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A Preliminary Investigation of Acculturative Stress and Diurnal Cortisol Among Latina Women

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Abstract

The interplay between biological and cultural factors has remained understudied among ethnic minority groups, including Latinos. To the best of our knowledge, minimal to no research has examined the relationship between acculturative stressors and diurnal cortisol among Latina women. This initial exploratory study sought to examine the relationship between cortisol and acculturative stress. Among a small sample of adult Latina women, salivary cortisol was collected at 3 time points (waking, 30 min postwaking, and bedtime) to assess the

cortisol awakening response (CAR) and diurnal cortisol response. Information regarding acculturative stress and acculturation was also collected. The major results showed that high levels of acculturative stress were associated with a blunted CAR and a flatter diurnal cortisol response when compared to low levels of acculturative stress. These preliminary findings highlight the potential role of cultural stressors in contributing to the biological stress response.

Keywords:

Latino ental health, acculturative stress, diurnal cortisol, cortisol awakening response

Stressful life events have often been linked to poor mental health through a dysregulation of physiological systems such as the hypothalamic–pituitary–adrenal (HPA) axis and the main stress hormone cortisol (Juster, McEwen, & Lupien, 2010). Unfortunately, marginalized groups have benefited less than other groups from scientific advancements in the knowledge of biological pathways and physiological responses to stress (Clingerman & Brown, 2012). Some work has sought to examine the biological factors associated with cultural stressors—primarily ethnic discrimination and mental health (Myers, 2009; Pascoe & Smart Richman, 2009). Generally speaking, these models posit that exposure to cultural stressors, particularly when chronic or long lasting, results in physiological changes that in turn contribute to psychological and physical problems. However, minimal to no research has investigated the relationship between cortisol and acculturative stress within Latino groups.

As one of the fastest growing ethnic groups in the United States, Latinos constitute approximately 17% of the population, and projections estimate that the number will rise to 30% of the population by 2050 (U.S. Census Bureau, 2013). Regardless of nativity status or time spent living in the United States, Latinos are likely to experience acculturative stress. A recent survey revealed that women across ethnicities reported higher average stress levels when compared to men and indicated that their stress levels had increased in the previous year (American Psychological Association, 2016). Perhaps similar to other ethnic groups, women of Latino descent are likely to experience additional stressors related to family and cultural expectations (Galanti, 2003). As such, investigating the experiences of Latina women will provide important insight into the health of this underrepresented group. This study sought to provide an initial exploratory examination of the relationship between cortisol and acculturative stress among Latina women.

Cortisol and Stress

The HPA axis is one of the body's main stress response systems. During instances of acute stress, the HPA axis releases corticotropin-releasing factor (CRF) in the hypothalamus, which in turn activates the pituitary gland to release adrenocorticotropic hormone (ACTH). ACTH then stimulates the adrenal cortex to release cortisol, a main stress hormone (Jackson, Knight, & Rafferty, 2010; McEwen, 1998). Whereas acute responses to stress are considered adaptive, chronic activation of the HPA axis from cumulative stress can lead to dysregulation of the system (Dowd, Simanek, & Aiello, 2009). The role of the HPA axis in response to stress is complex and dynamic in nature. Still, salivary cortisol is commonly used as an indicator of HPA functioning (Kudielka & Kirschbaum, 2005). Cortisol is also thought to be a critical biological intermediary linking chronic stressors to physical and mental health problems (Miller, Chen, & Zhou, 2007). The natural diurnal rhythm is such that cortisol levels show a 50 to 75% rise within the first 30 to 45 min after waking. Following this morning peak, cortisol levels drop sharply and then decrease more gradually throughout the day, reaching their lowest point in the evening around bedtime (Pruessner et al., 1997).

