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Taking It to Heart: Preliminary Investigation on the Cardiovascular Effects of Racial/Ethnic Microaggressions in Latinx

James J. García, PhD[1*]; Dylan G. Serpas, BS [Student][2]; Yaritza Torres, BS [Student][1]

[1]*Department of Psychology, University of La Verne, 1950 Third Street, La Verne, CA 91750, USA*
[2]*Department of Psychology, California State University, Fullerton, 800 N. State College Blvd, Fullerton, CA 92831, USA*

[*]***Corresponding author***
James J. García, PhD
Assistant Professor, Department of Psychology, University of La Verne, 1950 Third Street, La Verne, CA 91750, USA; Phone. 909-448-4147; Fax. 909-448-1627;
E-mail: JGarcia4@laverne.edu

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ABSTRACT

Background

Microaggressions — as a cumulative psychosocial stressor — may be a unique mechanism in the development of cardiovascular diseases, *via* transient changes in cardiovascular reactivity (CVR), for Latinx.

Method

Experimental study with Latinx college students (n=33) randomly assigned to either a microinsult, microinvalidation, or control condition. Independent variables for MANOVA/MANCOVAs were the study conditions and dependent variables were blood pressure (BP) and impedance cardiography (ICG) indicators.

Results

At baseline, two one-way MANOVAs showed no differences by condition for BP or ICG indicators. For the manipulation, results indicated no significant differences by condition for BP or ICG indices. During recovery, results demonstrated no significant differences by condition in BP or ICG indicators. Lastly, baseline experiences of microaggressions were not significantly associated with BP and ICG at recovery.

Conclusion

The experimental manipulation produced no significant difference in CVR by condition. Inferiority and second-class citizen microaggressions were not significantly associated with CVR at recovery. Findings do not negate the existence or cardiovascular impact of microaggressions; rather, these effects appear to be subtle. Implications for Latinx cardiovascular health are discussed.

Keywords

Blood pressure (BP); Impedance cardiography; Cardiovascular reactivity; Latinx; Racial/ethnic microaggressions; Cardiovascular health disparities.

INTRODUCTION

Recent estimates from the National Vital Statistics System (NVSS) indicate heart diseases are the leading cause of death in the United States (U.S.).[1] Comparatively, Latinx demonstrate lower cardiovascular diseases (CVDs) prevalence, incidence, and mortality compared to non-Hispanic Whites or non-Hispanic Blacks,[2] a finding attributed to the so-called Hispanic health paradox[3]; however, this does not mean Latinx people are immune from developing or dying as a result of CVDs. In Latinx communities, CVDs are the second cause of death.[4] Moreover, the US-based Hispanic Community Health Study/Study of Latinos (HCHS/SOL) estimate a 2-5% prevalence of CVDs, with variation by Latinx group.[5] Some scholars propose an examination of psychosocial factors in the development of CVDs among Latinx.[6] Together, CVDs rank as the second leading cause of death for

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Latinx, indicating a need to examine the role of psychosocial factors in CVD risk.

Though much is known about blatant discrimination and CVD, there is limited evidence on subtle discrimination and CVDs. Indeed, racial/ethnic discrimination is conceptualized as a psychosocial stressor salient for communities of color.[7] The advent of the HCHS/SOL provides evidence of blatant experiences of racial/ethnic discrimination as a psychosocial factor in the development of CVDs for Latinx. For example, data from the HCHS/SOL indicate variation in ethnic discrimination, with Mexican, Puerto-Rican, and other/multiple origin Latinx reporting higher experiences compared to Cuban-origin Latinx.[8] Moreover, greater ethnic discrimination was strongly associated with greater metabolic syndrome prevalence for some Latinx groups as well as increased risk for comorbid diabetes and depression in the HCHS/SOL.[9,10] From the experimental literature, data indicate exposure to blatant racial/ethnic discrimination in the lab produces increased cardiovascular reactivity (CVR).[11,12] This CVR hypothesis focuses on transient changes in blood pressure (BP) or indicators of electrical functioning of the heart assessed *via* impedance cardiography (ICG) during race-based social interactions. Consistent with this hypothesis, blatant experiences of racial/ethnic discrimination produced exaggerated (i.e., significantly greater than baseline) systolic blood pressure responses in Latinx in a discrimination lab paradigm.[13] Furthermore, Latinx college students who interacted with a prejudiced non-Hispanic White confederate demonstrated significant increases in several BP and ICG indicators during the anticipation and interaction phase.[14] However, there is limited data on the link between subtle discrimination and CVDs in Latinx.

