The 7° ICOH international conference on work environment and cardiovascular health.

STRESS MANAGEMENT IN WORKING PLACE: ROLE OF CARDIOVASCULAR AUTONOMIC CONTROL

03.05.2017

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CONFIDENTIAL AND PROPRIETARY: D. Lucini. Materiale ad esclusivo uso interno. Vietata la duplicazione e qualsiasi altro utilizzo

European Journal of Internal Medicine 23 (2012) 295–301

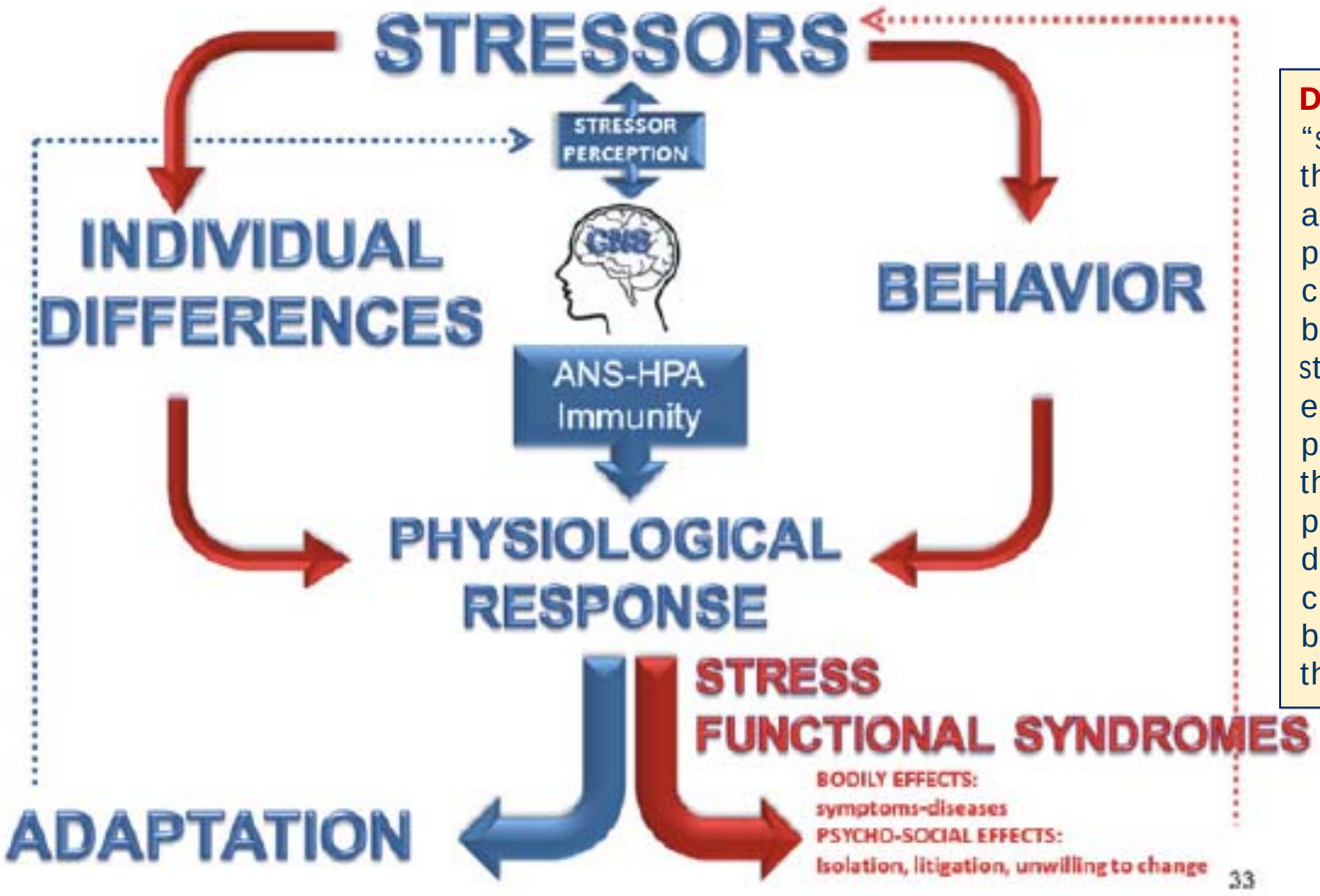
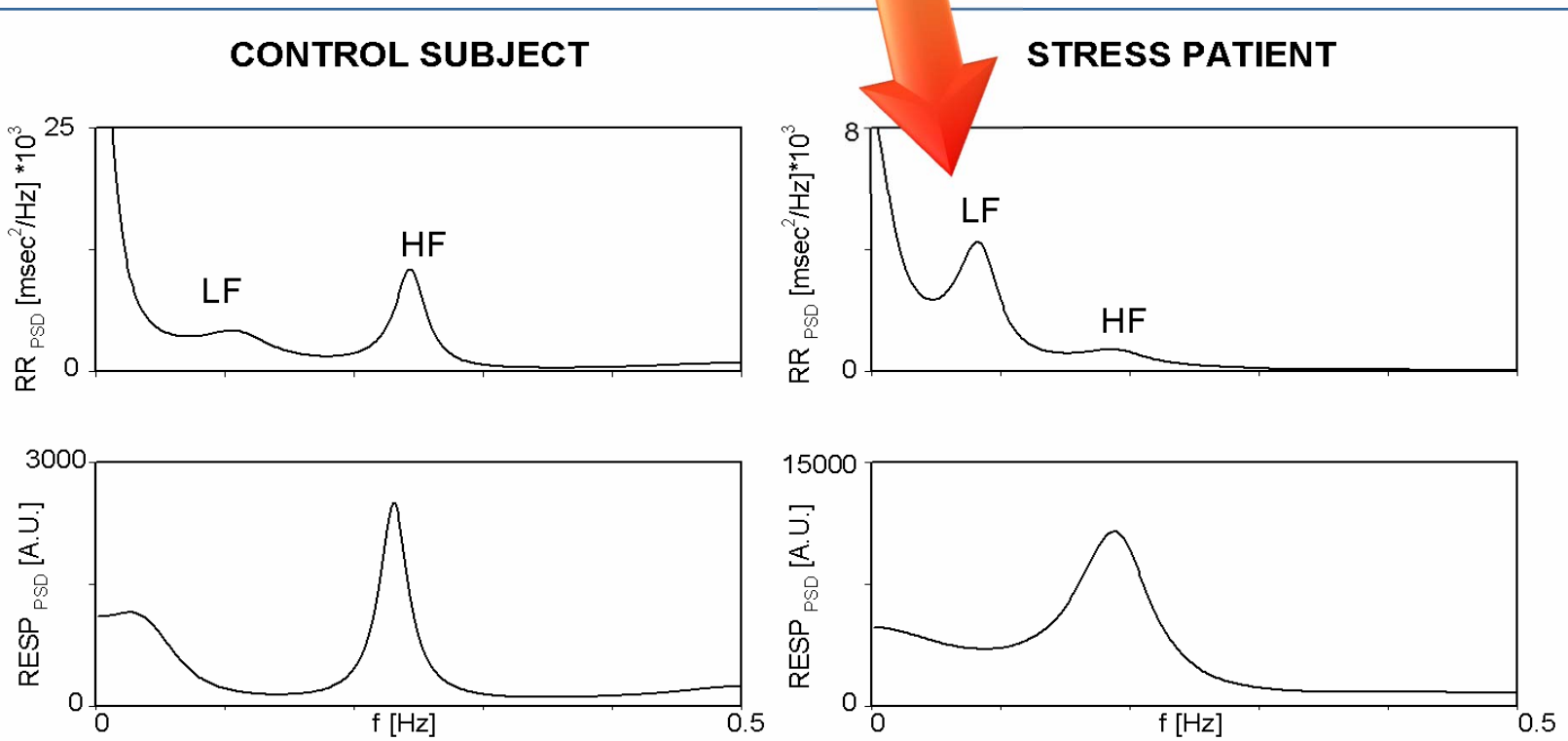


Fig. 1. Model of stress (adapted from [2]) and functional syndromes. The effects of stressors on health depend on hypothalamic–pituitary–adrenal (PHA) axis, autonomic nervous system (ANS) and immunity responses mediated by central nervous system (CNS), individual stress perception, individual differences and behavior. The final result may be adaptation or maladaptation represented by negative organic (somatic symptoms or increased risk of disease) and/or psychosocial consequences. These latter ones may per se become new stressors initiating a vicious cycle.