The cortisol awakening response (CAR) refers to the changes in cortisol levels experienced between waking and the morning peak (30 to 45 min after waking). Although CAR dysregulation has been used in the past as an indicator of stress-induced injury to the HPA axis (Pruessner et al., 1997), more recent research has postulated that the CAR is a distinct and independent process from diurnal patterns in HPA activity (Clow, Hucklebridge, Stalder, Evans, & Thorn, 2010). The exact function of the CAR remains unclear but has been linked to the anticipation of demands and perceived burden (Fries, Dettenborn, & Kirschbaum, 2009). Among Mexican American adults, an attenuation of the CAR—or smaller differences between waking and postwaking cortisol levels—has been associated with subclinical symptoms of depression (Mangold, Marino, & Javors, 2011).

Generally speaking, diurnal rhythms characterized by decreased morning levels and increased afternoon or evening cortisol, resulting in flatter slopes, are indicative of greater HPA dysregulation and mental health symptoms (Skinner, Shirtcliff, Haggerty, Coe, & Catalano, 2011). Past research has reported flatter diurnal cortisol rhythms among ethnic minorities, primarily African Americans, when compared to non-Hispanic Whites (Adam et al., 2015; Skinner et al., 2011). A similar pattern has emerged for Latina women who showed a flatter cortisol response pattern than non-Hispanic women (Gallagher-Thompson et al., 2006).

Acculturative Stress

The process of adapting to two or more cultures, referred to as *acculturation*, has been described as inherently stressful. As such, *acculturative stress* refers to the demands that stem from intercultural contact or the process of cultural adaptation (Berry, 2006). Individuals who interact with a new culture have to negotiate varying, and at times opposing, sets of values and expectations (Gonzales, German, & Fabrett, 2012). Acculturative stressors can include pressures from both the mainstream U.S. culture and the traditional culture (Rodriguez, Myers, Mira, Flores, & Garcia-Hernandez, 2002). Some examples of acculturative stress can include learning a new language, adhering to different cultural norms, retaining the native language and customs, and brokering between American and Latino ways of living (Torres, Driscoll, & Voell, 2012). Acculturative stress has been linked to poor Latino mental health outcomes in numerous studies (Hovey & Magana, 2002; Torres, 2010).

As mentioned previously, research examining cortisol and acculturative stress is scarce. Some work has investigated the relationship between cortisol and acculturation among Latino samples. For example, research with a sample of pregnant Latina women reported that high levels of acculturation predicted increased total cortisol levels (Ruiz, Pickler, Marti, & Jallo, 2013), whereas reduced HPA activity was noted among later generation participants (Ruiz, Stowe, Brown, & Wommack, 2012). In contrast, another study indicated that increased time in the United States was associated with blunted total cortisol output among Latino men (Squires et al., 2012). Among Mexican American men, high levels of adherence to the Anglo or mainstream culture were associated with a decrease in the CAR (Mangold, Mintz, Javors, & Marino, 2012; Mangold, Wand, Javors, & Mintz, 2010). The authors of these studies conclude that acculturative stress is a significant factor in CAR dysregulation.

Research examining diurnal cortisol patterns with Latinos reported that among pregnant women of Mexican descent, greater acculturation was associated with a flatter slope (D'Anna-Hernandez et al., 2012). Among Latino day laborers, high allostatic load—an indicator of physiological changes due to chronic stress—was associated with greater everyday discrimination, being questioned about legal status, and fear of being deported (de Castro, Voss, Ruppin, Dominguez, & Seixas, 2010). In contrast, a study with pregnant women of Hispanic origin found no relation between cortisol levels and cumulative stress, as measured by interpersonal violence, community violence, and ethnic discrimination (Suglia et al., 2010). This particular study did not assess acculturative stress. Overall, inconsistencies exist in the empirical literature regarding the nature of cortisol dysregulation in relation to cultural variables among Latinos living in the United States. Some of these discrepancies can be attributed to the methodological differences by which biological stress and cortisol are

measured (i.e., total cortisol output vs. diurnal response), along with the minimal studies that have accounted for cultural variables in a systematic manner.