Contemporary race-based prejudice and discrimination has taken on a gradual, subtle, and insidious nature, a phenomenon termed racial/ethnic microaggressions.[15] These brief, subtle, and ambiguous social interactions communicate hostility towards, and devaluing of, a stigmatized person or group; these are further categorized into microassaults, microinvalidations, or microinsults.[16] Qualitative literature indicates there are specific microaggressions salient to Latinx, including microinsults based on accent and microinvalidations related to being assumed as foreign-born or not "American enough."[17] Quantitative evidence demonstrate associations between physical health and racial/ethnic microaggressions[18,19]; however, limited experimental research on the CVR of racial/ethnic microaggressions exist. For example, an unpublished dissertation found no differences in BP or ICG indicators for experimentally manipulated racial/ethnic microaggressions.[20] Despite that microaggression themes salient to Latinx are well-documented, very few studies empirically test racial/ethnic microaggressions as acting *via* a potential CVR pathway, which may play a role in the development of CVDs for these communities.

Given blatant discrimination findings, racial/ethnic microaggressions or subtle discrimination may act *via* an acute CVR pathway, thereby evoking greater reactivity in Latinx. However, there is only one unpublished study to-date with null findings, indicating a need to test this assertion as CVR reliably predicts the development of disease.[12,21] Hence, this is an exploratory study focused on testing the CVR of Latinx using experimentally manipulated microaggression conditions.

METHOD

Sample

Latinx college students (n=33) were recruited from a private Hispanic serving institution in Southern California. Participants were instructed to not exercise, drink caffeinated beverages, and to properly hydrate prior to the experiment.

Procedure

Participants were randomly assigned to one of three experimental conditions: microinsult (n=11), microinvalidation (n=11), or control (n=11). All subjects underwent a 10-minute vanilla baseline,[22] a 2-minute manipulation (i.e., interacting with a non-hispanic White-appearing study confederate in one of the manipulation conditions), and a 10-minute recovery period. The study was advertised as a social interactions study, where participants were informed they would be interacting with another participant (i.e., confederate) while hooked up to physiological equipment. All participants were debriefed after the study, provided with the study aims, asked whether they caught on to the microaggression statement from the study confederate using a manipulation check, and were given mental and physical health resources.

Study manipulations were conceptualized according to previous literature.[17,20] In the microinvalidation condition, Latinx participants interacted with the study confederate who asked participants "*Hey, what's your major?*" and then "*Where are you from?*" allowing participants to respond, followed by "*No, where are you really from?*" For the microinsult condition, participants had an interaction with the study confederate consisting of "*Hey, what's you major?*" followed by "*You speak English really well.*" Lastly, the control condition had participants engage in a neutral social interaction with the study confederate, including "*Hey, what's your major?*" and "*What day is it today?*"

Measures

Blood pressure was assessed at specific time intervals using the GE Healthcare DINAMAP™ ProCare 400 BP Monitor.[23] An occlusion cuff was placed above the bend of the non-dominant arm by trained research assistants. Blood pressure measurements yielded the following four indicators: systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR), and mean arterial pressure (MAP). Average BP for each condition was calculated. Reactivity change scores for the manipulation condition were calculated (Δreactivity; manipulation minus baseline values). Participants were asked to sit with an upright posture, uncrossed legs, and with their blood pressure cuffed forearm and elbow positioned on the table.

Electrical functioning of the heart (i.e., ICG) was continuously assessed at specific time intervals using the Mindware Mo-

bile® device.[24] A standardized electrode configuration was used by trained research assistants, in line with manufacturer recommended practices.[24] This device transmits a low voltage current throughout the thoracic cavity, yielding the following six indicators: left ventricle ejection time (LVET), stroke volume (SV), cardiac output (CO), thoracic impedance (Zo), pre-ejection period (PEP), and change in impedance overtime (dZ/dt). Average ICG indicators for each condition were calculated. Reactivity change scores were calculated for the manipulation condition (Δreactivity; manipulation minus baseline values). Participants followed the same sitting procedures used for BP readings.