DEFINITION

"stress" may be considered as the psychological, behavioural and physiological (or pathophysiological) consequence of the interaction between a subject and a stressor; considering as "stressor" everything (acute or chronic) present in the environment or in the subject's mind that could be perceived as important, dangerous or potentially capable to modify, both negatively or positively, the subject's life

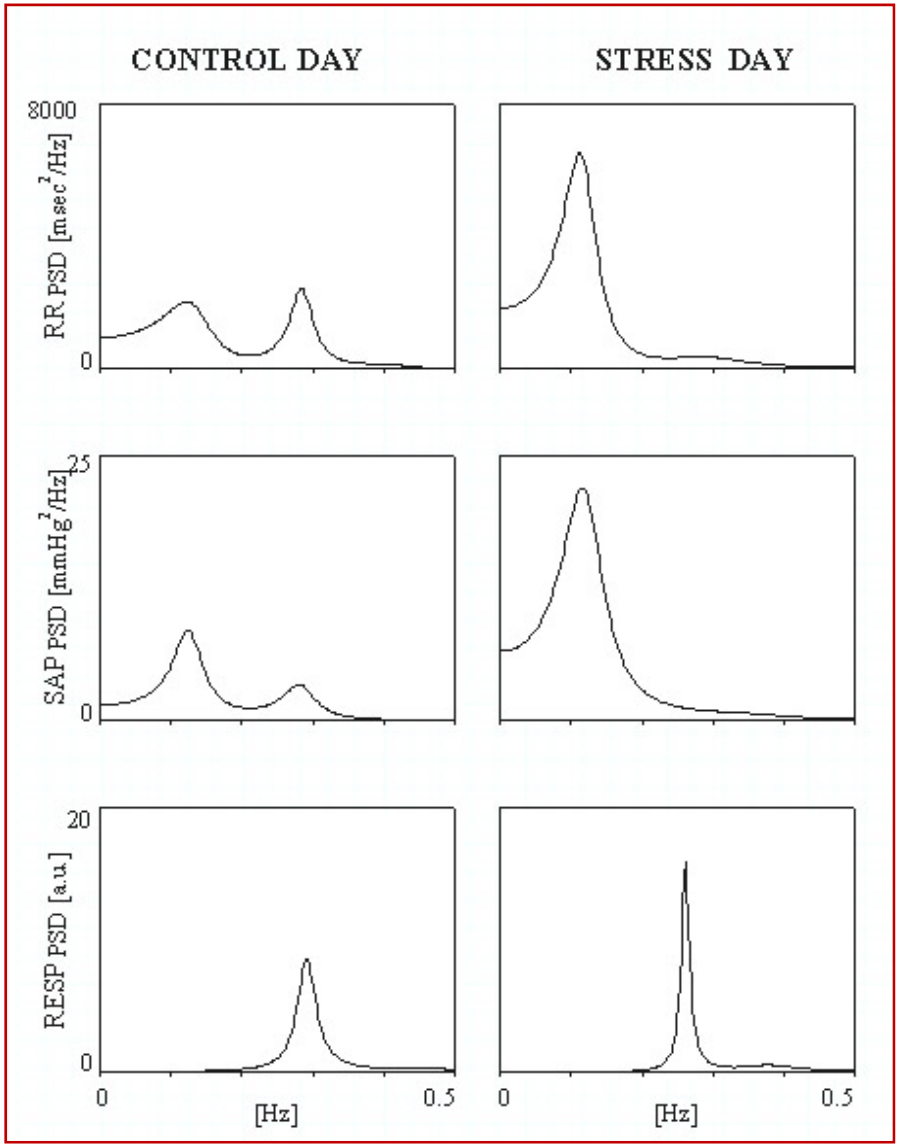
STRESS & ANS



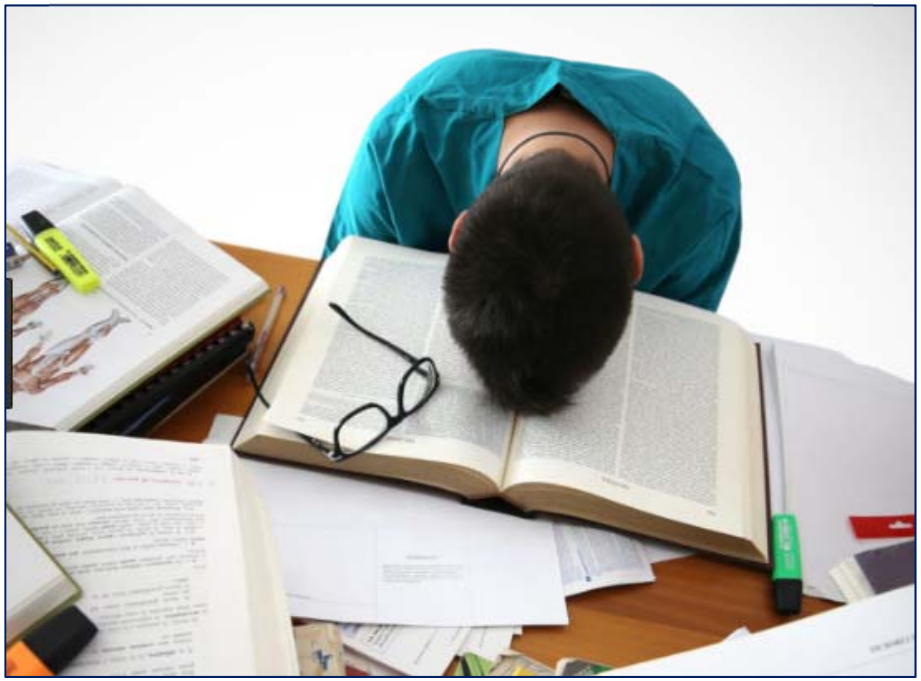
Lucini et al, in: Stress and Cardiovascular Disease. Springer, 2012

Hemodynamic and Autonomic Adjustments to Real Life Stress Conditions in Humans

Daniela Lucini, Guido Norbiato, Mario Clerici, Massimo Pagani



STUDENTS



(*Hypertension*. 2002;39:184-188.)

Impact of Chronic Psychosocial Stress on Autonomic Cardiovascular Regulation in Otherwise Healthy Subjects

Daniela Lucini, Gaetana Di Fede, Gianfranco Parati, Massimo Pagani

PATIENTS

(*Hypertension*. 2005;46:1201-1206.)

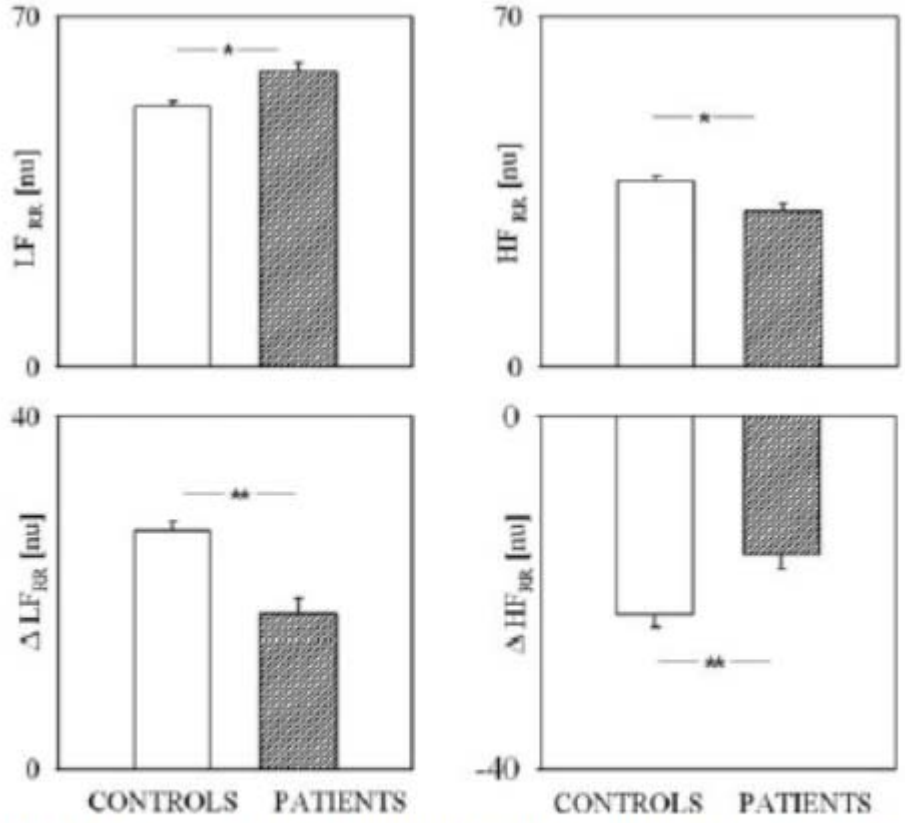


Figure 1. Average value (and SEM) of LF_{RR} (left top panel) and HF_{RR} (right top panel) at rest and of standing-induced changes of LF (ΔLF_{RR}; left bottom panel) and high (ΔHF_{RR}; right bottom panel) frequency in controls (open bars) compared with patients (lined bars). nu indicates normalized units. $^{*}P<0.05$; $^{**}P\leq 0.001$.