This study sought to address the gaps in the empirical literature examining biological factors and cultural variables—namely, acculturative stress—within Latino groups. As such, the purpose was to investigate the relationship between cortisol and acculturative stress in a sample of Latina women. Hypothesis 1 indicated that high levels of acculturative stress would be associated with a diminished CAR when compared to low acculturative stress. Hypothesis 2 stated that while controlling for acculturation and age, significant differences would emerge in the patterns of diurnal cortisol between low and high levels of acculturative stress. It was expected that high levels of acculturative stress would be associated with markers of dysregulation—namely, a flatter diurnal slope.

Method

Participants and Procedures

This study included 18 adult women who self-identified as Latina or Hispanic. The average age of the sample was approximately thirty-six years (*SD* = 10.59, range of 24–54). In terms of nativity status, 12 individuals reported having been born outside of the United States. The majority of participants reported having obtained a bachelor's degree or higher (*n* = 13), with the remaining having some college and/or a high school degree or equivalency. Participants were asked to choose from categories of annual household incomes (i.e., less than $35,000, $35,000 to $50,000, and greater than $50,000) as an indication of socioeconomic background. Five participants reported an annual income of less than $35,000, eight indicated having an annual income of between $35,000 and $50,000, and six reported earning more than $50,000 annually. In the region where participants were recruited, the median annual household income for Latinos was $36,121 (Center for Economic Development, 2016).

All study procedures were approved by the host university's institutional review board. Participants were recruited at a local community center with the assistance of key personnel within the community center who served as liaisons between the researchers and the participants. Trained bilingual (English–Spanish) research assistants obtained informed consent and explained the study procedures. Once individuals had provided consent to participate in the study, they were asked to complete a packet of questionnaires (see the Measures section) in their preferred language. The majority of respondents filled out the surveys in English (*n* = 14; 78%). Upon completion of the questionnaires, the research assistants distributed cortisol kits and described their contents and the collection protocol. Participants were instructed to begin the protocol of collecting salivary cortisol the next day or the following Monday to ensure that sampling took place on a weekday. The participants then arranged to deliver the salivary cortisol samples to the research assistants at the community center. Participants were given $10 gift cards for completion of the questionnaires and $30 gift cards for the salivary cortisol samples.

Measures

Acculturative stress

The Multidimensional Acculturative Stress Inventory (MASI; Rodriguez et al., 2002) is a 36-item instrument that assesses an individual's level of acculturative stress related to competency of English and Spanish language use, pressures to acculturate to the mainstream culture, and pressures against acculturation to the mainstream culture. Respondents rate items according to the previous 3 months on a 6-point scale ranging from 0 (*does not apply*) to 5 (*extremely stressful*). Items are averaged to obtain an overall score that ranges from 0 to 5, where higher MASI scores correspond to greater acculturative stress. As reported previously (Rodriguez et al., 2002),

the MASI is a valid and reliable measure, with a Cronbach's alpha of .91 in the current sample (U.S. born: .92, foreign born: .92).

Acculturation

The Brief Acculturation Rating Scale for Mexican Americans—II (BARSMA–II; Bauman, 2005) is a 12-item questionnaire available in English and Spanish adapted from the original 30-item Acculturation Rating Scale for Mexican Americans (ARSMA; Cuéllar, Arnold, & Maldonado, 1995). The measure includes an Anglo Orientation subscale (AOS) and a Mexican Orientation subscale (MOS). Participants indicate how often they endorse the statement on a 5-point Likert scale that ranges from 1 (*not at all*) to 5 (*extremely often or almost always*). Responses are averaged and can range from 1 to 5; higher scores indicate stronger self-reported adherence to the respective culture. Cronbach's alphas for this study were 0.90 for the AOS and 0.81 for the MOS.