The racial/ethnic microaggressions scale (REMS) was used at baseline to assess for prior experiences of microaggressions.[25] The current study focused on the REMS inferiority and second-class citizen subscales, given these are salient microaggression experiences for Latinx.[17] Adequate reliability estimates for REMS scores for the inferiority and second-class citizen subscale were demonstrated.

Consistent with prior research, each condition was used as an independent variable in two separate multivariate analysis of variance (MANOVA) and four different MANCOVAs (controlling for baseline CVR), with BP and ICG indicators analyzed separately.[20] The two REMS subscale scores were entered as predictors of recovery CVR using ten separate linear regression analyses with the Statistical Package for the Social Sciences version 26 (SPSS®).[26] Given multiple analyses, the *p*-value was adjusted to p=0.005 (i.e., 0.05/10) in order to account for multiple comparisons.

RESULTS

Participants were 18 to 33-year-old, majority U.S.-born, predominantly Mexican-origin Latinx college students from a private Hispanic serving institution in Southern California. Findings from the REMS indicated participants reported experiencing at least one racial/ethnic microaggression within the last six-months. There were no missing data for BP indicators or the REMS scores, resulting in an N=33 for these analyses. However, there were missing data for ICG indicators for nine participants across study conditions, n=9 (control), n=8 (microinsult), and n=7 (microinvalidation), resulting in a total N=24 for ICG analyses. Given the exploratory and pilot nature of this study, missing data for ICG indicators were not imputed. See Table 1 for further demographic information.

Results from two separate omnibus One-way MANOVAs showed no baseline differences by condition for BP, including SBP, DBP, HR, and MAP, $F(8, 54)=1.17$, $p=0.33$; Wilks' $\Lambda=0.73$, partial $\eta^2=0.15$ or ICG, including LVET, SV, CO, Zo, PEP, and dZ/dt, $F(14, 30)=0.56$, $p=0.87$; Wilks' $\Lambda=0.63$, partial $\eta^2=0.21$. Thus, no baseline differences in CVR by condition emerged.

Controlling for baseline BP and ICG indicators, results from two separate omnibus One-way MANCOVAs demonstrated no significant differences by condition during the manipulation for BP, including SBP, DBP, HR, and MAP, $F(8, 46)=0.83$, $p=0.59$; Wilks' $\Lambda=0.77$, partial $\eta^2=0.13$ or ICG, including LVET, SV, CO, Zo, PEP, and dZ/dt, $F(14, 16)=0.87$, $p=0.60$; Wilks' $\Lambda=0.32$, partial $\eta^2=0.43$ (Table 2).

Table 1. *Demographic Characteristics of the Sample*

	Control	Microinsults	Microinvalidation	
Participants	**n=11**	**n=11**	**n=11**	**N=33**
Age, M(SD)	20.45 (4.25)	19.73 (2.05)	20.45 (3.27)	20.21
Sex, N(%)				
Male	3 (27.3)	2 (18.2)	2 (18.2)	7 (21.2)
Female	8 (72.7)	9 (81.8)	9 (81.8)	26 (78.8)
Hispanic Origin, N(%)				
Central American				6 (18.2)
Cuban				1 (3.0)
Mexican				24 (72.7)
South American				1 (3.0)
Other				1 (3.0)
Class Standing, N(%)				
Freshman				13 (39.4)
Sophomore				4 (12.1)
Junior				8 (24.2)
Senior				8 (24.2)
First Generation, N(%)				
No				9 (27.3)
Yes				24 (72.7)
Speak Another Language, N(%)				
No				13 (39.4)
Yes				20 (60.6)
REMS Second Class (α=0.77)	0.052 (0.10)	0.06 (0.13)	0.16 (0.26)	
REMS Inferiority (α=0.70)	0.25 (0.24)	0.14 (0.15)	0.24 (0.22)	

Note. REMS=Racial Ethnic Microaggressions Scale.

