

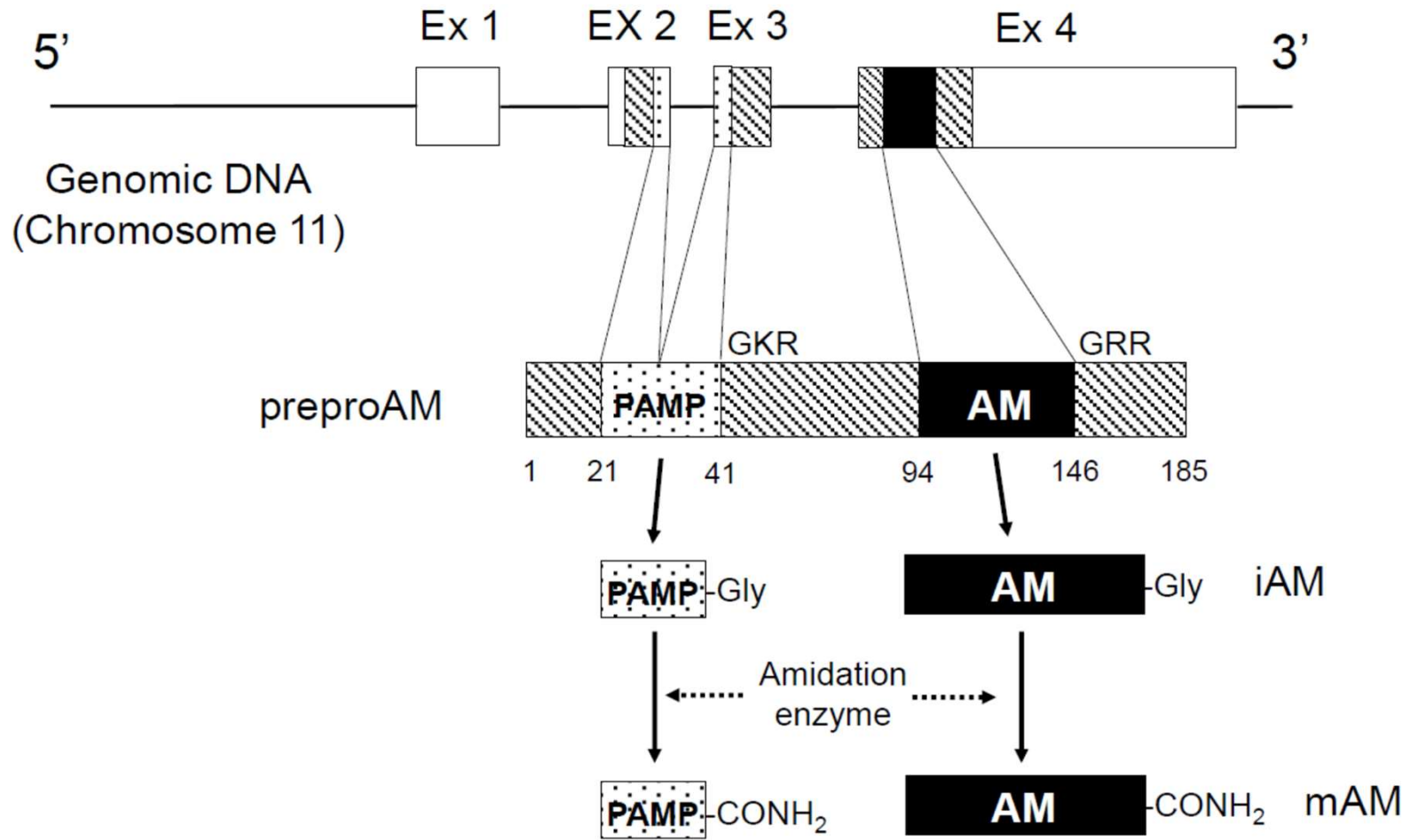
EFFECT OF YOGA ON VASVULAR STRESS HORMONE ADRENOMEDULLIN AND RELATION TO CARDIOMETABOLIC DISEASE

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GREAT ITALY VIII INTERNATIONAL MEETING
SEPTEMBER 26TH –OCTOBER 4TH 2019
CILENTO REGION –SALERNO (Italy)