CANCER CAREGIVERS

EUROPEAN JOURNAL OF CANCER 44 (2008) 2437–2443

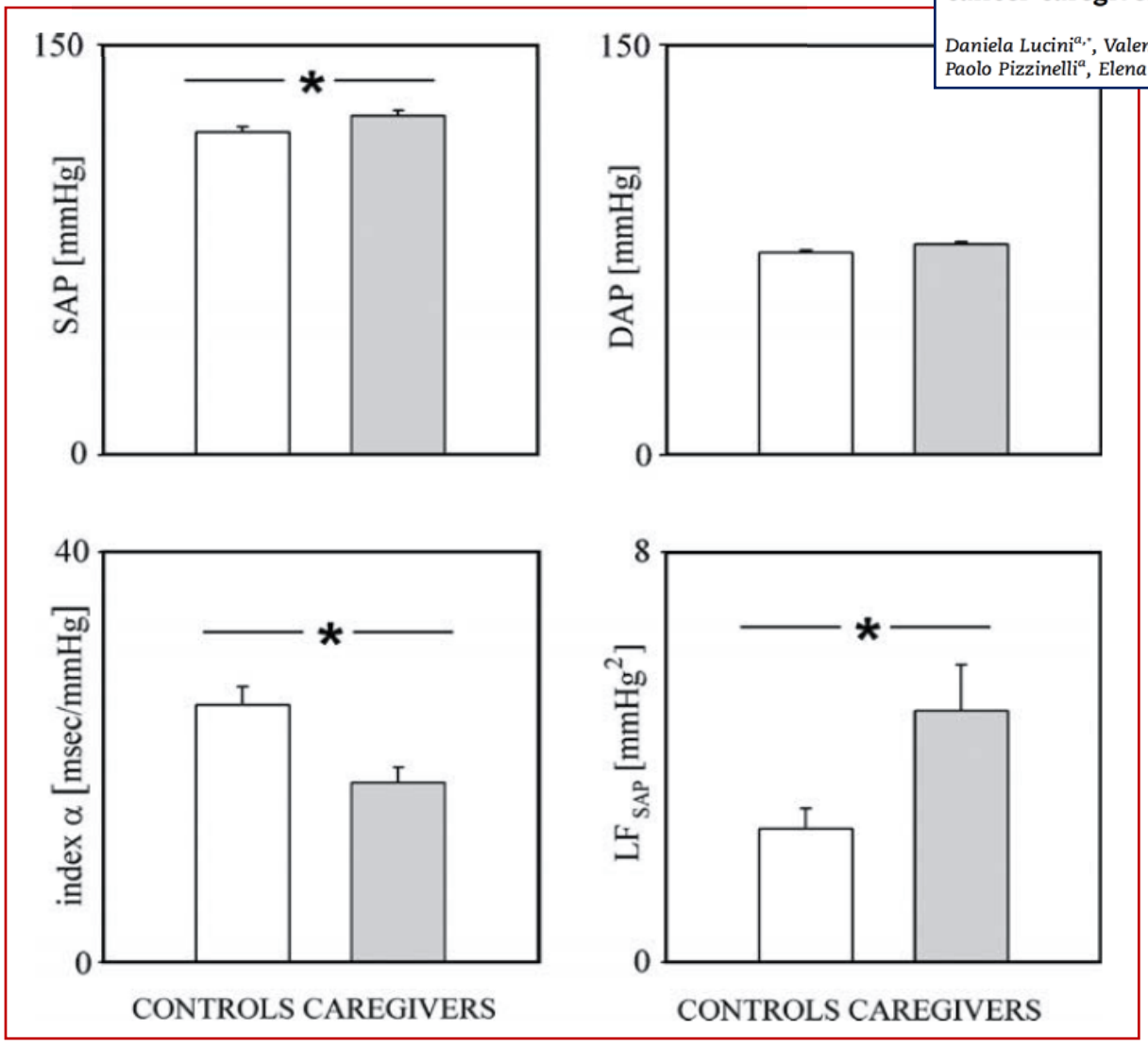
available at www.sciencedirect.com

ScienceDirect

journal homepage: www.ejconline.com

Evidence of autonomic dysregulation in otherwise healthy cancer caregivers: A possible link with health hazard

Daniela Lucini[a,], Valentina Cannone[b], Mara Malacarne[a], Daniela Bruno[a], Silvia Beltrami[a], Paolo Pizzinelli[a], Elena Piazza[c], Gaetana Di Fede[d], Massimo Pagani[a]*



Stress and Hypertension

Stress Management at the Worksite

Reversal of Symptoms Profile and Cardiovascular Dysregulation

Daniela Lucini, Silvano Riva, Paolo Pizzinelli, Massimo Pagani

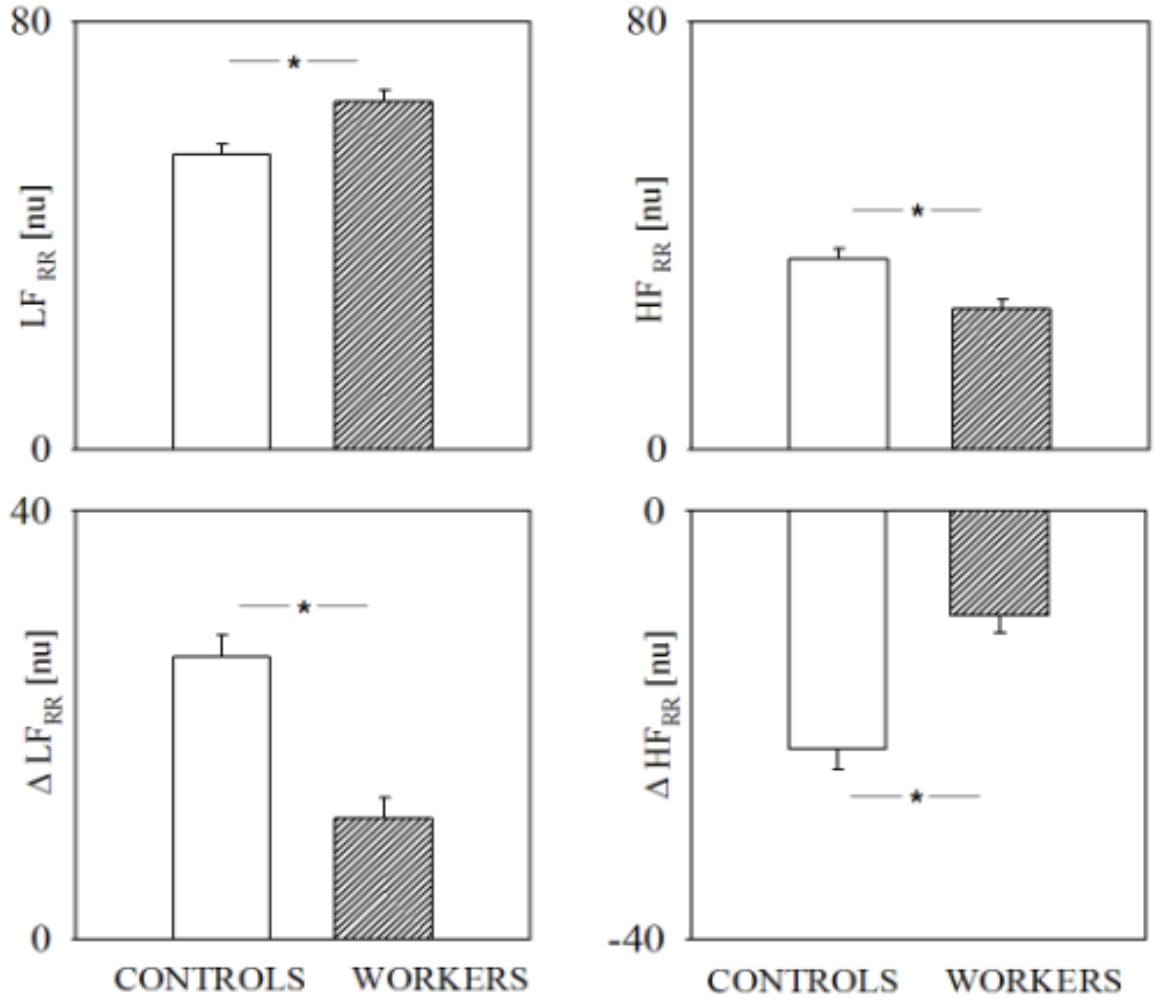
Editorial Commentary

Stopping Stress at Its Origins

Richard V. Milani, Carl J. Lavie

EMPLOYEES

(*Hypertension*. 2007;49:291-297.)



