

PSYCHOLOGICAL RESILIENCE MODULATES THE EFFECT OF ADVERSE CHILDHOOD EXPERIENCES ON VASCULAR ENDOTHELIAL FUNCTION AND MITOCHONDRIAL REACTIVE OXYGEN SPECIES IN YOUNG ADULTS

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Introduction

- Adverse Childhood Experiences (ACEs) are severe psychosocial stressors that occur during the first 18 years of life
- ACEs include physical, emotional, and sexual abuse, unstable home environment, and community adversity
- ACEs invoke a dose-dependent increase in cardiovascular disease risk in middle and older adulthood
- ACEs are associated with impaired vascular endothelial function (VEF) and reduced psychological resilience
- Chronic psychosocial stress promotes mitochondrial damage that may induce excess mitochondrial reactive oxygen species (mtROS) production, a contributor to oxidative stress and vascular dysfunction

Purpose: To examine the role of psychological resilience on vascular endothelial function (VEF) and mitochondrial reactive oxygen species (mtROS) in young adults with versus without prior ACE exposure.

Methods

- Cross-sectional cohort (n = 23)
- Inclusion Criteria: no history of cardiometabolic disease
- Adverse Childhood Experience score of 0 (ACE-) or ≥3 (ACE+)
- Connor Davidson Resilience Scale (CD-RISC-25)
- In vivo vascular endothelial function characterized by brachial artery flow mediated dilation (FMD)
- Ex vivo cell culture model to assess mtROS
 - Human aortic endothelial cells (HAECs) cultured in 10% participant serum and stained with CellROX
 - Live HAECs imaged using fluorescence microscopy
 - mtROS presented as Median Fluorescence Intensity (MFI); arbitrary units)

Table 1. Characteristics of (n = 23) participants across groups

Sample Characteristic	Mean ± SD or n (%)		
	ACE- (n = 11)	ACE+HR (n = 5)	ACE+LR (n = 7)
Age (y)	24.8 ± 5	22.2 ± 4	24.7 ± 6
Height (cm)	164.4 ± 9.7	170.0 ± 13.0	166.4 ± 8.9
Weight (kg)	72.5 ± 18.8	73.4 ± 13.8	65.9 ± 9.6
BMI (kg·m ²)	26.6 ± 5.7	25.4 ± 4.3	24.0 ± 4.5
Sex			
Male	5 (45)	1 (20)	2 (29)
Female	6 (55)	4 (80)	5 (71)
Race			
White	8 (73)	4 (80)	6 (86)
Black	0 (0)	0 (0)	0 (0)
Asian/Pacific Islander	1 (9)	0 (0)	0 (0)
Other	2 (18)	1 (20)	1 (14)
ACE Score	0 ± 0	5 ± 2	5 ± 2
Resilience (CD-RISC) Score	78 ± 15	75 ± 7	60 ± 9
Anxiety Symptoms (ZRSA)	27 ± 5	33 ± 6	37 ± 5
Center for Epidemiologic Studies Depression Scale (CESD)	11 ± 8	14 ± 8	25 ± 8