ADRENOMEDULLIN- WIDELY EXPRESSED AND SECRETED WITH ENDOTHELIUM AS A MAIN SOURCE OF CIRCULATING LEVELS



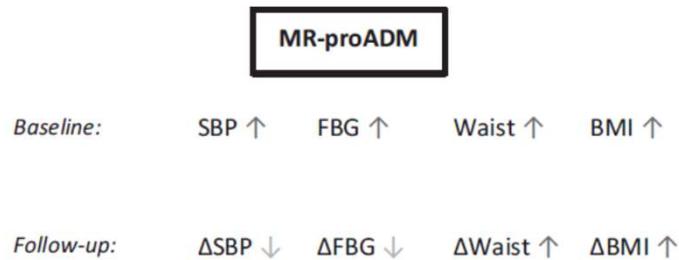
Novel and Conventional Biomarkers for Prediction of Incident Cardiovascular Events in the Community

Biomarker	HR	
	Multivariable-Adjusted HR (95% CI) ^b	<i>P</i> Value
First cardiovascular events		
CRP	1.19 (1.07-1.32)	.002
Cystatin C	1.13 (1.03-1.23)	.006
MR-proADM	1.12 (1.01-1.24)	.04
MR-proANP	1.12 (1.00-1.25)	.04
N-BNP	1.22 (1.10-1.36)	<.001
First coronary events		
Cystatin C	1.15 (1.04-1.27)	.006
MR-proADM	1.21 (1.07-1.37)	.002
N-BNP	1.28 (1.12-1.47)	<.001

Melander et al. JAMA 2009

Midregional proadrenomedullin predicts reduced blood pressure and glucose elevation over time despite enhanced progression of obesity markers

Therese Ohlsson, Peter M. Nilsson, Margaretha Persson, and Olle Melander
 Journal of Hypertension 2019, 37:590–595

