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Analysis of Endocrine Response to Perceived Difference in Cross-cultural Interactions

Carole Woolford-Hunt
Andrews University, cwh@andrews.edu

Marlene Murray
Andrews University, mmurray@andrews.edu

Tevni Grajales Guerra
Andrews University, tevni@andrews.edu

Kristina Beenken-Johnson
Andrews University, kristinj@andrews.edu

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Title: Analysis of Endocrine Response to Perceived Difference in Cross-Cultural Interactions

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‡ Carole Woolford-Hunt, PhD
Department of Graduate Psychology & Counseling, Andrews University, Berrien Springs, MI, USA.

1*Marlene Murray, PhD
Department of Biology, Andrews University, Berrien Springs, MI, USA.

Tevni Grajales Guerra, PhD
Department of Graduate Psychology & Counseling, Andrews University, Berrien Springs, MI, USA.

Kristina Beenken-Johnson, BS.
Department of Graduate Psychology & Counseling, Andrews University, Berrien Springs, MI, USA

‡ First Author

2***Corresponding Author**

1* Marlene Murray, 4280 Administration Dr. Price Hall 225, Berrien Springs, MI, 49104.
 +1 269 471-6243. mmurray@andrews.edu

2* Marlene Murray, 4280 Administration Dr. Price Hall 225, Berrien Springs, MI, 49104.
 +1 269 471-6243. mmurray@andrews.edu

Abstract

We live in a world where awareness of ethnic and cultural diversity is an ever increasing reality. Business and education turn to the social sciences to inform them about how to manage and optimize cross-cultural interactions. Although much research has been done on the impact of cross-cultural interactions on a wide range of variables, one less researched area is the endocrine response to cross-cultural interactions. In this study we set out to investigate the endocrine response to cross cultural interactions and the impact of these interactions on perceived differences. To do so we measured the pre and post levels of the stress hormone cortisol of individuals communicating in dyads for 15 minutes. Results showed a significant impact of ethnic interaction on perceived differences and cortisol levels. Practical implications of these findings could have application in the areas of education, psychology, business and human relations in general. Implications for further research are discussed.

Keywords: Cross-cultural, perceived difference, cortisol, endocrine.

Introduction

The use of physiological indicators to measure the effects of racial bias and attitudes has an approximately 60-year history in social psychology. During the 1950s, the United States society began to frown on overt expressions of prejudice. Recognizing the implications this might have on self-report measures of prejudice, researchers began to use physiological indices to study prejudice (Amodio, Harmon-Jones, & Devine, 2003). Rankin and Campbell's (1955) flagship experiment revealed heightened galvanic skin responses (GSR) in White participants when interacting with an African American experimenter as opposed to a White experimenter. Vidulich and Krevanick (1966) also used GSR to assess participants' reactions to photographs of landscapes (neutral stimuli), Black-Black interactions (critical stimuli), Black-White interactions (critical stimuli), and White-White interactions (control stimuli). Critical stimuli elicited greater GSRs than control or neutral stimuli. Subsequent research on the physiological effects of racial bias used measurements of finger pulse volume (FPV), heart rate (HR), basal skin impedance, digital blood flow, respiration, pulse rate, skin conductance, electromyography and much more (see Guglielmi, 1999 for a complete review). More recently, researchers have examined White participants' threat responses to photographs of Black versus White faces as measured by eyeblink responses to startle probes and response latencies (Amodio, et al., 2003; Richeson & Trawalter, 2008).

One explanation for the anxiety demonstrated in cross-cultural interactions is that the majority group member is afraid of being labeled prejudiced and the minority group member is afraid of confirming stereotypes about their group (Clark, Anderson, Clark, & Williams, 1999;

Shelton, 2003; Richeson & Shelton, 2007, Richeson & Trawalter, 2008). Plant and Devine (2003) proposed a model to explain the causes of interracial anxiety, which takes into account theories of prejudice and social anxiety. They argued that interracial anxiety stems from a lack of previous positive experiences with the out-group, which leads to negative expectations of interactions. This in turn, results in a tendency to avoid out-group members and harbor hostility toward them.