Results

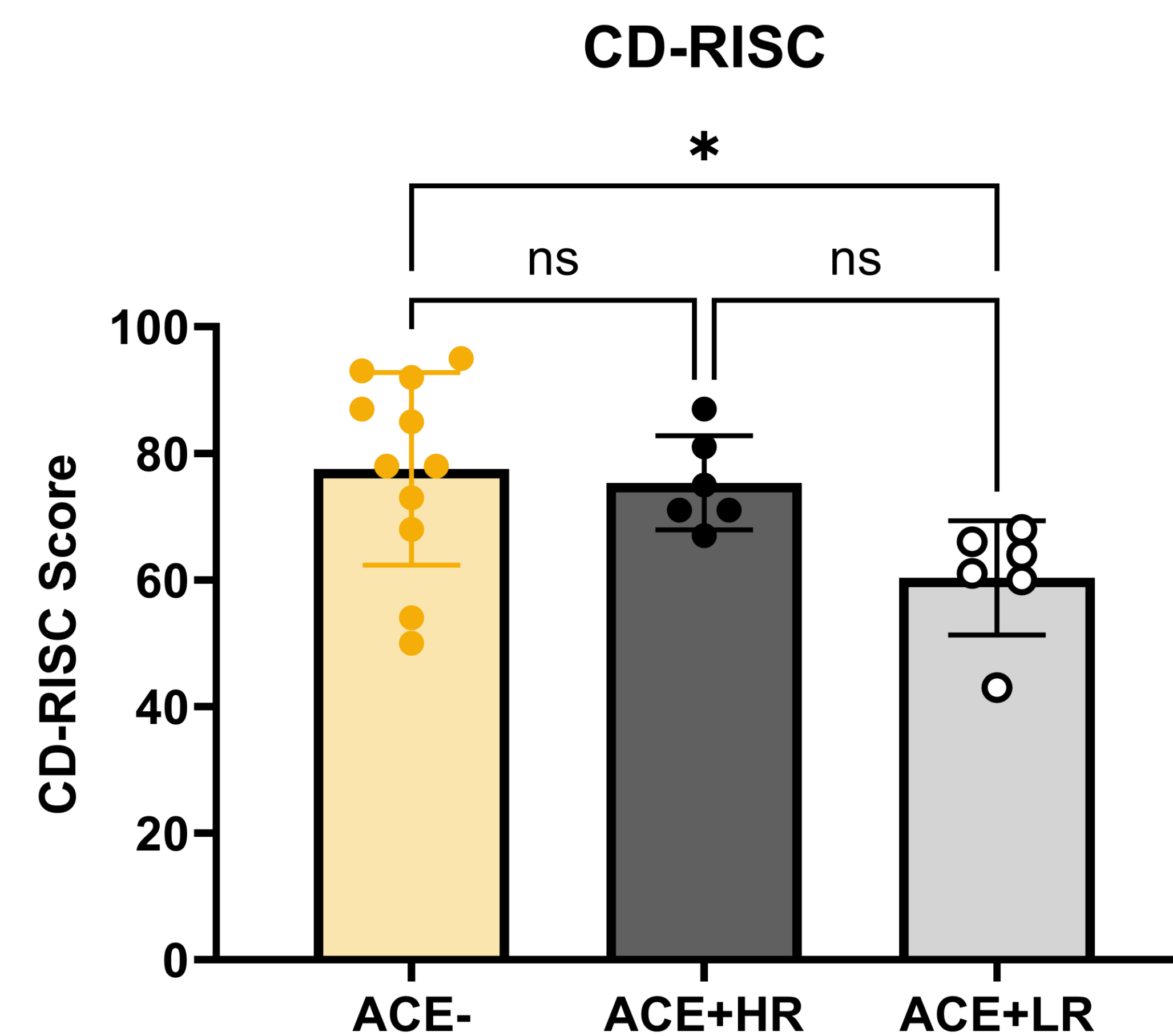


Figure 1. Mean (± SD) psychological resilience across ACE groups measured by the Connor-Davidson Resilience Scale (CD-RISC). *, p < 0.05;