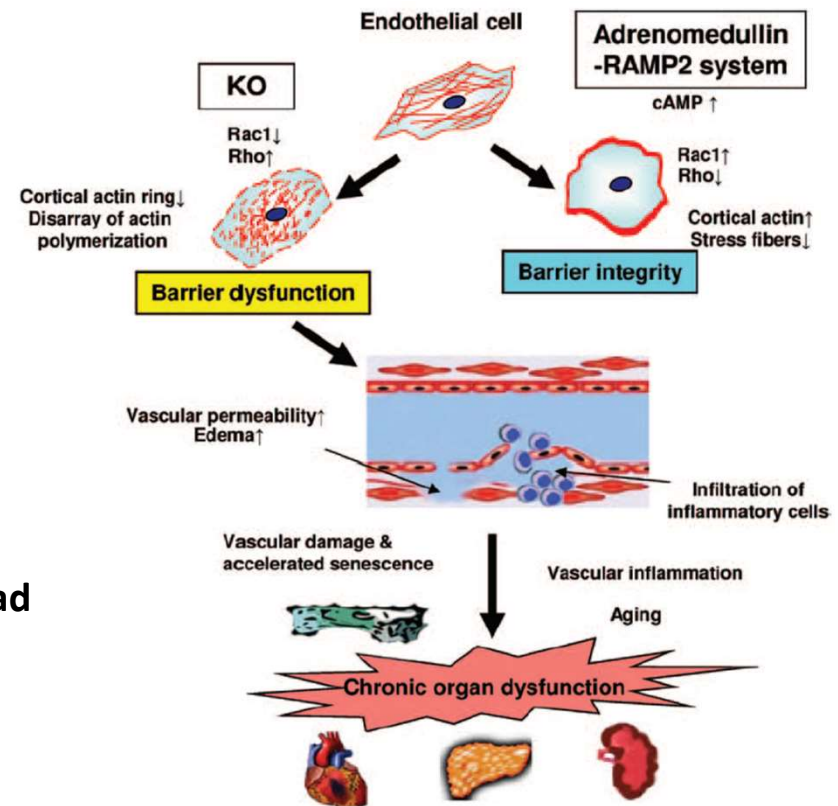


ADM (bio-active ADM) = Good guy but sign of something bad

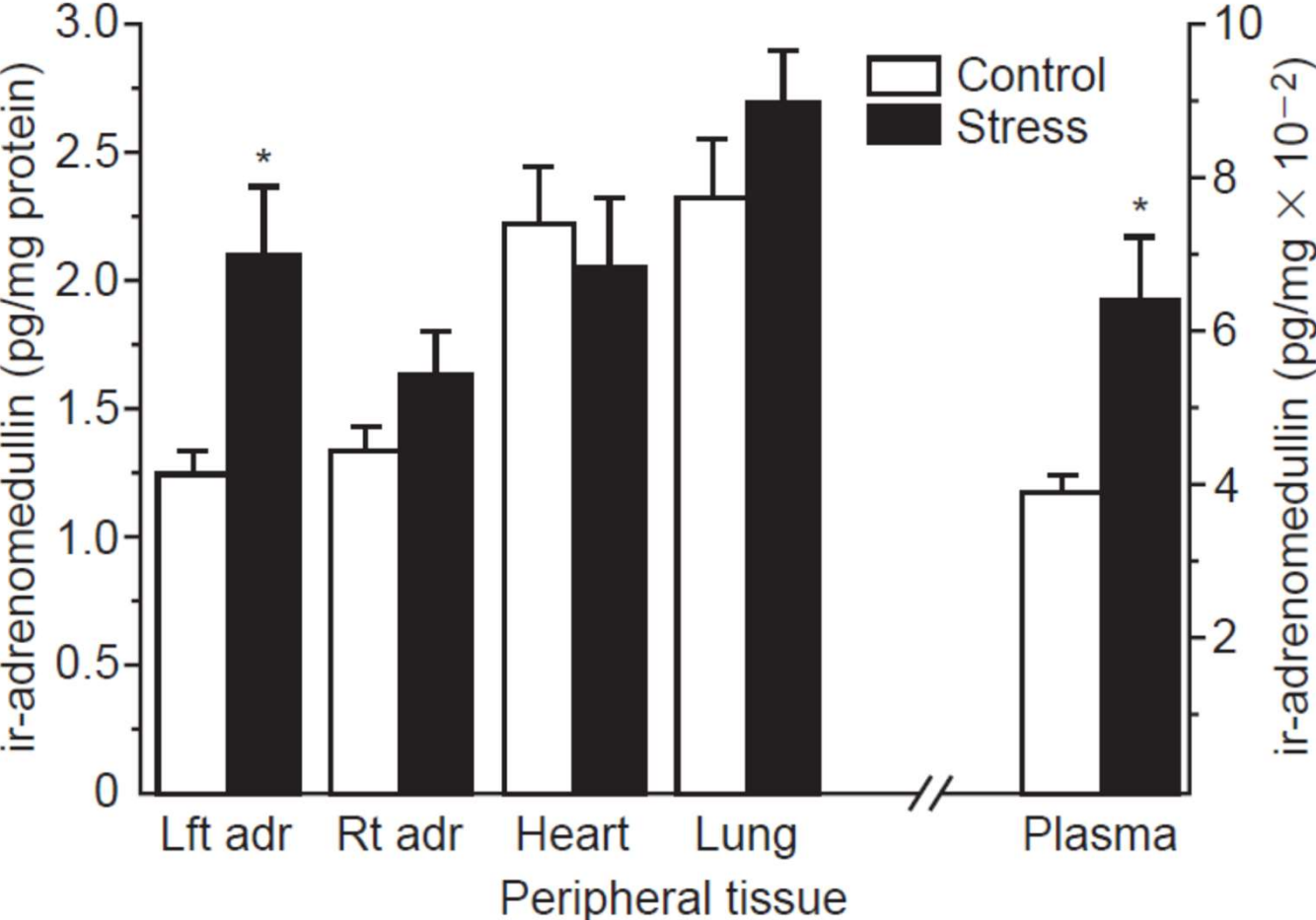
“high value = cry for help”

Vascular Endothelial Adrenomedullin-RAMP2 System Is Essential for Vascular Integrity and Organ Homeostasis

Teruhide Koyama; Laura Ochoa-Callejero, PhD; Takayuki Sakurai, PhD; Akiko Kamiyoshi, PhD; Yuka Ichikawa-Shindo, MD, PhD; Nobuyoshi Iinuma, MD, PhD; Takuma Arai, MD, PhD; Takahiro Yoshizawa; Yasuhiro Iesato, MD; Yang Lei; Ryuichi Uetake; Ayano Okimura; Akihiro Yamauchi; Megumu Tanaka; Kyoko Igarashi; Yuichi Toriyama, MD; Hisaka Kawate; Ralf H. Adams, PhD; Hayato Kawakami, MD, PhD; Naoki Mochizuki, MD, PhD; Alfredo Martínez, PhD; Takayuki Shindo, MD, PhD



