studies for competent perinatal care (Jones, Kubelka, & Bond, 2001) and in Mexican-American pregnant women (D'Anna-Hernandez et al., 2015). The current study showed good reliability scores with a Cronbach's $\alpha = 0.94$ for AOS and 0.84 for MOS.

2.4. Acculturative stress

To measure participants' acculturative stress, the Social Attitudinal Familial and Environmental Stress Scale (SAFE) was used (Mena, Padilla, & Maldonado, 1987). The SAFE was administered during the first trimester. The SAFE is a 24-item scale that ranges from 0 (Does not apply) to 5 (Extremely stressful). Higher scores indicate greater stress. The SAFE has been validated in Mexican-American populations (Hovey & Magana, 2000) and Mexican-American pregnant women (D'Anna-Hernandez et al., 2015). The current study also showed good reliability scores with a Cronbach's $\alpha = 0.92$.

2.5. Perceived discrimination

The Discrimination Stress Scale (DSS) was administered in the first trimester (Flores et al., 2008). The DSS is a 14-item scale that ranges from 1 (Never) to 4 (Very often). Higher scores represent greater racial/ethnic discrimination. The DSS has been used to investigate physical and mental health in Mexican-American populations (Flores, Tschann, Dimas, Pasch, & de Groat, 2010). The current study also showed good reliability scores with a Cronbach's $\alpha = 0.91$.

2.6. State anxiety

Participants were asked to complete the State Anxiety Inventory (STAI-Form Y) once every trimester. The STAI measures participants' state-like anxiety feelings such as tension, nervousness, and unease at the current moment (Spielberger, Gorsuch, & Lushene, 1970). The STAI contains a 20-item scale that ranges from 1 (Never) to 5 (Very much so). Higher scores indicate greater state anxiety. The STAI Spanish translation has been validated (Novy, Nelson, Smith, Rogers, & Rowzee, 1995), and has been one of the most commonly validated self-report measures for perinatal state anxiety (Dennis, Coghlan, & Vigod, 2013; Meades & Ayers, 2011), including Mexican-Americans (Britton, 2008; Engle, Scrimshaw, Zambrana, & Dunkel Schetter, 1990). The current study also showed good reliability scores with a Cronbach's $\alpha = 0.88$ for all time periods.

2.7. Perceived stress

To control for general stress, participants were asked to answer the Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983). The PSS intends to measure participants' degree of stress-related feelings and thoughts in the last month. The PSS is a 14 item scale with a 5 point Likert scale that ranges from 0 (Never/Rarely) to 4 (Very Often). Higher scores indicate greater stress, with a max score of 4. The PSS has also been used to compare general perceived stress and mental health symptoms in Mexican-American pregnant women (D'Anna-Hernandez et al., 2015). The PSS scale Spanish version has been validated (Sanz-Carrillo, Garcia-Campayo, Rubio, Santed, & Montoro, 2002). For the current study, the Cronbach's $\alpha = 0.72$.

2.8. Procedure

A longitudinal study design was conducted across pregnancy. Participants completed the study visits before or after their prenatal clinic appointments. Participants completed a total of four visits for the study. The first contact with the participants was when they were less than 15 weeks pregnant ($M = 11.97$, $SD = 2.00$). The first visit took approximately 45 min and consisted of the consent process, demographic questionnaires, sociocultural stress surveys (acculturation, acculturative stress, and perceived discrimination), and a perceived stress questionnaire. The trimester visits were completed when participants were between 15 and 17 ($M = 16.52$, $SD = 1.37$), 25–27 ($M = 26.07$, $SD = 1.28$), and 33–35 ($M = 33.93$, $SD = 1.02$) weeks gestation. At each trimester visit, participants completed state anxiety measures, which took approximately 10 min to complete. All measures were offered to participants in both Spanish and English. Participants were compensated \$25.00 at the end of every assessment completed; a total of \$100 was provided as compensation for completion of the study.

2.9. Statistical analysis

In order to control for possible covariates, the relationship between demographic variables and outcome variables were examined (Howell, 2012). Thus, Pearson's correlations were conducted to determine the relationship of demographic variables such as age, years in the U.S., years of education, and income with state anxiety. Mixed model analyses of variances (ANOVA) were conducted to investigate the relationship between categorical demographics such as place of birth, employment status, language, and marital status with state anxiety across pregnancy.