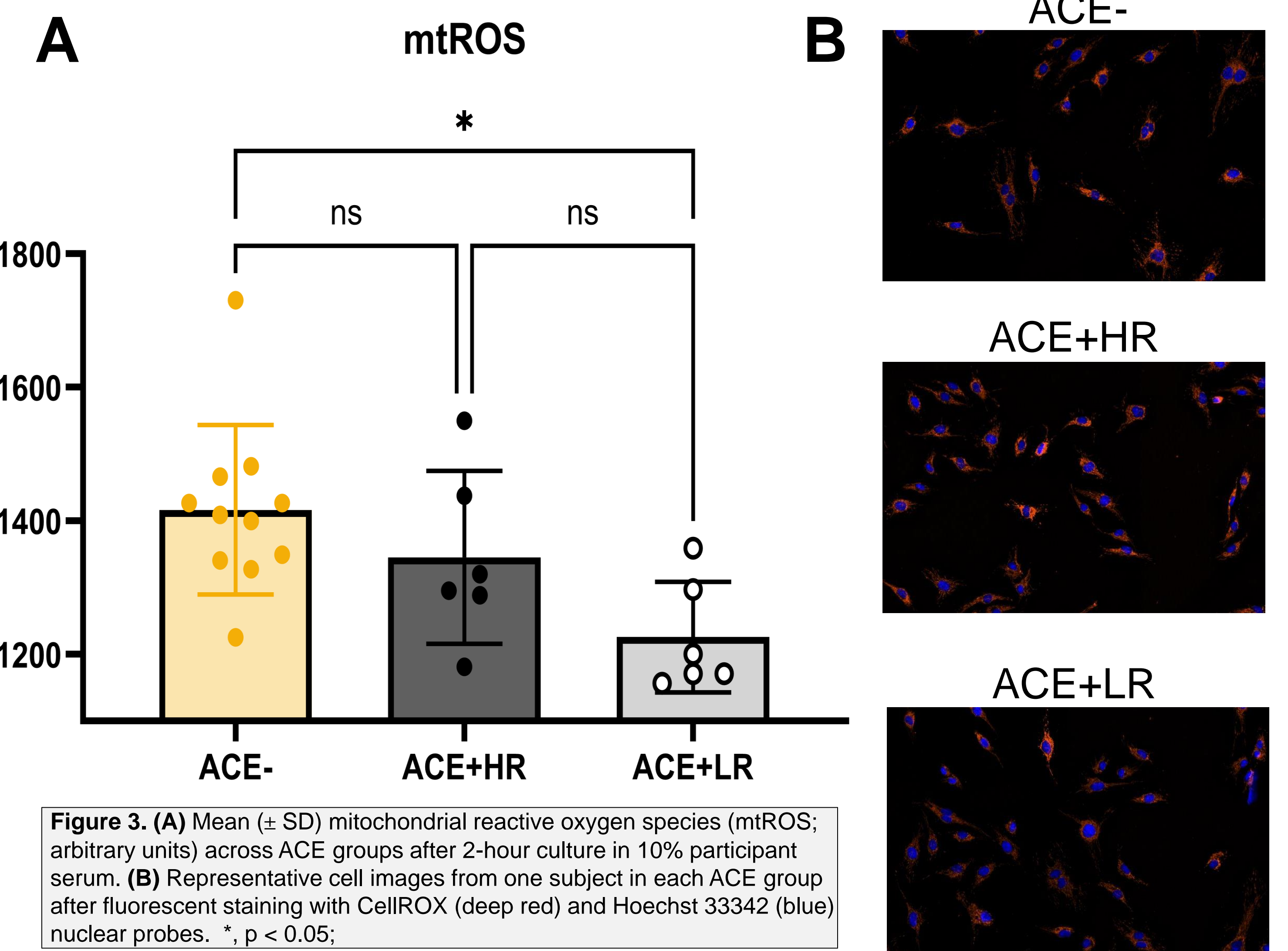


Figure 3. (A) Mean (± SD) mitochondrial reactive oxygen species (mtROS; arbitrary units) across ACE groups after 2-hour culture in 10% participant serum. (B) Representative cell images from one subject in each ACE group after fluorescent staining with CellROX (deep red) and Hoechst 33342 (blue) nuclear probes. *, p < 0.05;