Stress and Hypertension

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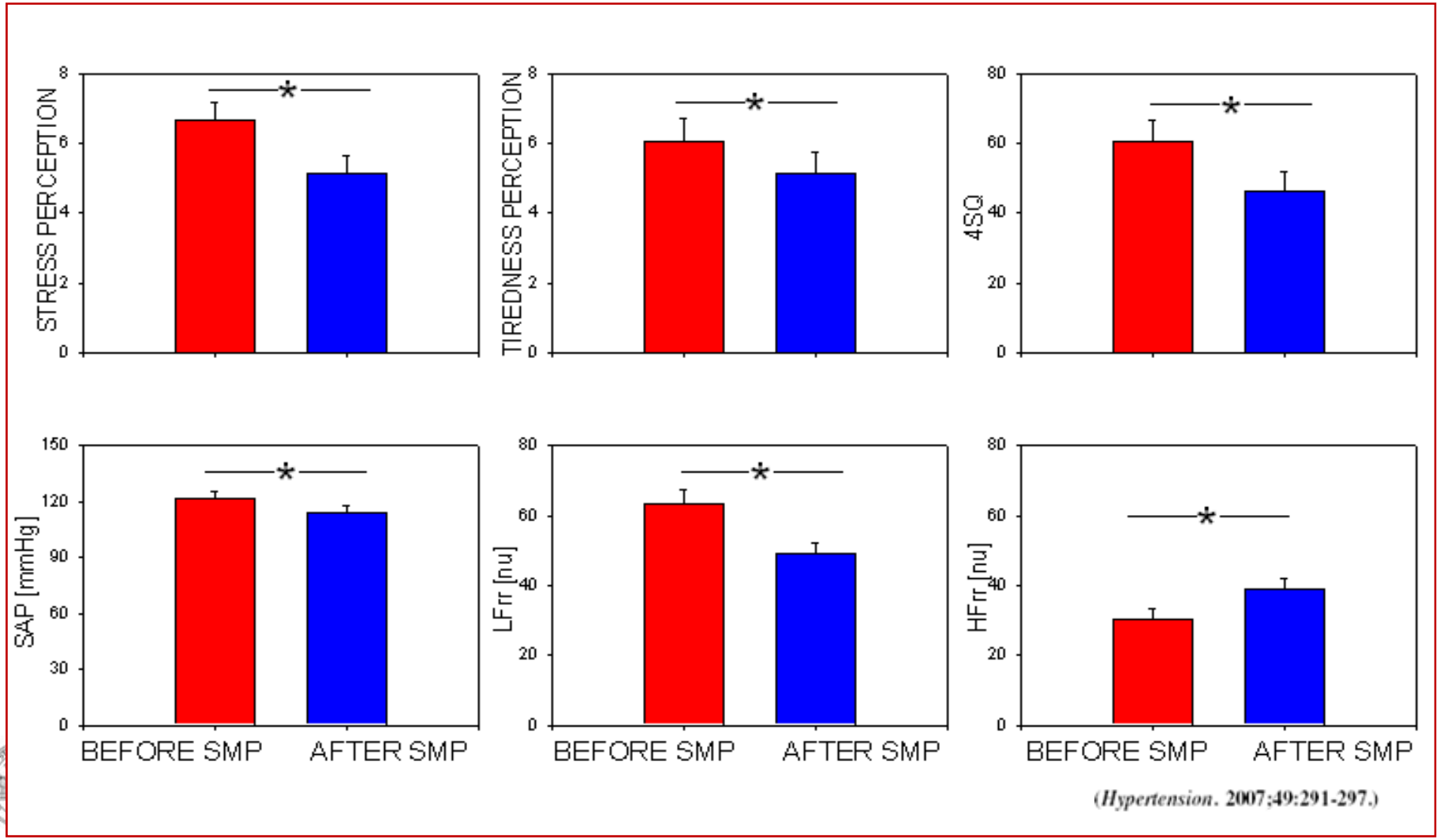
STRESS
Management program



(*Hypertension*. 2007;49:291-297.)

STRESS
Management program
Ecological approach

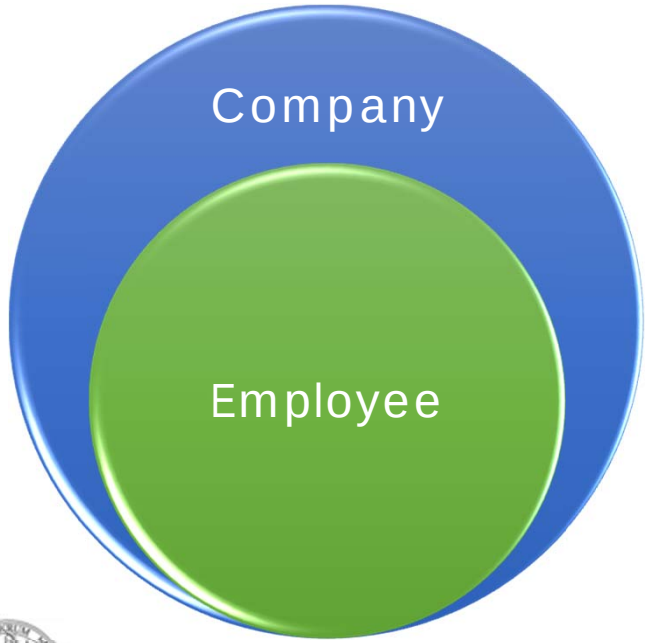


Table 1 Different elements of the Health programs of companies A and B

	Company A	Company B
Medical screening		
Medical history	Y	Y
Physical examination	Y	Y
Biochemical	Y	Y
Internist health consultation	N	Y
Web tool		
General info on healthy lifestyle	Y	Y
Lifestyle questionnaire (diet, exercise, stress)	Y	Y
Personalized suggestions	Y	Y
Nutrition		
General information	Y	Y
Special healthy canteen	N	Y
Exercise		
General information	Y	Y
Gym	N	Y
Tailored programs	N	Y
Physical activity assessment (accelerometer)	N	Y
Outdoor running track	N	Y
Wellness fostering service		
Web tutorial (nutrition, exercise, stress)	Y	Y
Group meeting (nutrition, exercise, stress)	N	Y

The specific attention to personal[illegible]anizational and environment aspects connotes the program of company B as ecological

Y = present

N = absent

The physical examination[illegible]d information on anthropometrics (height, weight, waist circumference), and cardiovascular (hear[illegible]terial pressure) individual values. Biochemical data were obtained by way of standard test from bl[illegible]n a laboratory of participants' choosing, or one offered by either company. Numerical data were [illegible]the web tool by participants. Potential advantages and disadvantages in the context of MetS have [illegible]iscussed already [10]

Lucini et al, 2015 Acta Diabetologica

European Journal of Internal Medicine 23 (2012) 295–301

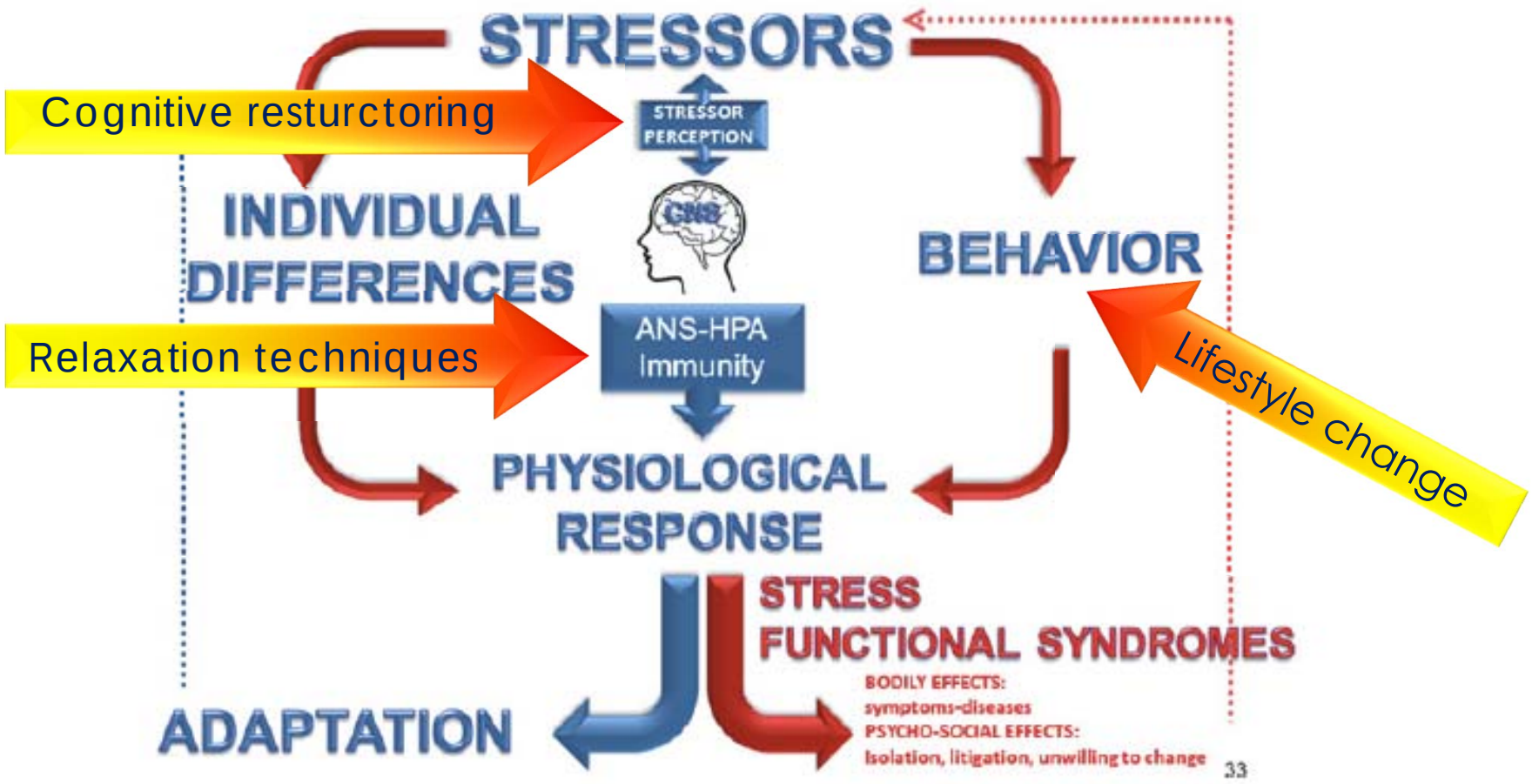
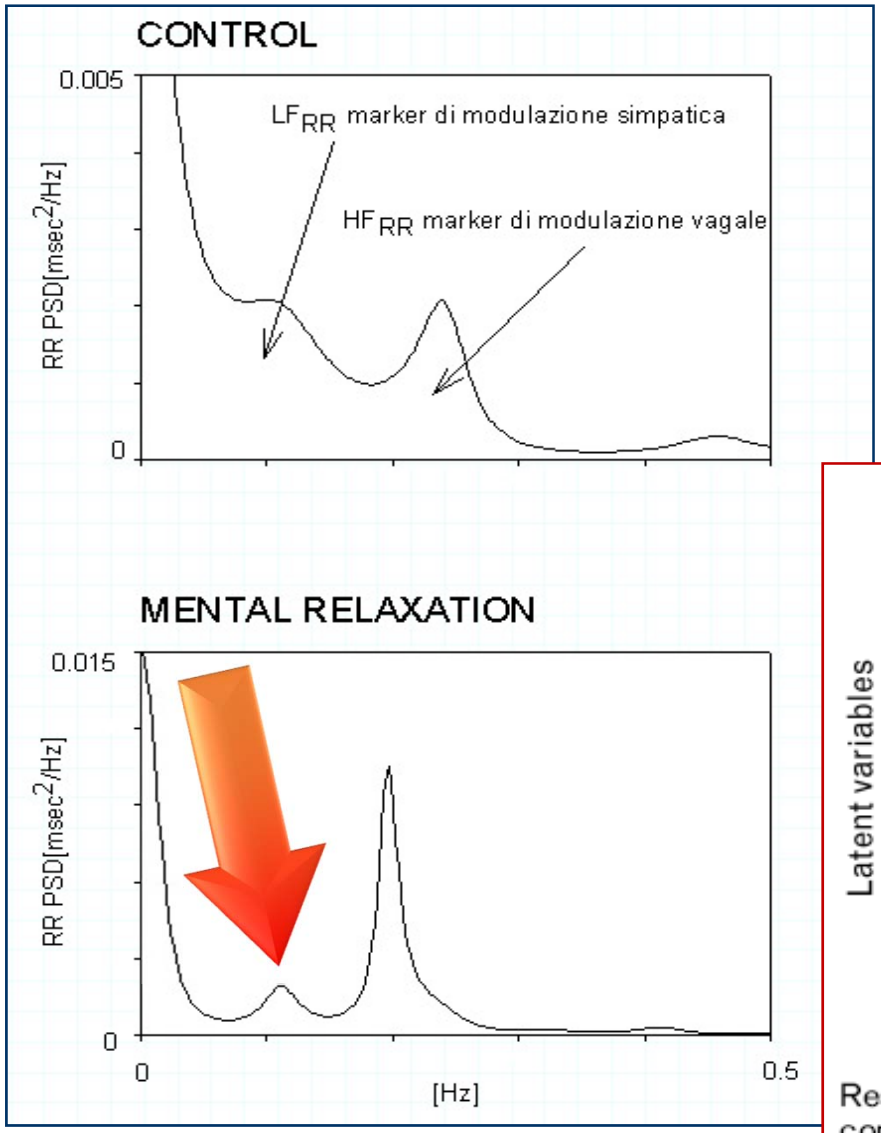