Controlling for baseline BP and ICG indices, results from two separate omnibus One-way MANCOVAs demonstrated no significant differences in BP by condition at recovery, including SBP, DBP, HR, and MAP, $F(8, 46)=0.88$, $p=0.54$; Wilks' $\Lambda=0.75$, partial $\eta^2=0.13$ or ICG, including LVET, SV, CO, Zo, PEP, and dZ/dt, $F(12, 14)=1.10$, $p=0.43$; Wilks' $\Lambda=0.27$, partial $\eta^2=0.49$ (Table 3).

To examine REMS predicting CVR at recovery, ten separate linear regression analyses were conducted with REMS subscales as independent predictors of recovery BP and ICG indicators. Given multiple analyses, the *p*-value for these analyses was adjusted to 0.005 (i.e., $p=0.05/10$). Based on this adjustment, results indicated baseline REMS subscale scores did not significantly predict BP or ICG indicators at recovery (Table 4).

Table 2. *MANCOVA for BP and ICG Indicators by Experimental Condition During the Study Manipulation*

	Experimental Condition				
	Microinvalidation	**Microinsult**	**Control**	***p***	**Partial η^2**
	M(SD)	**M(SD)**	**M(SD)**		
BP Indicators					
ΔSBP, mmHg	11.77(7.33)	8.42(3.21)	8.14(4.62)	0.190	0.120
ΔDBP, mmHg	7.83(5.61)	3.90(4.18)	4.62(2.42)	0.118	0.151
ΔMAP, mmHg	9.12(5.97)	5.74(2.97)	5.93(2.23)	0.147	0.137
ΔHR, beats/min	7.02(13.42)	4.79(4.33)	0.61(5.57)	0.323	0.083
ICG Indicators					
ΔLVET, m sec	-13.18(23.81)	-7.53(22.49)	2.51(22.76)	0.739	0.042
ΔSV, mL/m^2	-34.28(93.82)	11.39(34.29)	-15.58(33.67)	0.179	0.218
ΔCO, L/min	87.21(229.29)	1.78(2.73)	-15.20(74.15)	0.508	0.092
ΔZo, Ohms	-0.04(0.10)	1.62(4.31)	-0.20(0.25)	0.708	0.048
ΔPEP, m sec	-8.49(8.50)	4.88(13.15)	-2.36(15.28)	0.745	0.041
ΔdZdt	-0.042(0.07)	0.70(1.20)	-0.05(0.06)	0.799	0.032

Note. N=33. Δ=Reactivity change. Means reported as Δ scores, i.e., average manipulation means – baseline means. BP=Blood Pressure. ICG=Impedance Cardiography. BP indices included Systolic blood pressure (SBP), Diastolic blood pressure (DBP), Mean arterial pressure (MAP), and Heart rate (HR). ICG indices included Left ventricle ejection time (LVET), Stroke volume (SV), Cardiac output (CO), Thoracic impedance (Zo), Pre-ejection period (PEP), and Change in impedance over time (dZ/dt). Covariates included in the model were BP and ICG measured at baseline. Effect sizes and p-values provided are related to multivariate omnibus tests. Given no significant differences were found, follow-up univariate main effects are not reported.

Table 3. *MANCOVA for BP and ICG Indicators by Experimental Condition at Recovery*

	Experimental Condition				
	Microinvalidation	**Microinsult**	**Control**	***p***	**Partial η^2**
	M(SD)	**M(SD)**	**M(SD)**		
BP Indicators					
SBP, mmHg	108.28(15.06)	101.96(9.38)	114.86(10.88)	0.138	0.141
DBP, mmHg	62.73(10.00)	59.72(8.29)	64.91(7.16)	0.566	0.043
MAP, mmHg	79.90(11.92)	75.25(8.56)	83.86(6.44)	0.259	0.099
HR, beats/min	78.70(4.51)	70.93(8.37)	78.14(13.39)	0.403	0.068
ICG Indicators					
LVET, m sec	284.60(34.47)	270.76(20.03)	291.19(45.98)	0.056	0.381
SV, mL/m^2	163.07(102.04)	260.79(162.03)	421.79(269.87)	0.122	0.296
CO, L/min	13.50(8.05)	40.75(60.58)	24.59(10.45)	0.616	0.078
Zo, Ohms	5.34(4.81)	8.70(5.04)	5.85(3.65)	0.143	0.277
PEP, m sec	92.64(16.44)	92.97(10.47)	83.84(12.84)	0.679	0.063
dZdt	0.41(.39)	4.39(9.72)	0.55(0.55)	0.464	0.120