As part of a larger study examining the psychoneuroendocrine response to perceived difference, the present study used cortisol measurements to assess how perceived differences during cross-cultural interactions affect stress levels. Cortisol is a glucocorticoid that is released into the bloodstream as a response to threat and can be detected in saliva approximately 20 minutes after secretion. This method of assessing stress-levels has a long history in a variety of fields (Baden et. al., 1973; Chamove and Bowman, 1978; Laures-Gore et. al., 2007; Grant et. al., 2009; Engert et. al., 2009). It is important to note that not all psychological stressors activate the cortisol response, but social interactions, especially those with an element of social-evaluative threat, have been found to induce significant cortisol changes (Dickerson and Kemeny, 2004). Thus, cortisol measurement is a convenient, non-invasive way to assess physiological stress levels after a cross-cultural interaction (Amodio, 2009).

To the best of our knowledge, Amodio (2009) is the only research that has examined cortisol level changes within the American context of cross-cultural interactions between blacks and whites. His study consisted of forty White American undergraduates. Participants' salivary cortisol levels and self-reported anxiety were measured before and after having a conversation

about race with either a Black or White experimenter. Results indicated a significant elevation in self-reported anxiety after interacting with a Black experimenter, but not a White experimenter. No overall differences were observed in cortisol levels for either the Black or White condition, but when baseline cortisol was covaried from post-interview cortisol, differences were evident in that some participants' cortisol increased and others' decreased during the interaction. Amodio (2009) and most of the other studies conducted in this area have focused exclusively on inter-racial contact between African Americans and Euro-Americans (Richeson and Shelton, 2000; Amodio, et al., 2003).

The present study seeks to expand the research by using the Perceived Differences Survey (PDS) to assess participants' perceptions of how similar or dissimilar they feel from their assigned conversational partner. We propose that stress response is not limited to interactions between African-Americans and Euro-Americans or 'Blacks and Whites' but are the result of any number of perceived differences between individuals engaged in cross-cultural interactions. The effect of perceived difference is a relatively untapped area of study. One study, conducted in Japan and Silicon Valley, assessed entrepreneurs' perception of differences between themselves and people who chose to work as managers in large corporations (Ohe, et. al., 1991). Another study assessed doctoral student's perceptions of the differences between themselves and their advisors, including differences of race and gender (Turban, et. al., 2002). Rosner et. al. (2010) used a perceived differences measure to assess the effects of the Beijing Olympic slogan, "One World, One Dream," on Chinese and American individuals' attitudes toward each other.

To study the effects of perceived difference during cross-cultural interactions on endocrine response we proposed the following hypotheses:

6

H01: Individuals automatically perceive how similar or different they are from a conversational partner.

H02: Type of ethnic interaction has significant effect on level of perceived difference.

H03: Type of ethnic interaction has significant effect on level of cortisol change.

This present study will add to the literature on many levels. First, it will use cortisol measurement to expand the research on the physiological effects of racial bias and attitudes. Second, it will test theories regarding interracial anxiety by measuring cortisol levels in the context of cross-cultural interactions. Third, it will assess how perceived differences, not just race, contribute to the challenges associated with cross-cultural interactions. Finally, it will utilize a new instrument - the Perceived Differences Survey (PDS) to measure perceived difference.

Method

Setting

Data was collected at a small private Christian Midwestern university. As the 6th most internationally diverse university in the U.S., (U.S. News and World Report) it provided the researchers a unique opportunity to engage individuals from four U.S. national ethnic groups (Hispanic descendent Americans, Asian descendent Americans, African descendent Americans and European descendent Americans) and from six international regions of the world (South America, Africa, Asia, the South Pacific, the Caribbean, and the Middle East, thus providing the perfect setting for a cross-cultural interaction study.

Participants

Undergraduate students, graduate students and community residents were recruited for this study on the basis of their ethnic, cultural and national origins. Forty-six participants (57% male, 43% female) representing eleven different ethnic groups completed the study. From the eleven ethnic groups represented Latino (18%) and Asian-American (14%) had the largest representation, followed by African American (11%) and Caucasian-American (9%). Samoans and Middle-Easterners had the smallest representation at 4.5% each, while West Indians and Africans were represented at 7% and 9% respectively. Seven languages were indicated, however, the preferred language was English, with the highest representation (59%) followed by Mandarin (11%). The majority of the participants were single (75%) with educational backgrounds ranging from High School to Masters degrees and the majority of participants self-reported as belonging to a Christian denomination. Participants were instructed to abstain from alcohol consumption for 12 hours prior and from dental work 48 hours prior to the session. Only participants who complied participated in the study.

Instruments/Measures

Demographic Survey. All participants completed a demographic survey in regards to gender, ethnicity, age, weight, educational level, preferred language and others.

Health Status Survey. All participants completed the Health Status Survey to assess their eligibility to donate saliva samples and to determine eligibility for participation in the study.