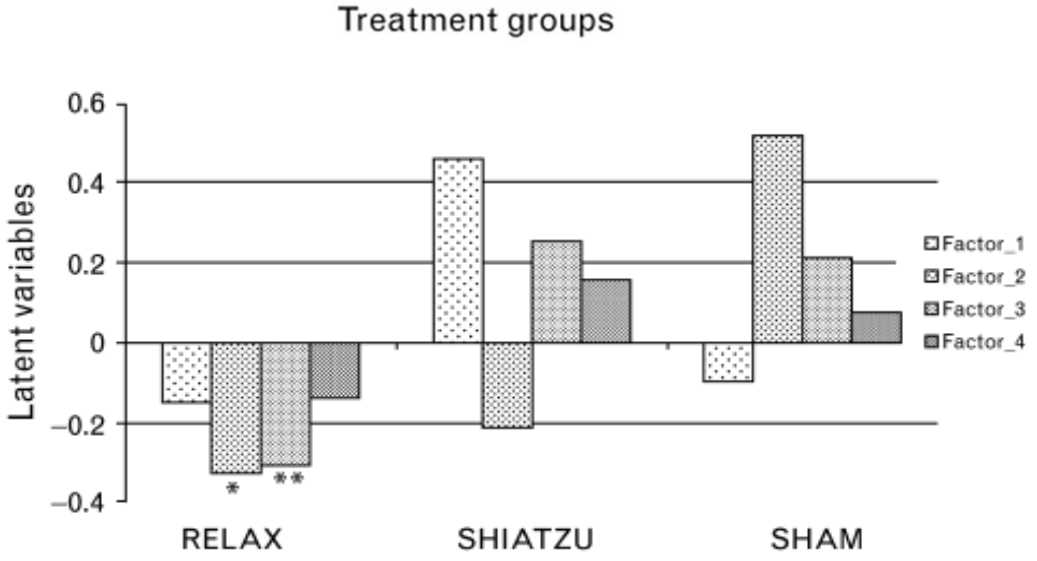
Fig. 1. Model of stress (adapted from [2]) and functional syndromes. The effects of stressors on health depend on hypothalamic–pituitary–adrenal (PHA) axis, autonomic nervous system (ANS) and immunity responses mediated by central nervous system (CNS), individual stress perception, individual differences and behavior. The final result may be adaptation or maladaptation represented by negative organic (somatic symptoms or increased risk of disease) and/or psychosocial consequences. These latter ones may per se become new stressors initiating a vicious cycle.



Complementary medicine for the management of chronic stress: superiority of active versus passive techniques

Daniela Lucini[a], Mara Malacarne[a], Nadia Solaro[b], Silvano Busin[c] and Massimo Pagani[a]

MENTAL RELAXATION



Results of factor analysis on the effects of different stress treatments, comparing active (relax), passive (shiatsu) and sham modalities. Notice that only the relaxation group shows a clear reduction in factors 2 (psychological stress perception) and 3 (normalized autonomic oscillatory indices). No difference is present in factor 1 (absolute autonomic indices) and factor 4 (heart rate and respiration). Significance $*P < 0.05$; $**P < 0.01$.

Journal of Hypertension 2009, 27:2421–2428

Acta Diabetol
DOI 10.1007/s00592-015-0744-x
Published online: 12 April 2015

ORIGINAL ARTICLE

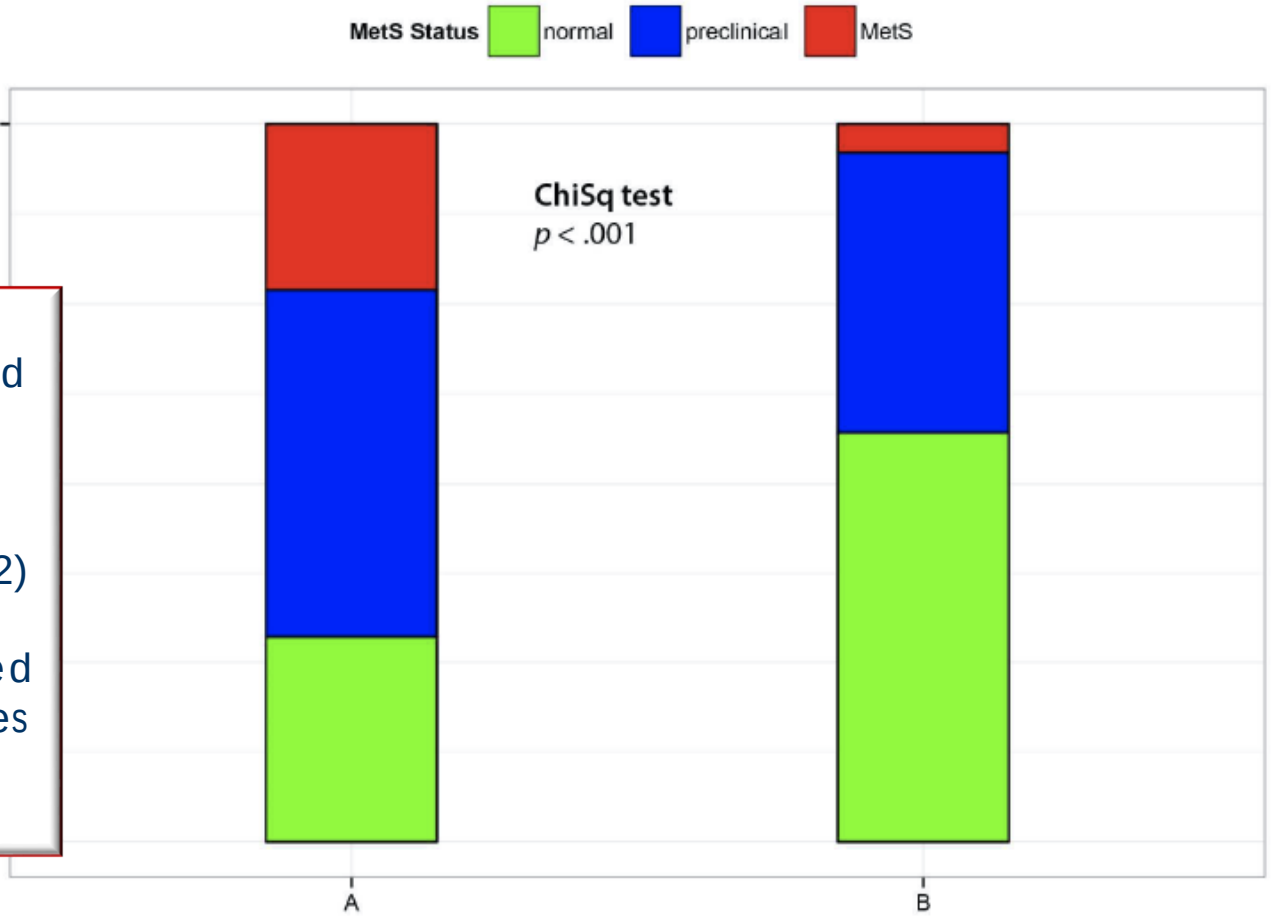
Reducing the risk of metabolic syndrome at the worksite: preliminary experience with an ecological approach