Salivary cortisol

Free cortisol levels were measured from salivary samples that were gathered at three specific time points (upon waking, 30 min postwaking, and before going to bed) as suggested previously (Adam & Kumari, 2009). Free cortisol is recommended for the assessment of dynamic HPA axis activity (Gozansky, Lynn, Laudenslager, & Kohrt, 2005; Kudielka, Hellhammer, & Wüst, 2009). Participants were asked to avoid drinking alcohol (12 hr prior), eating (60 min prior), smoking, and brushing teeth before the collection of samples. Participants were instructed to wash or rinse their mouths for 2 to 3 min prior to sample collection. Participants were then to "chew" on a cotton swab for 30 to 40 s and place the swab in a plastic tube (Salimetrics LLC, State College, PA), which they were then to label with the time and date. Participants were strongly encouraged to report accurate times of sampling even if the protocol was not followed. They were instructed to store the samples in a freezer as soon as possible until they could be delivered to the research assistants. Once retrieved by the research assistants, the salivary samples were immediately transported and stored in an environment of −20 °C for later analysis. Overall, samples were exposed to room temperatures for a minimal amount of time during transport from participants' homes to the community center to the university laboratory for storage (typically 20–60 min).

Although menstrual cycle phase and oral contraceptives have been found to influence HPA activity (Kudielka & Kirschbaum, 2005), a community liaison to this study suggested that gathering this information could be perceived as inappropriate within the community. Thus, these data were not gathered to respect the cultural norms of this group. The viability of the specimens was examined prior to analysis, along with the times the samples were taken. Postwaking cortisol samples were collected within 45 min of the waking samples (median of 30 min). One participant was not able to follow this protocol (postwaking sample was 90 min after waking) and was excluded from the main analyses. Salivary cortisol levels were quantified using an enzymatic immunoassay (Salimetrics LLC, State College, PA). Previous studies have established the reliability of this technique (Pruessner et al., 1997). The CAR was computed by calculating the difference in cortisol levels between waking and 30 min after waking (Adam & Kumari, 2009).

Results

Mean differences among study variables were examined for nativity status and annual household income, with no statistically significant variations observed. Cortisol readings were commensurate with those in past reports of Mexican American adolescents (Zeiders, Doane, & Roosa, 2012) and migrant farmworkers (Clingerman & Brown, 2012). As shown in Table 1, acculturative stress was significantly and negatively correlated with Anglo orientation. Preliminary analyses revealed that the bedtime cortisol levels for the sample were significantly and positively skewed, whereas those for Mexican orientation were negatively skewed. As recommended by Adam and Kumari (2009) and Tabachnick and Fidell (2013), square root transformations were conducted to approximate normal distributions and were entered into the main analyses. No significant outliers were observed.

Table 1
Means, Standard Deviations, and Correlations of Main Study Variables

Variables	1	2	3	4	5	6	7
1. Waking cortisol (μg/dL)	—	.05	.18	−.63**	−.08	.26	.08
2. 30 min postwaking cortisol (μg/dL)		—	−.11	.75***	−.37	.12	.14
3. Bedtime cortisol (μg/dL)			—	−.24	.24	−.06	−.29
4. Cortisol awakening response (CAR)				—	−.24	−.08	.06
5. Acculturative stress					—	−.50*	.13
6. Anglo orientation						—	−.44†
7. Mexican orientation							—
M	.26	.47	.13	.21	1.03	3.56	4.05
SD	.11	.13	.14	.17	.62	.98	.86
Range	.12–.46	.18–.71	.01–.44	−.20–.42	.08–2.60	1.33–4.67	1.83–5.00

† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

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In order to examine the study hypotheses, a median split was used to divide acculturative stress into high and low groups. To test Hypothesis 1, an independent samples *t* test was conducted to examine mean differences based on high and low groups of acculturative stress. This analysis revealed a statistically significant variation such that the low acculturative stress group showed a higher CAR when compared to the high acculturative stress group, $M = .30$ ($SD = .10$) and $M = .13$ ($SD = .18$), respectively; $t(15) = 2.34$, $p = .03$. As an estimate of effect size, Cohen's *d* was 1.15, suggesting a large effect according to Cohen (1988), which is consistent with the results of previous work (Mangold et al., 2012). These results support the hypotheses of this study. Given that age, particularly as it pertains to menopausal symptoms, has been found to influence cortisol output (Fries et al., 2009), the sample was divided into two groups based on median split to examine potential variations in the CAR. No statistically significant differences were observed based on age.