Note. N=24. BP=Blood Pressure. ICG=Impedance Cardiography. BP indices included Systolic blood pressure (SBP), Diastolic blood pressure (DBP), Mean arterial pressure (MAP), and Heart rate (HR). ICG indices included Left ventricle ejection time (LVET), Stroke volume (SV), Cardiac output (CO), Thoracic impedance (Zo), Pre-ejection period (PEP), and Change in impedance over time (dZ/dt). Covariates included in the model were BP and ICG measured at baseline. Effect sizes and p-values provided are related to multivariate omnibus tests. Given no significant differences were found, follow-up univariate main effects are not reported.

Table 4. *Summary of Simple Regression Analyses REMS Subscales Predicting CVR Indicators at Recovery*

	REMS Subscale			
	Second Class		Inferiority	
Criterion	β	**95% CI**	β	**95% CI**
SBP, mmHg	0.079	-20.60-31.98	0.361	1.13-40.86
DBP, mmHg	0.108	-12.35-22.71	0.277	-2.91-24.46
MAP, mmHg	0.091	-14.85-24.69	0.351	0.37-30.40
HR, beats/min	0.017	-19.36-21.23	0.045	-14.37-18.40
LVET, m sec	-0.545	-344.44- -69.52	-0.337	-123.77-11.42
SV, mL/m^2	-0.192	-1514.57-601.23	-0.081	-624.26-433.86
CO, L/min	-0.114	-214.65-130.07	0.067	-74.03-99.05
Zo, Ohms	0.092	-20.56-31.48	-0.106	-14.31-8.78
PEP, m sec	-0.225	-121.63-38.24	-0.144	-47.90-24.19
dZdt	-0.118	-33.26-19.47	0.057	-11.42-14.70

Note. N=3. REMS=Racial Ethnic Microaggressions Scale; CVR=Cardiovascular Reactivity; SBP=Systolic Blood Pressure; DBP=Diastolic Blood Pressure; MAP=Mean Arterial Pressure; HR=Heart Rate; LVET=Left Ventricle Ejection Time; SV=Stroke Volume; CO=Cardiac Output; Zo=Thoracic Impedance; PEP=Pre-Ejection Period; dZ/dt=Change in impedance overtime. An adjusted p-value of .005 (i.e., p=0.05/10) account for chance, given multiple analyses.

DISCUSSION

Findings indicate exposure to one experimentally manipulated racial/ethnic microaggression does not evoke significant CVR among Latinx college students. Moreover, baseline experiences of racial/ethnic microaggressions did not significantly predict BP and ICG indicators at recovery for Latinx. Together, these findings do not negate the existence or impact of racial/ethnic microaggressions as proposed by some[27]; rather, the effects of racial/ethnic microaggressions appear to be subtle (consistent with the conceptualization of such ambiguous interpersonal slights) and relate to the experiential (rather than empirical) realities faced by Latinx living in a prejudiced society.[28]

Current null findings are consistent with an unpublished dissertation that found no exaggerated CVR in the experimentally manipulated microaggression groups for Latinx.[20] Moreever, microaggressions not predicting recovery CVR is inconsistent with an unpublished dissertation that found a positive association between inferiority microaggressions and SBP in Latinx.[18] Furthermore, none of the regression analyses significantly predict BP and ICG at recovery after adjusting for multiple comparisons. Perhaps subtle discrimination does not function primarily through a CVR pathway, but rather *via* the cortisol reactivity pathway of the Hypothalamic Pituitary Adrenal axis[29,30]; this warrant further study and replication.