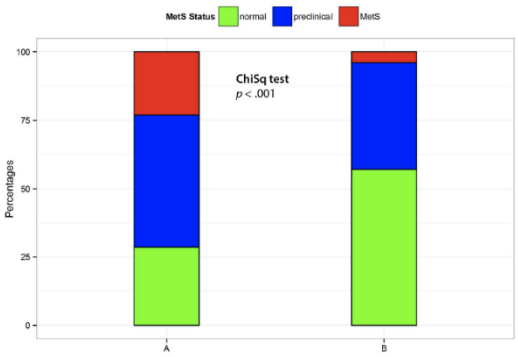
Daniela Lucini[1,2] · Silvano Zanuso[3,4] · Nadia Solaro[5] · Chiara Vigo[1,2] · Mara Malacarne[1,2] · Massimo Pagani[1]

The study involved 1089 workers of two Italian multinational companies (683 in company A and 406 in company B) that follow different workplace health promotion policies.

LIFESTYLE

The Company (B) which offers an environment and culture that promote healthy lifestyle, has an higher number of employees without (or 1-2) metabolic syndrome components as compared to company A which does not guarantee this ecological approach





INDIVIDUAL PROBABILITY

Normal Preclinical MetS

Table 4 Model-based individual probabilities (IP) of being within a specific MetS status computed by companies and controlling for gender and age group

Gender	Age group	Company	*N*	IP normal[a]	IP preclinical[a]	IP MetS[a]	Sum
Female	<35	A	26	0.698	0.297	0.005	1
		B	37	0.883	0.116	0.001	1
	35–44	A	58	0.582	0.411	0.007	1
		B	81	0.819	0.179	0.002	1
	>44	A	104	0.556	0.429	0.015	1
		B	15	0.804	0.192	0.004	1
Male	<35	A	55	0.257	0.584	0.159	1
		B	93	0.530	0.423	0.047	1
	35–44	A	133	0.172	0.611	0.217	1
		B	130	0.404	0.529	0.067	1
	>44	A	307	0.158	0.489	0.353	1
		B	50	0.379	0.497	0.124	1
Mean probability			1089	0.392	0.454	0.154	1

[a] For fixed gender and age group categories, gray-colored cells indicate the largest probability, in the comparison between companies A and B, of being in a specific MetS status. By construction, individual probabilities sum to 1 within each row

Individual Probability of being without MetS components is higher in Company B which offers an environment and culture that promote healthy lifestyle

Lucini et al, 2015 Acta Diabetologica

Acta Diabetol
DOI 10.1007/s00592-014-0605-z

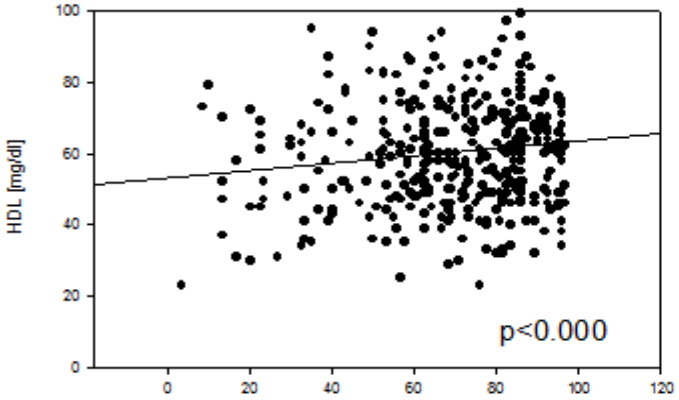
ORIGINAL ARTICLE

A simple healthy lifestyle index as a proxy of wellness: a proof of concept

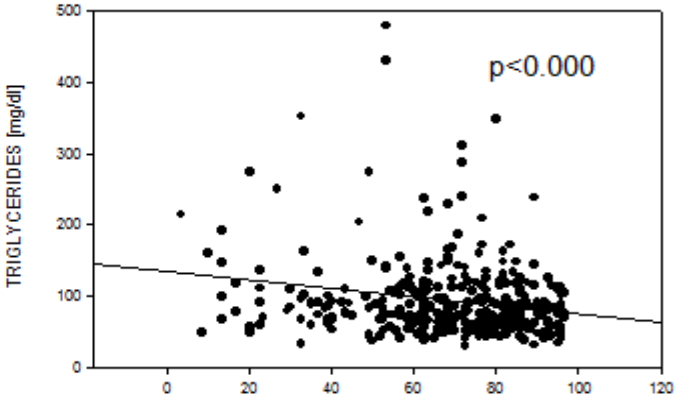
Daniela Lucini · Silvano Zanuso · Steven Blair · Massimo Pagani

unitary health index, web-based tool created from self-reports related to nutrition, physical activity, stress perception. It correlated significantly with key biochemical, hematological, and hemodynamic variables