To address the hypotheses that pregnant women who report high levels of acculturative stress, acculturation, and perceived discrimination would report high levels of state anxiety symptoms across pregnancy, three separate multi-level models were conducted. In the model, acculturative stress, acculturation, and perceived discrimination were each entered as independent variables along with trimester to predict the trajectory of maternal anxiety throughout pregnancy. Perceived stress was included as an additional covariate. For the multilevel models, the estimation employed was Restricted Maximum likelihood (REML) and the fixed effects were psychosocial stressors, perceived stress, and income. Missing data was not included in the model and the time point of trimester 1 was fixed to 0. Lastly, the approximation technique employed was Schwarz's Bayesian Criterion (BIC).

3. Results

3.1. Descriptives

Income was negatively associated with prenatal anxiety in the second ($r = -0.20, p = 0.01$) and third trimester ($r = -0.17, p = 0.04$). Thus, income was included as a covariate in all further analyses. All other demographic variables were unrelated to maternal anxiety and are presented in Tables 1 and 2.

Maternal anxiety symptoms did not differ across pregnancy (RM ANOVA, $F(2, 149) = 2.360, p = 0.100$). Anxiety scores in the first trimester ranged from 20 to 59, ($M = 36.12, SD = 9.71$), in the second trimester ranged from 20 to 63, ($M = 34.18, SD = 9.16$) and in the third trimester ranged from 20 to 60, ($M = 35.17, SD = 9.45$). Although there is no cut off for the STAI, previous work in pregnant women populations have used the scores above 45 as an indicator for high state anxiety (Austin, Tully, & Parker, 2007; Podvornik, Globevnik, & Praper, 2015). In the first, second, and third trimesters, respectively, 19.4%, 11.1%, 15.2% of women scored above 45 on the STAI. However, all women reported some anxiety symptoms with 53% of women showing an increase of anxiety symptoms during pregnancy (data not shown).

The intraclass correlation (ICC) coefficient was calculated to determine whether there was a clustering effect in the data. The ICC of the current study was $\rho = 0.542$. Therefore, 54.2% of the variance in maternal anxiety scores was associated with the pregnancy trimesters. Thus, there was a clustering effects and a multilevel model was suggested.

3.2. Acculturation and symptoms of anxiety throughout pregnancy

A multilevel model analysis showed no effect of time ($b = -3.45, SE = 2.898, t(133.26) = -1.19, p = 0.236$) or Mexican Orientation (MOS; $b = -2.364, SE = 1.616, t(139.716) = -1.462, p = 0.146$) on prenatal anxiety symptoms. Mexican Orientation was not associated with the trajectory of prenatal anxiety symptoms overtime ($b = 0.775, SE = 0.692, t(133.424) = 1.121, p = 0.264$), while controlling for maternal perceived stress and income.

A multilevel model analysis showed no effect of time ($b = -0.387, SE = 1.180, t(136.52) = -0.328, p = 0.743$) or Anglo Orientation (AOS); ($b = -0.203, SE = 0.87, t(142.466) = -0.234, p = 0.815$) on prenatal anxiety symptoms. Anglo Orientation was not associated with the trajectory of prenatal anxiety symptoms overtime ($b = 0.050, SE = 0.379, t(137.561) = 0.134, p = 0.894$), controlling for maternal perceived stress and income.

3.3. Acculturative stress and symptoms of anxiety throughout pregnancy

A multilevel model analysis showed the effect of time on prenatal anxiety symptoms was not significant, ($b = 0.995, SE = 0.730, t(136.037) = 1.362, p = 0.175$). Acculturative stress was not associated with anxiety symptoms, ($b = 0.071, SE = 0.054, t(152.274) = 1.307, p = 0.193$). Finally, acculturative stress was associated with the trajectory of prenatal anxiety symptoms overtime ($b = -0.045, SE = 0.022, t(135.749) = -2, p = 0.047$), indicating that high levels of acculturative stress are associated with a small decline of symptoms during

pregnancy (Fig. 1). This relationship remained significant even after controlling for maternal perceived stress and income.