STRESS CAUSES INCREASED PRODUCTION AND SECRETION OF ADRENOMEDULLIN



NeuroReport 10, 2829-2833 (1999)

**AIM: TO TEST IN A RANDOMIZED CONTROLLED TRIAL IF YOGA
ALTERS PLASMA CONCENTRATION OF ADRENOMEULLIN**

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A woman with long brown hair is shown from the chest up, wearing a white t-shirt. She has her hands pressed against her face, covering her eyes and nose, with her fingers spread. Her expression is one of distress or stress. The background is a blurred indoor setting with a bookshelf and a blue wall.

STUDY POPULATION:

- 1) Advertisements searching for adults (40-65 y) experiencing chronic everyday stress
- 2) Telephone interview by psychologists- included if moderate to high stress during the last month based on the "perceived stress scale" (PSS)
- 3) Physically fit to perform slow but deep yoga postures
- 4) Age 40-65 years
- 5) No yoga or mindfulness during past 12 months
- 6) No current psychological or psychopharmacological therapy

RANDOMIZED CONTROLLED TRIAL IN SUBJECTS EXPERIENCING STRESS

- **YIN YOGA (60 min twice weekly for 5 weeks)**
- **YIN YOGA + MINDFULNESS (60+30 min twice weekly for 5 weeks)**
- **CONTROL THERAPY (no therapy but invited to course after study)**