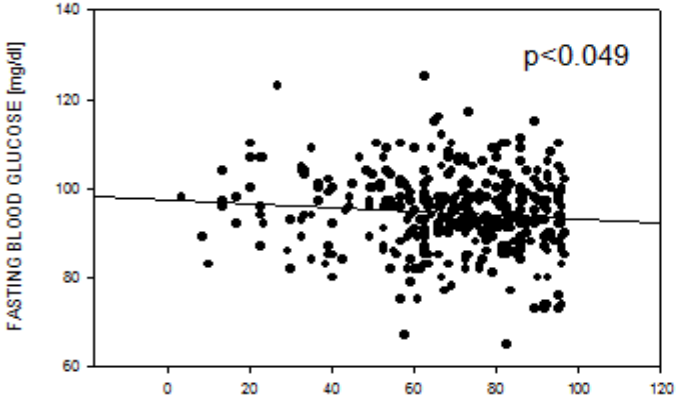
HDL CHOLESTEROL



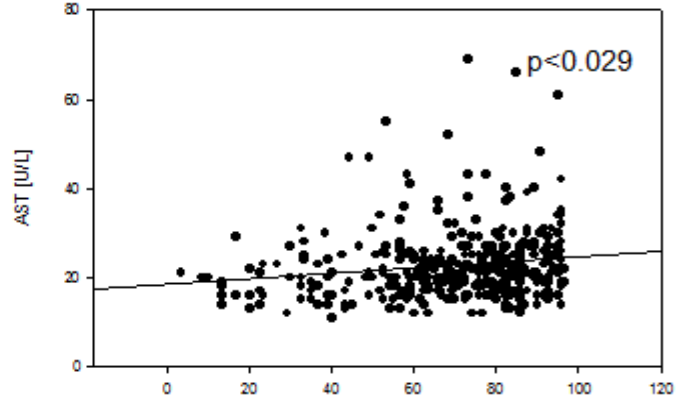
TRGLYCERIDES



FASTING PLASMA GLUCOSE

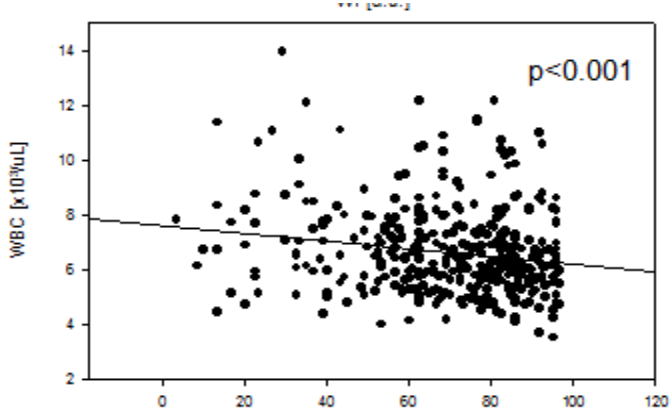


AST

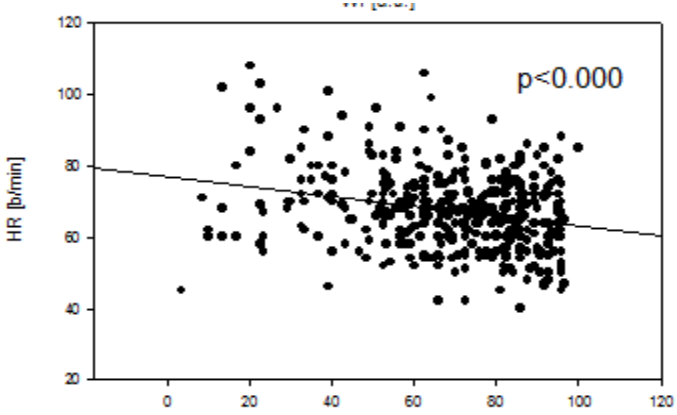


HEALTH INDEX

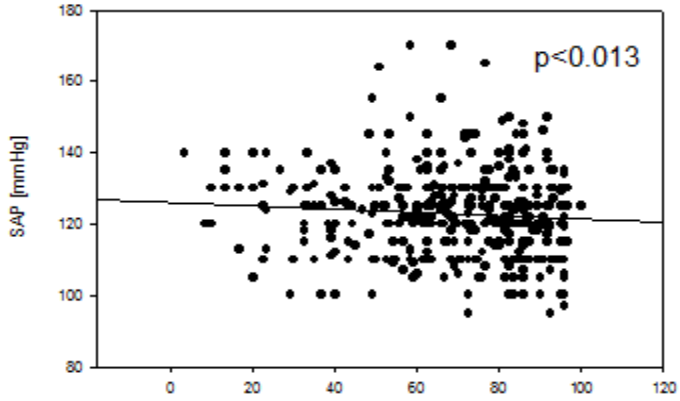
WHITE BLOOD CELLS



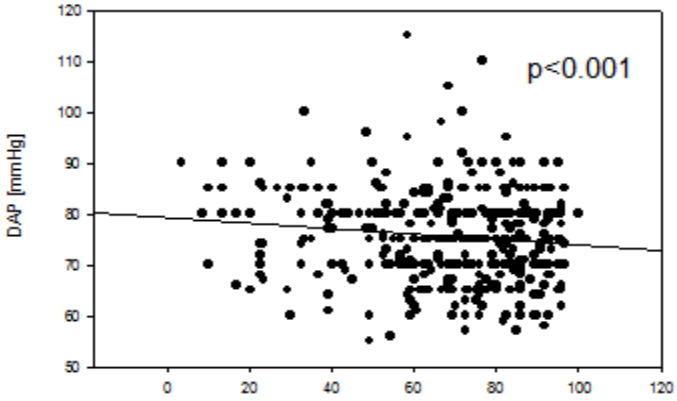
HEARTH RATE



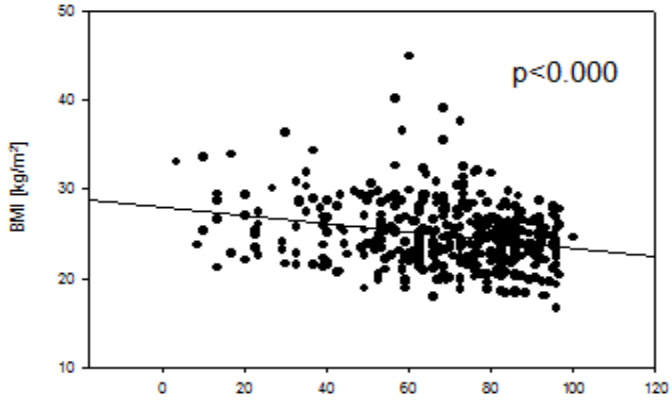
SYSTOLIC ARTERIAL PRESSURE



DIASTOLIC ARTERIAL PRESSURE



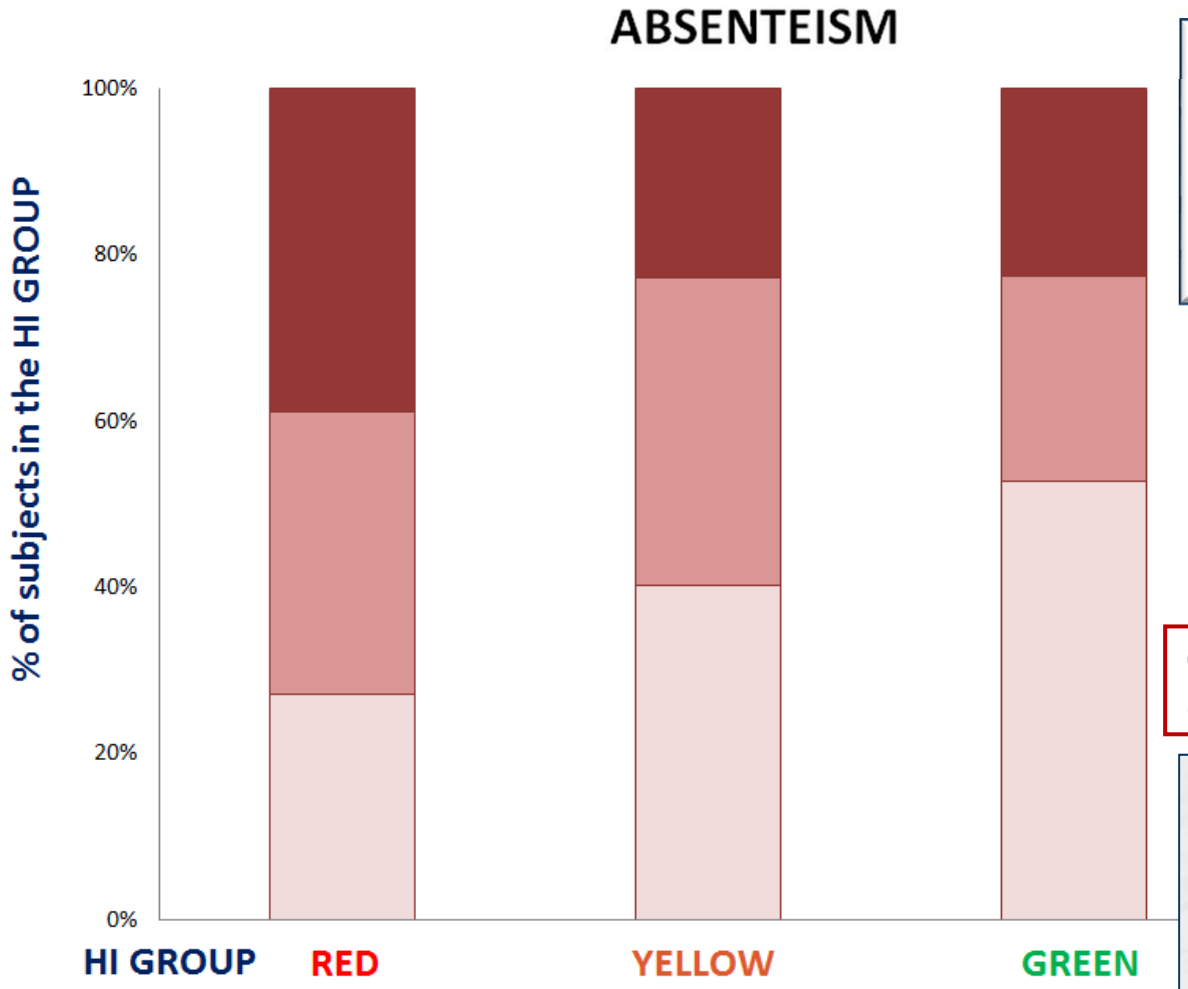
BMI



HEALTH INDEX

Acta Diabetol (2015) 52:81–89
DOI 10.1007/s00592-014-0605-z

HEALTH INDEX & ABSENTEISM



High absenteism Percentage is higher in low score (red) group

P<0.006

- > 40 hours/year
- 1 - 40 hours/year
- 0 hours/year

Correlation Health Index and absenteism: p=0.024

Acta Diabetol (2015) 52:81–89
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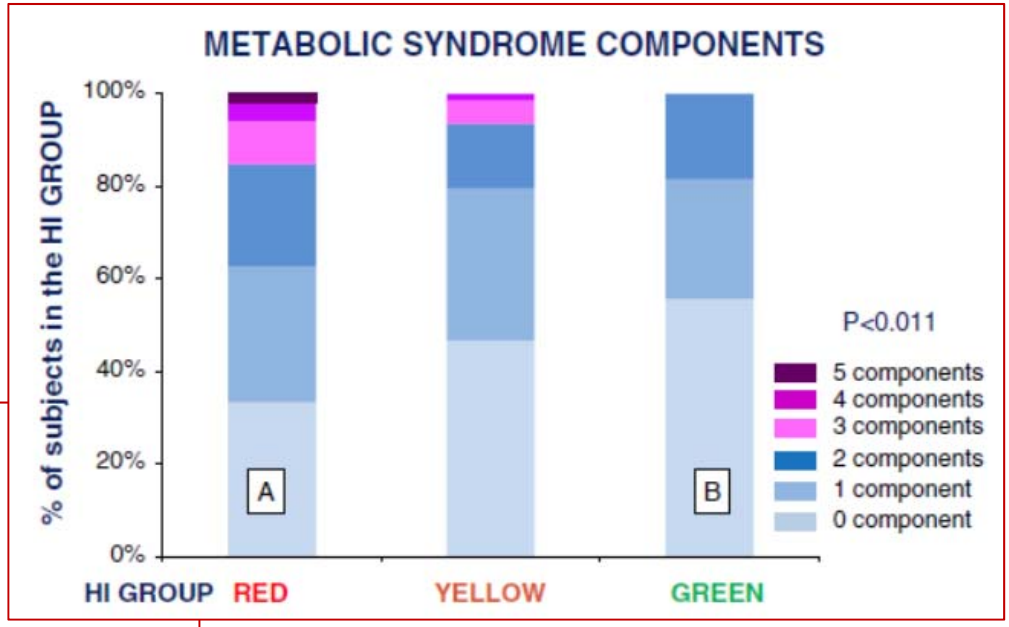
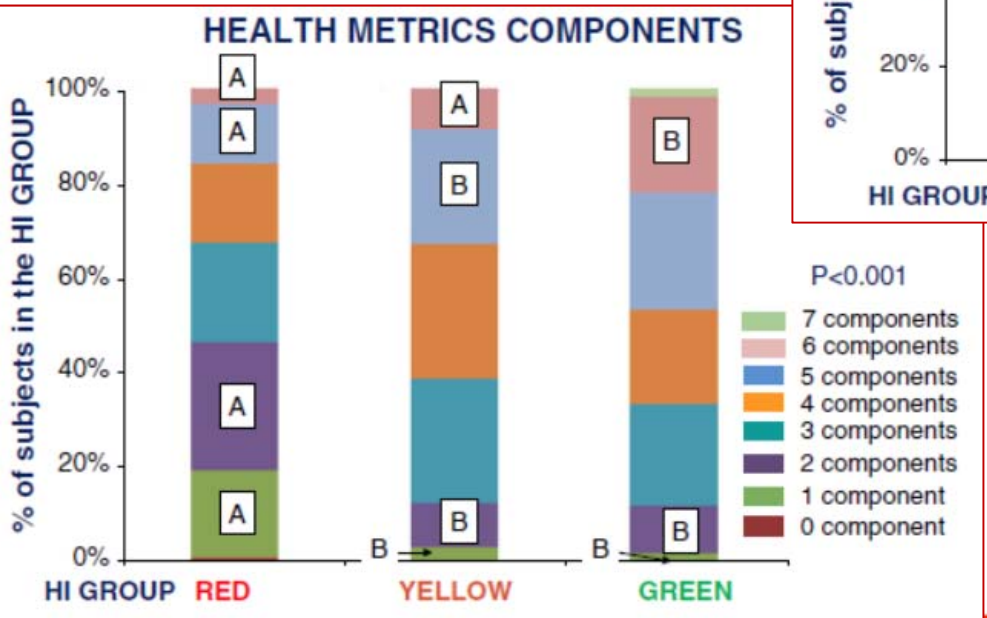
HEALTH INDEX

Using a unitary health index (HI) from self-reports, poor health behavior is associated with more elements of metabolic syndrome and with fewer elements of the ideal cardiovascular health profile.





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DOI: 10.1111/eci.12730
Eur J Clin Invest 2017; 47 (3): 241–249

ORIGINAL ARTICLE

A composite autonomic index as unitary metric for heart rate variability: a proof of concept

Roberto Sala*,†, Mara Malacarne*,†, Nadia Solaro‡, Massimo Pagani* and Daniela Lucini*,†