Salivary Cortisol. Saliva was collected using the Salimetrics Oral Swab (SOS) and stored in cryovial tubes at -80º C. Salivary cortisol concentrations were determined from a 25μl

sample using the Salimetrics ® High Sensitivity Salivary Cortisol Enzyme Immunoassay Kit. The assay is optimum when saliva samples have a pH ≤ 3.5 or ≥ 9.0. All samples were within this range and were assayed in duplicates.

Perceived Differences Scale (PDS). The PDS was developed *ex professo* for this study and is a 17-item multidimensional four-factor (social, physical, general look, and status) instrument. Confirmatory factor analysis test showed good fit for the model Chi square = 102.68, (df = 109, sig=.471), CFI = .990, NFI = .751, PRATIO = .801, RMSEA = .005.

Procedure

Participants were exposed to both same ethnic and different ethnic interactions in two sessions that occurred across a two-week time frame. On the first data collection day, all participants were assembled in one room and reminded that the purpose of the experiment was to determine the impact of cross-cultural interactions on stress levels.

In order to establish baseline cortisol concentrations, during the first hour participants completed a demographic survey and a health status survey that included questions probing for compliance regarding restricted substances, after which a saliva sample was submitted. This was followed by a 15-minute interaction with someone self identifying as belonging to the same ethnic group. Each interacting pair was assigned a topic that was not arousing or related to racial issues for discussion. Examples of discussion topics include: "If you knew that tomorrow would be the last full day of your life, how would you spend the day?" and "If you didn't have to worry about making a living what would you most likely to do for the rest of your life?" The interaction was followed by a 20-minute break, the minimum time needed for circulating cortisol levels to be

detected in the saliva (Kirschbaum et al., 1993). A Perceived Difference Survey (PDS) was then completed. Participants were not informed before the interaction that they would be asked to fill complete the PDS at the end of interaction, therefore all information collected on the PDS was harvested by the participant implicitly/unconsciously.

After PDS completion a second submission of a saliva sample was requested to determine the effect of the interaction on cortisol levels. The procedure was repeated on the second data collection day except participant interacted with someone of a different ethnic group and different non-arousing topics were assigned for discussion. Saliva cortisol concentrations were then determined.

Results

Before proceeding with the hypothesis testing, the data was screened and the assumption of equal variance verified. The general mean score for the perceived difference measures taken after each interaction was 8.37 (SD=3.70). For the same ethnic group interaction the mean = 7.02 (SD = 3.67), and for the different ethnic group interaction mean= 9.65 (SD = 3.27). Levene statistics (1, 88) = 0.08, p = 0.770 indicates homogeneity of variance. (Table I). In addition, cortisol measures were taken before and after each interaction in order to measure the change (increase or decrease). Change in cortisol had a general mean score = 0.16, (SD= 0.18). For the same ethnic group interaction the mean = 0.12 (SD = 0.13), and for the different ethnic group interaction mean= 0.19 (SD = 0.21). Levene statistics (1, 87) = 3.52, p = 0.062 indicates homogeneity of variance. (Table I)

(Table I)

Hypothesis Testing Results

H01: Individuals automatically perceive how similar or different they are from a conversational partner. Our results revealed that participants were able to clearly identify individuals who were of similar ethnic and cultural background (mean = 5.71, S.D.= 2.47) and those who were from different ethnic and cultural backgrounds (mean = 10.20, S.D.= 2.89). A significant difference between the means was found (figure 1).

(Figure 1)

H02: Type of ethnic interaction has significant effect on level of perceived difference. Analysis of variance was used to test the hypothesis: Type of ethnic interaction has significant effect on level of perceived difference. A small (partial eta = 0.128) but significant effect $F(1,88) = 12.891$, sig. <0.01, power = 0.994 was observed, thus supporting research hypothesis H02. (Table II)

(Table II)

H03: Type of ethnic interaction has significant effect on level of cortisol change. Figure 2 shows the mean salivary cortisol levels following interactions with individuals of the same (0.13 μg/dl) and different (0.19 μg/dl) ethnic groups. Analysis of variance used to test the hypothesis: Type of ethnic interaction has significant effect on level of cortisol change showed a very small (partial eta = 0.042) but significant effect $F(1,89) = 4.273$, sig. <0.05, power = 0.534, thus supporting research hypothesis H03. (Table II).