***PSYCHOLOGICAL STRESS (PSS, Insomnia Severity Index (ISI) & Hospital Anxiety and Depression Scale (HADS))**

***PLASMA ADM**

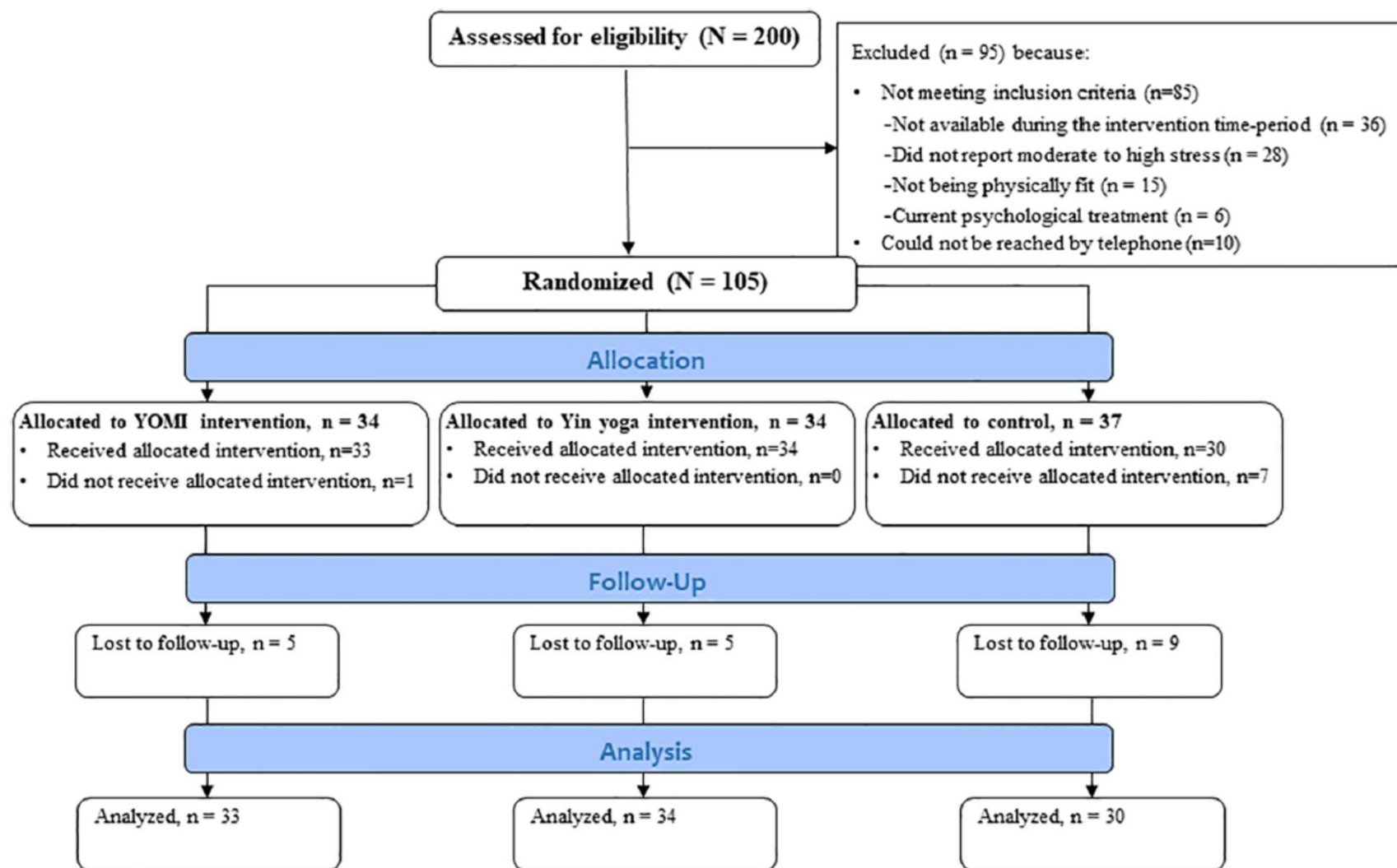
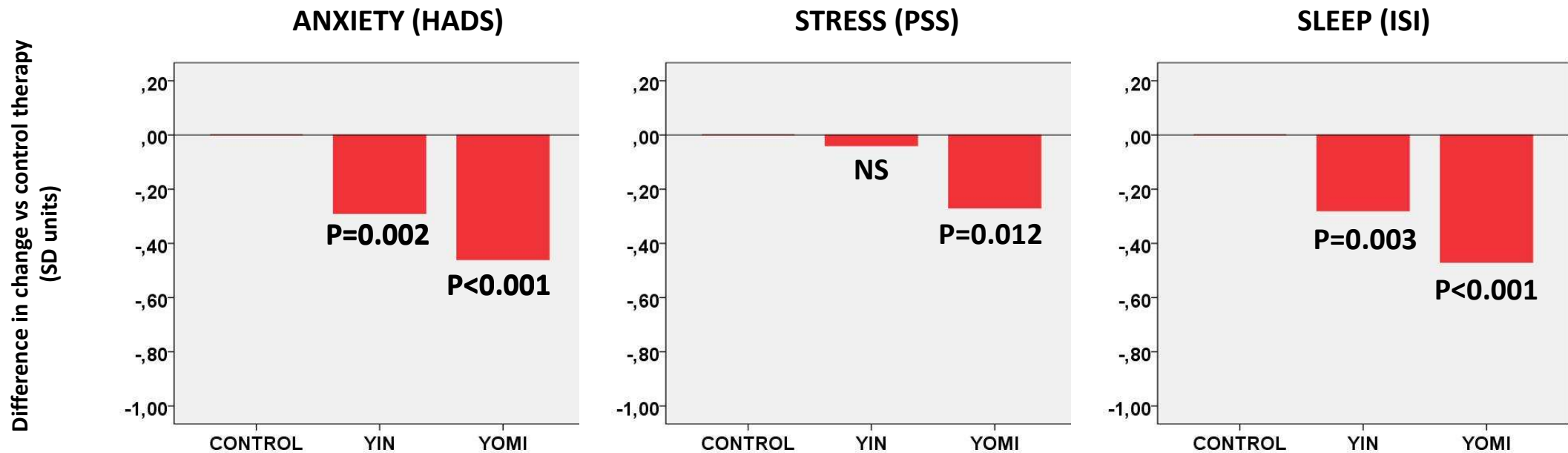


Fig 1. CONSORT flow diagram.

Table 1. Descriptive statistics of the participants at baseline.