Compared to a blatant discrimination experiment, the current study did not evoke significant CVR. This is in contrast with Sawyer and colleagues, who found significantly lower PEP but higher HR in Latinx women during an interaction with a known prejudiced confederate.[14] It may be possible that current study results did not significantly evoke CVR due to the subtle and ambiguous nature of racial/ethnic microaggressions, whereas the study by Sawyer and colleagues contained an anticipatory effect, whereby participants were expecting to interact with someone who was known to be blatantly prejudiced. Additionally, one microaggressive social interaction may not be enough to produce the exaggerated cardiovascular responses typically seen with blatant racial/ethnic discrimination paradigms.[13] Conceivably, the cumulative and chronic nature of microaggressions may impact BP and ICG indicators across time and settings, indicating a need to examine this using longitudinal designs by assessing experiences outside the lab in the real world (e.g., ecological momentary assessment) and using ambulatory devices to capture cardiac functioning to accurately portray the CVR effects of racial/microaggressions; these speculations should be further tested and explored.

In relation to the broader psychophysiology literature, the biopsychosocial model of challenge and threat (BPS-CT) posits there are specific patterns of CVR that emerge when faced with challenge and threat situations, including race-based stressor tasks[11]; this model is the primary framework used in CVR studies. However, this analysis has received criticism in the challenge-threat literature.[31] Despite this larger debate, some propose an enhanced BPS-CT model to use with Latinx people that incorporates Latinx sociocultural values[32]; this may be a fruitful area of research focused on risk and resilience for Latinx in CVR studies.

This study is not without methodological and statistical limitations. First, this is a modest sample, with 33 college-aged students from a private university; future studies should use community samples of different ages and socioeconomic statuses, as these characteristics may influence the detection of racial/ethnic microaggressions. Second, the Latinx groups were collapsed to represent one monolithic group given the small Latinx group sizes, thereby representing ethnic gloss,[33] which neglects the unique historical and contextual factors influencing CVD risk for each Latinx group[34]; future CVR studies should disaggregate the Latinx pan-ethnic group. More importantly, it cannot be ruled out that the administration of the REMS at baseline may have primed participants on this study's aims, which likely contributed to null findings as participants might have known what the study entailed. Interestingly, during the debriefing period, all participants were provided with a summary sheet with the study aims and most participants indicated they were not able to detect the microaggression manipulation from the study confederate. Perhaps the confederate statements did not rise to the level of being detected as microaggressions by participants or there may be other reasons (beyond those assessed herein) contributing to participants not identifying the statements as microaggressions; these two lines of inquiry warrant further research. Post-hoc power analyses were conducted using G*Power to identify the required sample size needed to detect significant effects during the experimental manipulation period.[34] For BP indicators, given a multivariate effect of partial η^2=0.13 (α=0.05; 1-β=0.80), a total sample size of 897 would be needed to detect significant effects. Given a multivariate effect of partial η^2=0.43 for ICG indicators (α=0.05; 1-β=0.80) a total sample size of 90 would be needed to detect significant effects. It is conceivable that the large number of participants needed to detect BP effects is consistent with the subtle impact of racial/ethnic microaggressions

on hemodynamic responses. However, the sample size required for ICG indicators suggests this method may be useful to capture the cardiovascular impact of experimentally manipulated racial/ethnic microaggressions; however, this warrants further replication. Lastly, it is worth mentioning that substantial ICG data were missing (due to containing significant artifacts) and these data were not imputed, given the exploratory nature of this study.

CONCLUSION

Findings suggest there are no significant cardiovascular impacts of racial/ethnic microaggressions for Latinx college students. However, given the cumulative and chronic nature of microaggressions, future studies should empirically test this CVR pathway for racial/ethnic microaggressions to inform cardiovascular health research for Latinx communities in the U.S.

AUTHORS' CONTRIBUTION

Study concept and design: García. Data collection: García, Serpas & Torres. Analysis and interpretation of data: García, Serpas & Torres. Drafting and revision of the manuscript: García, Serpas, & Torres. Obtained funding: García.

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CONSENT

All study procedures were approved prior to data collection by the Institutional Review Board (IRB) of the University of La Verne and participants provided informed consent.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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