(Figure 2)

11

Discussion

This study investigated the impact of perceived differences on stress as measured by cortisol levels of individuals who participated in cross-cultural (different group) versus same group interactions. In order to assess difference, the Perceived Differences Survey (PDS) was developed as a self-report tool to have participants assess 'sameness' and 'difference' between self and study conversational partner.

The PDS was very effective as it consistently and accurately measured sameness and difference as reported by study participants. As our results revealed, participants were able to clearly identify individuals who were of similar ethnic and cultural background and those who were from different ethnic and cultural backgrounds. The PDS was administered after the interaction and participants had no prior knowledge that they would be required to generate the information solicited on the PDS about their dialogue partner. Although repetition priming cannot be ruled out for the second data collection day, the self-reported perceptions of "sameness" and "difference" of participants were probably attained automatically and subconsciously. We surmise this since the main primary activities on data collection days were the interactions and saliva collection. Our observation that data on 'sameness and difference' appear to be automatically harvested may have many implications for cross-cultural interactions and relations. Similar to previous studies (Richeson and Shelton 2007; Amodio et. al., 2003), difference was perceived. However, in the current study since participants were from diverse cultural origins (international and within the United States), the "meaning" made of the difference and the resulting experienced stress (lower cortisol levels compared to previous studies), may have been

mediated by the culture of origin of participants. Thus, the perceived threat that participants experienced in previous studies between Afro-Americans and Euro-Americans (Richeson and Shelton 2007; Amodio et. al., 2003), may be different than that experienced by individuals from diverse setting from outside of the U.S. This is an important finding as it suggests that difference can be experienced even on a endocrine level, with varied levels of 'corresponding stress, depending on how individuals are primed by their culture to make 'meaning' of the differences they automatically perceive.

Our results also revealed that type of ethnic interaction (same or different) did have a small but significant effect on perceived difference. This is closely tied to H01 as it supports the fact that not only do individuals automatically perceive differences between themselves and their conversational partner but the type of ethnic interaction is significantly correlated with their level of perceived difference. Additionally, our results also revealed that type of ethnic interaction (same or different) did have a small but significant effect on stress as measured by cortisol levels. A larger cortisol change would probably require a greater level of perceived difference or threat perception between participants. Thus the results strongly support H01 and provide small but significant support for H02 and H03. In fact it showed that the effect of ethnic interaction on perceived difference is greater than the effect of ethnic interaction on stress, as measured by cortisol levels, in diverse international cross-cultural group interactions.

Although this study broadened the discussion of the impact of cross-cultural interaction on the stress response between African-Americans and Euro-Americans to a diverse international group; one limitation of this study was the small sample size of each international group.

Another is the participants' immersion into this predominantly residential/on-campus, culturally diverse setting may have minimized the impact of perceived difference on cortisol levels. In addition, the religious homogeneity of the participants may have also impacted their stress reaction to the cultural and ethnic differences they perceived.

As previously mentioned, the use of physiological indicators to measure the effects of racial bias and attitudes is well established in social psychology. More recent studies have shown that cross-cultural contact impacts individuals stress response as measured by cortisol levels. Many of these studies, however, have focused exclusively on inter-racial contact between African-Americans and Euro-Americans (Richeson and Shelton 2007; Amodio et. al., 2003). Our results indicate stress response to cross cultural differences, though significant, is not limited to interactions between African-Americans and Euro-Americans or 'blacks and whites' but are the result of any number of perceived differences between individuals engaged in cross-cultural interactions from a variety of cultural backgrounds. Thus the current study broadens the scope of research in the area of cross-cultural interactions on stress.

One avenue of further research would be to determine what sameness and difference means to each cultural group or individual since this may shed light on the observed impact of ethnic interaction on stress/cortisol levels in this study. Additionally, the impact of difference on stress levels can be researched using larger sample sizes and a variety of stress measurement tools.

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16

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Table I

Perceived difference and level of cortisol change descriptive statistics in general and by type of

interaction

Variable	Type of interaction	N	Mean	SD	SError
Perceived Differences		90	8.3667	3.69771	0.38977
	Same	44	7.0227	3.67574	0.55414
	Different	46	9.6522	3.26747	0.48176
Cortisol Change		89	0.1574	0.17871	0.01894
	Same	44	0.1185	0.12827	0.01934
	Different	45	0.1954	0.21168	0.03155

Table II

Analysis of the significance of the effect of ethnic interaction on Perceived Differences and