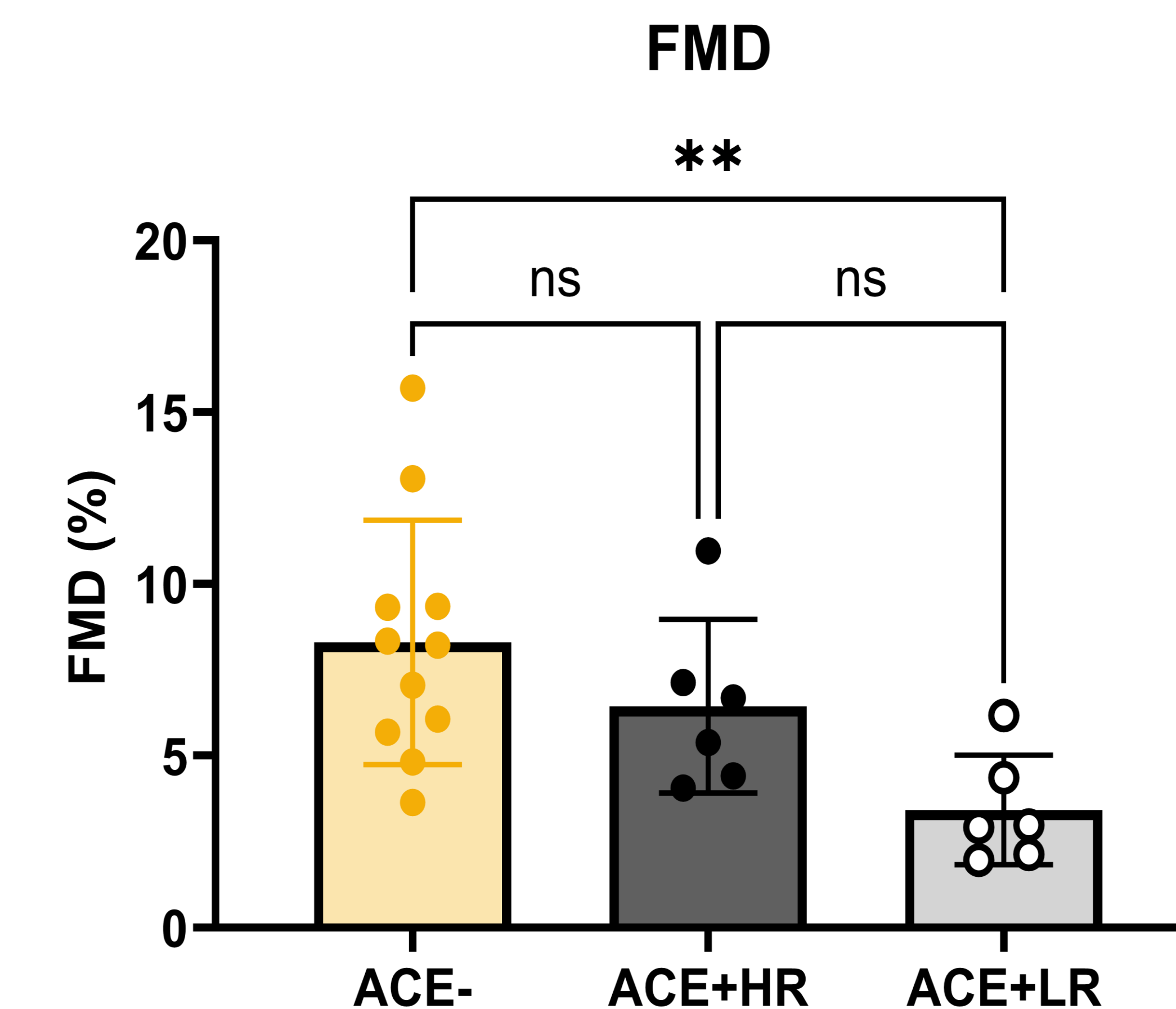


Figure 2. Brachial artery FMD (calculated as percent change in diameter in response to 5 minutes of occlusion) across ACE groups. *, p < 0.05; **, p < 0.001

Conclusions

Our findings support reduced vascular function and paradoxical reductions in mitochondrial reactive oxygen species in those with prior ACE exposure and lower psychological resilience.

- These data replicate our previous findings that VEF measured by FMD is lower in young adults with ACEs compared to no ACEs, and particularly in those with prior ACE exposure and lower psychological resilience
- Opposite to our hypothesis, mtROS was lower in individuals with high ACE exposure and lower psychological resilience
- These data suggest that lower mtROS is driven by circulating factor(s)



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