Variable	Group			p values
	YOMI (n = 33)	Yin Yoga (n = 34)	Control (n = 30)	
Sex (women, n %)	26 (79%)	27 (79%)	23 (77%)	0.96
Age (M±SD)	54.4 ± 7.0	53.4 ± 5.7	52.6 ± 6.8	0.56
Education (n %)				0.64
High school degree	11 (33.3%)	15 (44.1%)	12 (40.0%)	
Bachelor's/Master's degree	19 (57.6%)	19 (55.9%)	17 (56.7%)	
Other	2 (6.1%)	0 (0%)	1 (3.3%)	
Marital status (n %)				0.47
Single	9 (27.3%)	10 (29.4%)	5 (16.7%)	
Married/co-habiting	24 (72.7%)	23 (67.7%)	25 (83.3%)	
Other	0 (0%)	1 (2.9%)	0 (0%)	
Employment status (n %)				0.73
Full/part-time job	28 (84.8%)	29 (85.3%)	27 (90%)	
Unemployed	1 (3%)	2 (5.9%)	2 (6.7%)	
Other	4 (12.1%)	3 (8.8%)	1 (3.3%)	
Body mass index (M (kg/m ²) ± SD)	25.6 ± 4.2	25.3 ± 5.0	26.1 ± 4.2	0.78
Cystatin C (mg/L) (M±SD)	0.88 ± 0.1	0.84 ± 0.1	0.90 ± 0.2	0.10
ADM [#] (M±SD)	6.1 ^{a,b} ± 0.3	5.8 ^a ± 0.3	5.9 ^b ± 0.4	0.01
Perceived stress (M±SD)	20.6±5.9	19.3±5.7	19.2±6.2	0.55
Anxiety (M±SD)	11.3 ^a ±3.6	10.3±3.6	8.9 ^a ±4.1	0.05
Depression (M±SD)	6.4±3.3	6.2±2.9	5.6±3.3	0.61
Insomnia (M±SD)	20.2±5.9	20.7±6.2	18.1±6.7	0.23

Effects of 5-weeks yoga ("YIN") and yoga+mindfulness (YOMI) vs CONTROL on parameters of psychological stress

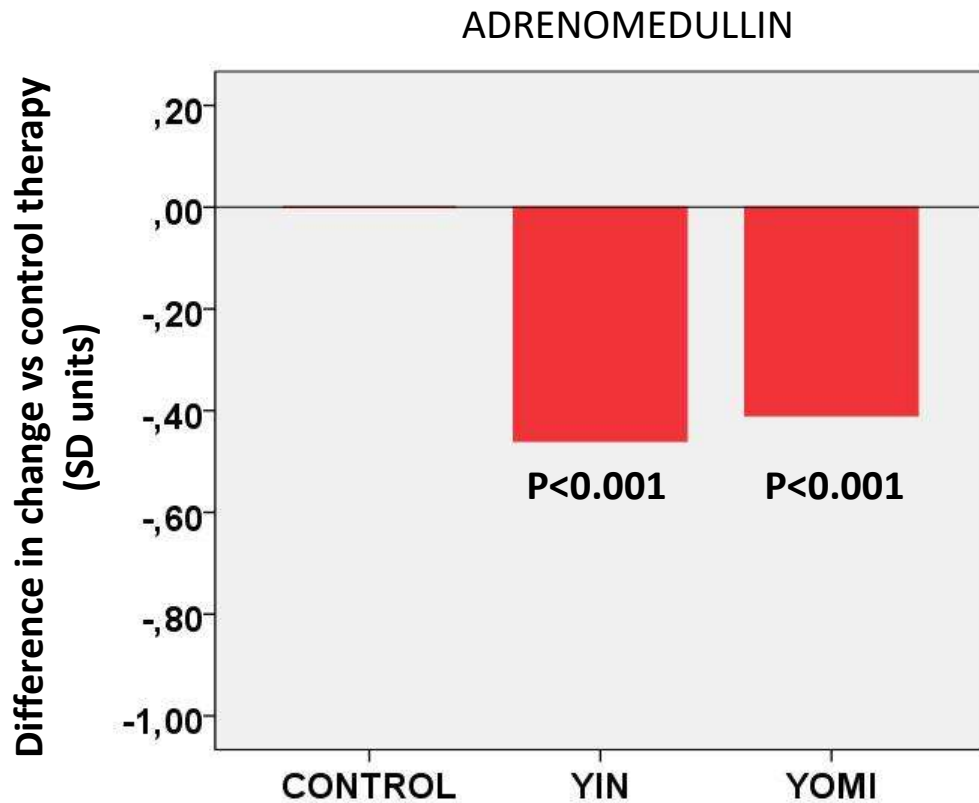


Daukantaitė, D, PLOS ONE, 2018

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Effects of 5-weeks yoga ("YIN") and yoga+mindfulness (YOMI) vs CONTROL on circulating adrenomedullin concentration