To address Hypothesis 2, a repeated-measures analysis of variance was conducted to examine cortisol levels within high and low acculturative stress groups. Age and acculturation, in the form of the AOS and MOS, were entered as covariates. Mauchly's test of sphericity indicated that this assumption had not been violated, $\chi^2(2) = 2.11$, $p = .35$. This analysis showed a main effect trending toward statistical significance in which cortisol levels may have changed across the three time points, $F(2, 22) = 3.01$, $p = .07$, $\eta^2 = .22$. More importantly, a statistically significant interaction was observed that showed that changes in cortisol levels differed in the high and low acculturative stress groups, $F(2, 22) = 6.03$, $p = .008$, $\eta^2 = .35$. Given the sample size, a post hoc power analysis was conducted and revealed excellent power [$(1 - \beta) = 0.99$] given the calculated effect size, number of participants, and number of measurements (i.e., time points; $\alpha = .05$). As shown in Figure 1, an illustration of the significant interaction shows comparable cortisol levels at waking, $t(15) = -.57$, $p = .58$; Cohen's $d = 0.28$, but the

high acculturative stress group had lower levels at 30 min postwaking, $t(15) = 2.53$, $p = .02$; Cohen's $d = 1.22$, and higher levels at bedtime, $t(8.31) = -2.11$, $p = .07$; Cohen's $d = 1.06$. These findings seem to support the study hypotheses and suggest that participants who scored in the high acculturative stress group showed a flatter diurnal cortisol slope when compared to the low acculturative stress group.

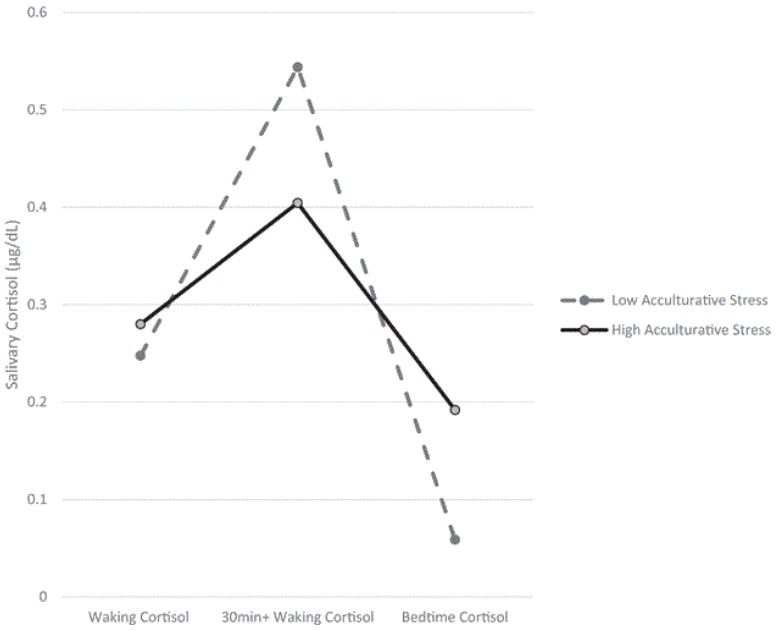

Figure 1. Diurnal cortisol response based on acculturative stress level. Nontransformed data shown.

Discussion

This study sought to better understand the biological indicators of stress as they relate to acculturative stress among Latina adults. Latina women are a group at high risk for experiencing increased stressors, both general and cultural, yet remain understudied in the broader empirical literature. Although some previous studies have examined ethnic discrimination and physiological responses (cf. Zeiders et al., 2012), to the best of our knowledge, this is the first study to examine acculturative stress and cortisol. Given the epidemiological research indicating that, for Latinos, increased exposure to the U.S. culture is associated with worse health outcomes (Alegría et al., 2007), acculturative stress could be a major risk factor that contributes to this phenomenon at a biological and psychological level. Overall, the findings of this initial exploratory study provide information regarding the potential role of cultural stressors in contributing to the biological stress response.