3.4. Perceived discrimination and symptoms of anxiety throughout pregnancy

A multilevel model analysis showed there was no effect of time on prenatal anxiety symptoms was not significant ($b = 1.583$, $SE = 1.387$, $t(137.297) = 1.142$, $p = 0.256$). In addition, perceived discrimination was not associated with prenatal anxiety symptoms ($b = 2$, $SE = 2.117$, $t(145.82) = 0.945$, $p = 0.346$). Finally, perceived discrimination was not associated with the trajectory of prenatal anxiety over time ($b = -1.259$, $SE = 0.921$, $t(137.489) = -1.367$, $p = 0.174$), while controlling for maternal perceived stress and income. A summary of the findings is listed in Table 3.

4. Discussion

This study examined the potential contributions of sociocultural stressors on symptoms of anxiety in Mexican-American women during pregnancy. Acculturative stress was found to be a unique predictor of maternal anxiety symptoms. Acculturative stress was associated with elevated levels of anxiety symptoms early in pregnancy and a slight decline in symptoms in later pregnancy, even when controlling for perceived stress. However, acculturation and perceived discrimination were not associated with the trajectory of symptoms of state anxiety across pregnancy. To our knowledge, this work is one of the first studies to suggest a unique role of acculturative stress, regardless of perceived stress, on prenatal anxiety symptoms in the vulnerable Mexican-American population, suggesting the need to assess acculturative stress in the perinatal period, a sensitive timepoint for mother and child well-being (Table 4).

Maternal anxiety symptoms were associated with acculturative stress during pregnancy in the current study. These results support previous work demonstrating acculturative stress has been associated with anxiety symptoms in non-pregnant Mexican-American populations (Crockett et al., 2007; Hovey & Magaña, 2000; Revollo et al., 2011; Suarez-Morales & Lopez, 2009). It is possible that during pregnancy women who experience acculturative stress may feel anxious when caught between the customs, values, and beliefs of their native culture and the mainstream culture their child will be raised in. Women may also feel pressured to assimilate to mainstream culture or experience cultural loss, which both are associated with subjective perception of stress and negative emotions (Crockett et al., 2007; Kartal & Kiropoulos, 2016). It is also possible that pregnant women who experience acculturative stress may modify their information and cultural beliefs about their expectations for motherhood with consequences for maternal anxiety as maternal expectations are related to maternal mental health (Henshaw, Fried, Teeters, & Siskind, 2014). Moreover, acculturative stress may lead to weak ties with Mexico and poorly established ties in the U.S. which is associated with marginalization within communities and/or families (Harley & Eskenazi, 2006). Women who are marginalized may be at risk for experiencing poorer mental health outcomes during pregnancy because they often lose social support and the positive influence of their native culture (Canals, Esparo, & Fernandez-Ballart, 2002; Harley & Eskenazi, 2006). However, in the current study, acculturative stress

was also associated with a slight decline in state anxiety symptoms in late pregnancy. It is possible that during late pregnancy women learn how to cope with cultural stressors and thus experience less anxiety. As such, other studies have seen a declines in maternal mental health symptoms, depression specifically, late in the perinatal period in Mexican-American mothers (Beeghly et al., 2002; Zeiders, Umaña-Taylor, Updegraff, & Jahromi, 2015), suggesting early pregnancy may be a risk period for experiencing mental health symptoms in this population. To our knowledge, this study was the first to uniquely associate acculturative stress with early perinatal anxiety symptoms, regardless of perceived stress.