Cortisol Change

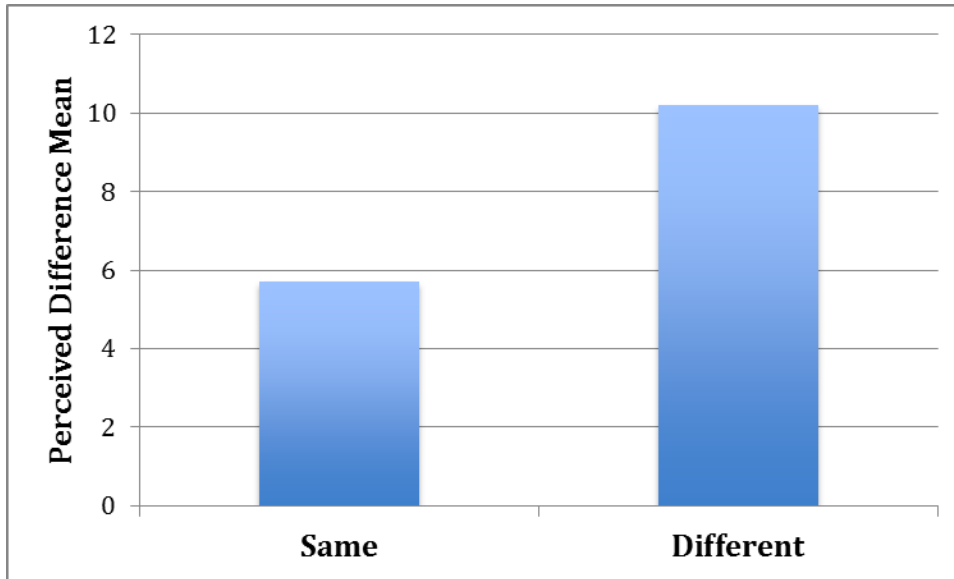| Variable	df	F	Sig.	Partial Eta	Power
Perceived Differences	1, 88	12.891	0.001	0.128	0.994
Cortisol Change	1, 89	4.273	0.042	0.042	0.534

Figure 1. Perceived difference mean scores following interactions with individuals of the same (5.71; S.D. = 2.47) and different (10.20; S.D. =2.89) ethnic groups. Significant difference between means (same/different) were found. Equal variances were assumed (Levene's test p> 0.05)
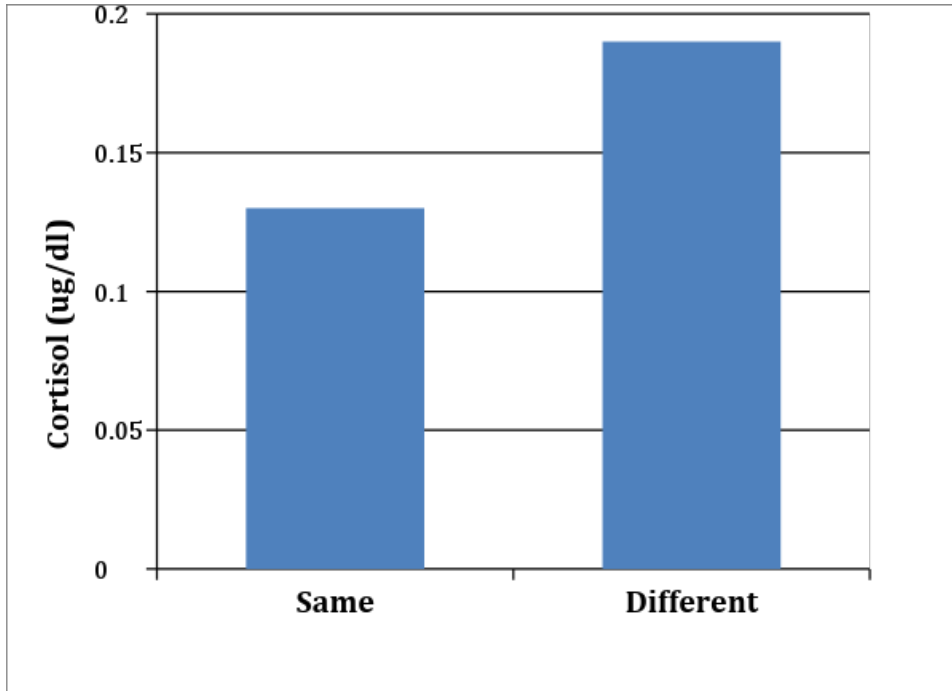
Figure 2. Mean salivary cortisol concentrations following interactions with individuals of the same (0.13; S.D. = 0.14) and different (0.19; S.D. =0.21) ethnic groups.