YOMI INDUCED CHANGE OF ADRENOMEDULLIN
VS CHANGE OF ANXIETY

$r=0.28, P=0.02$

Daukantaitė, D, PLOS ONE, 2018

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SUMMARY AND CONCLUSIONS:

***BOTH YIN YOGA (YIN) AND YIN YOGA COMBINED WITH PSYCOEDUCATION+MINDFULNESS (YOMI) (TWICE WEEKLY FOR 5 WEEKS) FAVOURABLY REDUCED STRESS, ANXIETY AND IMPRVED SLEEP, WITH MOST PRONOUNCED EFFECT BY YOMI**

***ADRENOMEDULLIN WAS SIGNIFICANTLY REDUCED BY BOTH YIN AND YOMI**

***IN THE YOMI GROUP, THE REDUCTION OF ANXIETY WAS RELATED TO AMOUNT OF ADRENOMEDULLIN REDUCTION**

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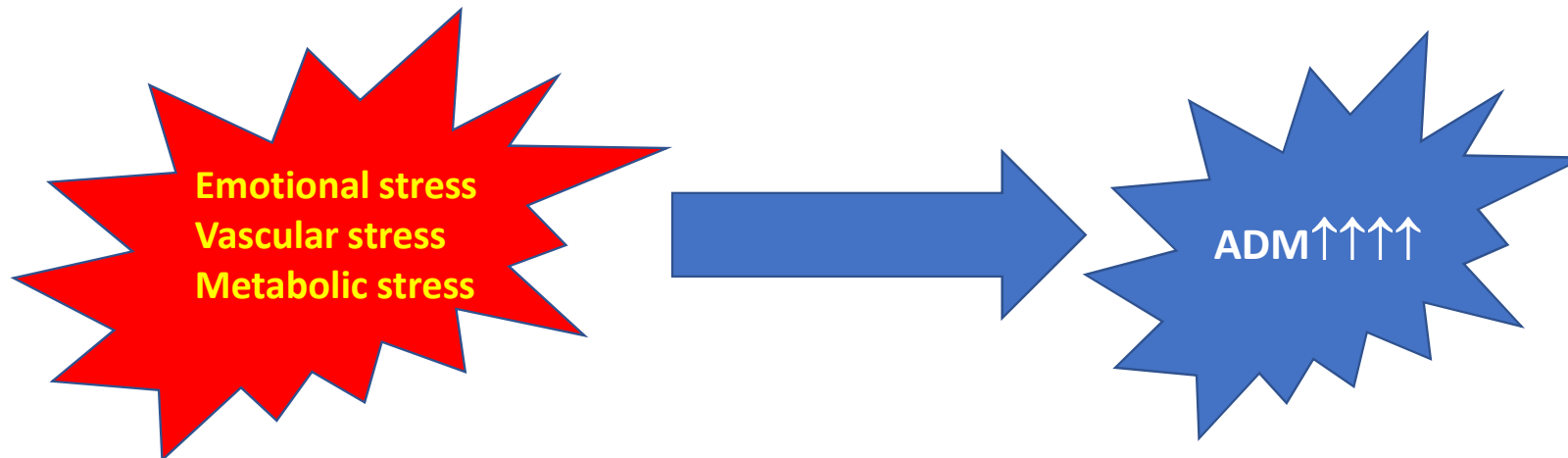


RESEARCH ARTICLE

Five-week yin yoga-based interventions decreased plasma adrenomedullin and increased psychological health in stressed adults: A randomized controlled trial

Daiva Daukantaitė^{1☯}, Una Tellhed^{1☯}, Rachel E. Maddux¹, Thomas Svensson^{2,3},
Olle Melander^{2,4*}

PLOS ONE | <https://doi.org/10.1371/journal.pone.0200518> July 18, 2018



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