In the current study, acculturation and discrimination were not associated with maternal state anxiety symptoms, though both have been associated with maternal mental health previously (Campos et al., 2007; D'Anna-Hernandez et al., 2015; De Mendoza et al., 2016; Hunt et al., 2004; Thomson & Hoffman-Goetz, 2009; Valencia-Garcia et al., 2012). In regards to acculturation, there are inconsistencies in the literature due to the previous use of proxy measures such as birthplace, years in the U.S., and language. These proxy measures often do not account for the individual's experiences with and perception of acculturative pressures (Rudmin, 2009) and represent a unidirectional model that does not capture barriers and challenges that Mexican-Americans may face as a result of acculturation (Hunt et al., 2004). More recent work using multidimensional scales of acculturation surprisingly showed that Mexican orientation was associated with elevated pregnancy anxiety symptoms (Campos et al., 2007). The current study did not measure pregnancy specific anxiety, but general state anxiety across pregnancy, likely accounting for the difference in findings. Pregnancy anxiety is related to, but is a distinct concept from state anxiety and focuses on worries about pregnancy complications and the delivery process (Dunkel Schetter & Tanner, 2012). It is possible that Mexican orientation may be related to symptoms of anxiety related to pregnancy as recently immigrated women may be more anxious of the birth process due to the limited medical resources in their native country (Dunkel Schetter & Rini, 2004). However, in line with the current study, more recent work also did not show a relationship with same measure of acculturation (ARSM-II) and prenatal depressive symptoms, but instead highlighted acculturative stress as a salient risk factor (D'Anna-Hernandez et al., 2015). Thus, acculturative stress may be the underlying factor that is associated with the adverse maternal mental health outcomes in minority populations that occur when interacting between cultures.

Discrimination was also not related to maternal anxiety symptoms in the current study. Most studies have investigated the relationship between discrimination and maternal depression, not anxiety symptoms. For example, discrimination during pregnancy has been associated with prenatal depression in young minority women (Earnshaw et al., 2013). Other work has also shown the relationship between discrimination and prenatal depression disappears when acculturative and perceived stress are included in the model (D'Anna-Hernandez et al., 2015), supporting the current work. Thus, acculturative stress may play a greater role in perinatal anxiety than perceived discrimination. It is also possible that discrimination contributes to acculturative stress. Previous work suggests that in non-pregnant Mexican-American populations, acculturative stress mediates the relationship between discrimination and psychological distress (Torres, Driscoll, & Voell, 2012). Furthermore, in non-pregnant adolescents, perceived discrimination accounted for a proportion of the variance between

acculturative stress and anxiety (Suarez-Morales & Lopez, 2009). This work highlights the indirect role that acculturative stress may have on the relationship between discrimination and anxiety symptoms. However, the current study does not point to independent effects of acculturation or discrimination on prenatal anxiety beyond that of acculturative stress.

This study is a prospective longitudinal study that collected anxiety measures at multiple time points throughout pregnancy to detect any change or stability in symptoms. In addition, it was conducted in the vulnerable, fast-growing Mexican-American population with all women showing anxiety symptoms and over half showing an increase in symptoms during pregnancy. This study also accounted for other important variables such as socioeconomic status and general perceived stress. However, there are limitations. First, the current study only used self-report surveys to collect anxiety symptoms and sociocultural stressors. Although, the measures used reported high internal validity, using physiological measures (e.g. cortisol, inflammatory markers) may shed light to the physiological mechanism related to anxiety and sociocultural stressors. Second, as this was a longitudinal study, there was attrition. It could be that most anxious women did not continue in the study, skewing the results; however, rates of attrition in the current study are similar to those in other studies with the same population (D'Anna-Hernandez et al., 2015; Lee et al., 2007). In addition, rates of anxiety (average 15.2% of women during pregnancy scored >45 on the STAI) were similar to that of the general population (Strine et al., 2015) with all women showing at least some anxiety symptoms. Lastly, the study was correlational. Therefore, no causal link between acculturative stress and anxiety symptoms could be established; however acculturative stress was still identified as an important contributor to maternal anxiety symptoms early in pregnancy.

The finding from the current study that acculturative stress is a salient risk factor of maternal anxiety symptoms in pregnancy in Mexican-American has clinical implications. First, assessing stressors related to the process of acculturation at initial obstetric visits may help identify factors relevant for negative mental health problems early in pregnancy. Furthermore, incorporating coping mechanisms related to acculturative stress into culturally-based interventions could optimize mother/child perinatal health outcomes and decrease the programming risk of fetal exposure to maternal stress and mental health symptoms. Lastly, findings may promote cultural competence in health care settings, particularly amongst provider-patient communication, critical to the health care experience (Englander et al., 2013). This is particularly true for vulnerable populations, who may have less resources or feel less confident in navigating the health care system. Cultural competence can lead to effective change in cross-cultural situations (Harris, 2010) and may help health care workers respond with cultural sensitivity to patients' values, customs, and beliefs (Betancourt, Green, & Carrillo, 2002). Together, these changes could influence decision making and interventions to improve treatment and delivery outcomes.