As expected, the findings suggest an attenuation effect in the CAR among the high acculturative stress group when compared to the low acculturative stress group. The CAR has been thought to indicate adrenocortical capacity, with decreased levels suggesting dysfunction and thus a vulnerability to physical and mental disorders (Meinlschmidt & Heim, 2005), including posttraumatic stress disorder (Yehuda, 2002). Linking the experience of acculturative stress with other forms of chronic stress is consistent with a minority stress model (Myers, 2009).

The results of this study support the notion that individuals who endorse high levels of acculturative stress show a flatter diurnal cortisol response slope—namely, lower cortisol levels after waking yet higher cortisol levels in the evening—when compared to the low acculturative stress group. Such a pattern of diurnal cortisol response has been found in past research to represent a blunting of cortisol associated with chronic stress levels and the inability to build an effective HPA response (Clingerman & Brown, 2012; Miller et al., 2007). It has been suggested that chronic and/or early exposure to stress can alter the HPA axis from a system of increased responsivity to one with a more diminished response (Heim, Ehlert, & Hellhammer, 2000; Meinlschmidt & Heim,

2005). Furthermore, a flat diurnal cortisol pattern has been linked to instances of uncontrollable stress. However, it is difficult to determine whether the cortisol patterns observed in this study are due to an acute instance of acculturative stress or if they are a result of cumulative pressures.

Acculturative stress includes pressures to conform to mainstream values and ways of living as well as the pressure to retain the traditional culture. For Latina women, this balancing of cultural demands may be particularly burdensome given the gender role expectation that they be all-nurturing, pious, and all-sacrificing, termed *marianismo*, in order to place the needs of the family above their own (Santiago-Rivera, Arredondo, & Gallardo-Cooper, 2002). It could be the case that numerous pressures stemming from different cultures have a marked influence on the individual's biological stress response.

There are several limitations to this study that should be noted. First, as stated previously, this is an initial exploratory study; given the small sample size, conclusions must be tempered and interpreted with caution. Still, this study has addressed a gap in the empirical research by investigating acculturative stress while accounting for acculturation and age in relation to commonly used biological markers of stress. Further research should examine these processes with a larger sample size to allow for sophisticated analyses such as multivariate repeated-measures modeling. Second, the sample characteristics, beyond sample size, restrict the generalization of the results to the broader Latino community—that is, the participants consisted of women who were well educated and from middle- to high-income socioeconomic backgrounds, which may influence the nature and type of stressors experienced. Still, this sample of Latina women represents a growing subset of the population, and these results begin to inform the complex and multilayered lived experiences of these individuals. In terms of cortisol sampling, three time points may have limited the characterization of the diurnal slope; thus, future work should seek to sample four to five time points a day across multiple days. Furthermore, assessing the CAR with two time points does not allow for the calculation of area under curve with respect to ground, which determines the peak of awakening cortisol levels. Also, this study did not assess menstrual cycle or body mass index, both of which have been found to influence cortisol output. Finally, unlike the assessment of acculturation, the measurement of acculturative stress did not include separate scores to account for bidimensionality.

Despite these limitations, this initial exploratory study provides information regarding the potential interplay of culture and biology among Latinos and begins to address the role of acculturative stress. Future research should continue to address acculturative stress and the related physiological consequences to replicate the current findings and to expand this line of inquiry to the larger community. Along these lines, assessing the complexity of HPA axis functioning should include the measurement of ACTH production and CRF secretion and indicators of allostatic load. Analyses that examine the various types of acculturative stress are needed to refine the nature of these experiences and their contribution to biological responses.

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