5. Conclusion

The present study is one of the first studies to examine sociocultural stressors and symptoms of state anxiety in pregnant Mexican-American women. Results suggest that Mexican-American pregnant women who experience acculturative stress may experience greater

symptoms of state anxiety throughout pregnancy, regardless of general perceived stress. Thus, assessing acculturative stress in the perinatal period may provide useful information for future obstetric interventions.

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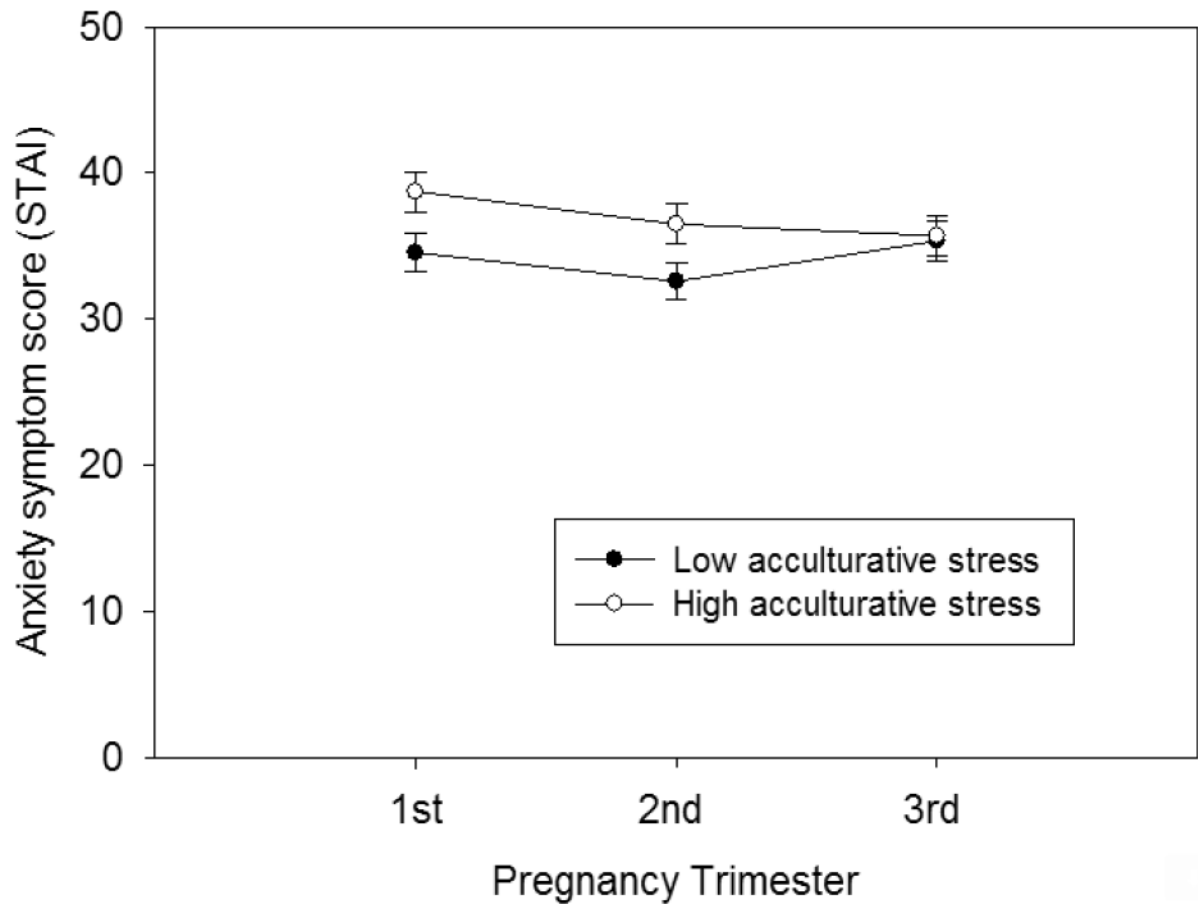


Fig. 1. Relationship between acculturative stress and maternal symptoms of anxiety across pregnancy. Pregnant women who reported high acculturative stress demonstrate a slight decline over time of maternal symptoms of anxiety than those who reported lower acculturative stress, while controlling for perceived stress and income ($b = -0.045$, $p = 0.047$). The figure shows dichotomous categories by using median splits of acculturative stress for graphical representation only. Data was analyzed continuously.

Table 1
Correlations of Continuous Participant Characteristics with Symptoms of Maternal Anxiety Throughout Pregnancy

Variable	Maternal Anxiety					
	<i>M</i>	<i>SD</i>	Trimester 1		Trimester 3	
			<i>r</i>	<i>r</i>	<i>r</i>	<i>r</i>
Age	26.98	5.38	-0.05	0.069	0.12	0.12
Years in U.S.	15.89	7.38	-0.01	0.11	-0.03	-0.03
Years of Education	11.02	2.81	-0.12	-0.03	0.01	0.01
Income	24,152.16	1,3487.25	-0.115	-0.20*	-0.17*	-0.17*

Note.

* $p < 0.05$

Table 2
Mixed Model ANOVA of Maternal Anxiety Symptoms Determined Via the STAI Based on Categorical Participant Characteristics

	Maternal Anxiety Symptoms										F	p	
	Trimester 1		Trimester 2		Trimester 3								
	N	M	SD	M	SD	M	SD	M	SD	M			SD
Place of Birth												0.738	0.567
U.S.	50	36.78	7.99	36.47	8.18	36.45	7.93						
Mexico	101	35.60	10.43	33.08	9.44	34.52	10.11						
Employment												1.285	0.270
Full time	29	34.62	9.86	35.41	11.60	35.79	10.57						
Part time	37	35.78	8.45	32.40	6.15	34.66	8.79						
Unemployed	84	36.61	10.21	34.51	9.38	35.25	9.53						
Language												1.794	0.130
Spanish	109	36.30	10.43	33.40	9.70	34.48	10.25						
English	17	35.18	8.33	35.24	5.97	34.13	6.16						
Both	25	35.20	6.93	36.79	8.30	38.71	6.64						
Marital Status												1.48	0.185
Married	58	34.57	9.10	33.52	9.17	34.75	8.69						
Living	67	37.06	9.93	33.52	8.59	34.85	9.35						
Separated/Divorced	4	33.25	8.77	34.25	7.41	41.25	9.39						
Never Married	21	36.10	9.92	37.10	10.50	36.00	11.58						

Table 3
Summary of Multilevel Modeling of Acculturation, Acculturative Stress, and
Discrimination on Maternal Symptoms of Anxiety Throughout Pregnancy While
Controlling for Maternal Perceived Stress and Income

<i>Maternal Anxiety Symptoms</i>				
Parameter	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Acculturation				
MOS	0.775	0.692	1.121	0.264
AOS	0.050	0.379	0.134	0.894
Acculturative Stress	-0.045	0.022	-2.00	0.047
Discrimination	-1.259	0.921	-1.367	0.174

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Table 4
Pearson Correlation Coefficients Between Acculturation, Acculturative Stress, Discrimination, and Symptoms of Anxiety Throughout Pregnancy

Variables	1	2	3	4	5	6	7
1. Anglo Orientation							
2. Mexican Orientation	-0.185 [*]						
3. Acculturative Stress	0.038	0.126					
4. Discrimination	0.065	0.016	0.44 ^{**}				
5. Trimester 1 Anxiety	-0.003	-0.083	0.196 [*]	0.099			
6. Trimester 2 Anxiety	0.117	-0.026	0.188 [*]	0.112	0.556 ^{**}		
7. Trimester 3 Anxiety	0.044	0.031	0.044	0.042	0.463 ^{**}	0.642 ^{**}	

Note.

^{*} $p < 0.05$,

^{**} $p < 0.01$