ANSI does not evaluate underlying neural activity, but quantifies the ANS impairment associated with different clinical conditions (hypertension, obesity, smoking), and the greater impact of their combination if simultaneously present in the same subject. As cardio-metabolic risk factors increase, greater is the impairment of ANS regulation.

ANSI

Autonomic Nervous System Index

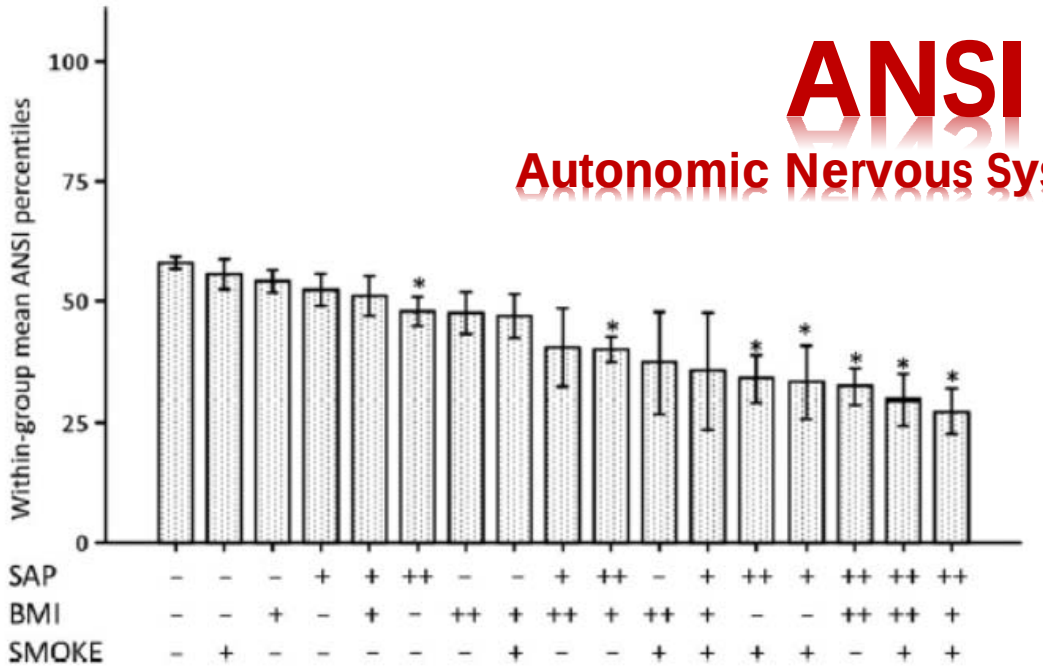

Figure 2 The bar plot of the means of $ANSI_3$ percentiles computed for each group formed by combinations of SAP, BMI and smoking categories. Overall, reduced ANSI values against reference normal group, indicative of impaired autonomic performance, are observed in groups with poor clinical profile, as approximated by clustering of elevated SAP and BMI, and of smoking. One-sided Dunnett's test to verify equality of within-group ANSI means against ANSI means lower than control group. Symbols for clinical conditions: SAP categories with thresholds at 120 and 140 mmHg are –, +, ++; BMI categories with thresholds at 25 and 30 kg/m^2 are –, +, ++; SMOKING is dichotomized into no/yes corresponding to – or +. A group with only 5 subjects (+,++,+) is not considered. *$P < 0.02$.

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A composite autonomic index as unitary metric for heart rate variability: a proof of concept

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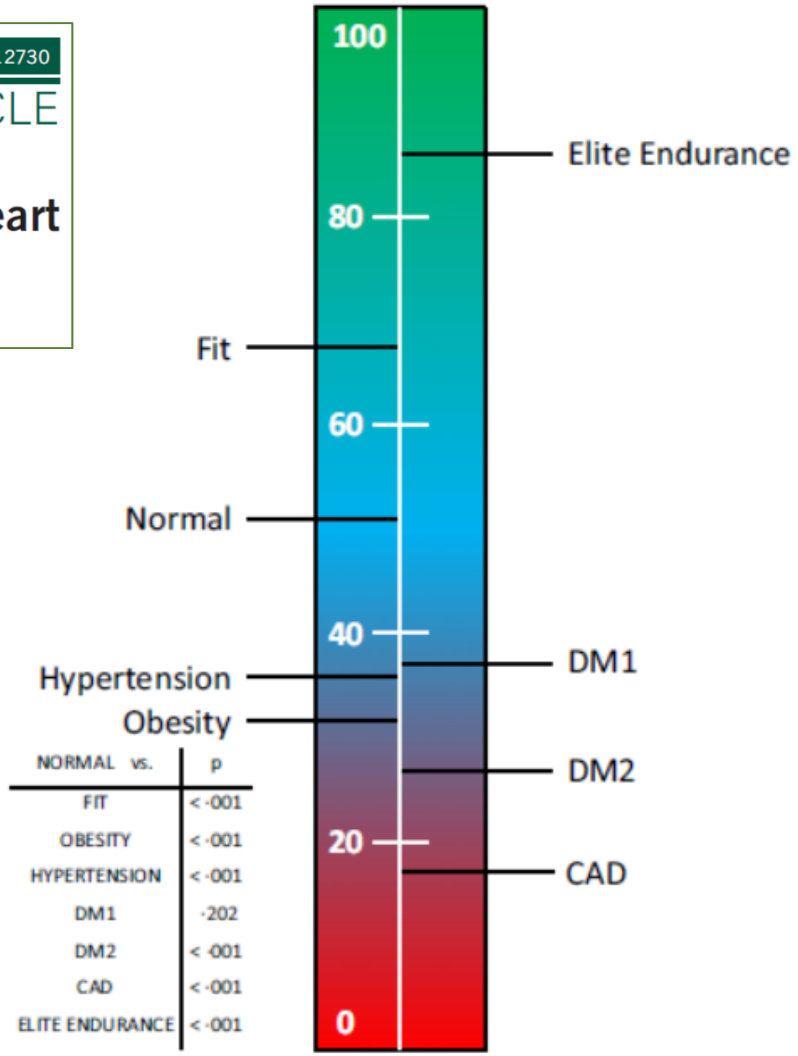
ANSI

Autonomic Nervous System Index

A composite unitary Autonomic Nervous System Index of cardiac regulation (expressed in percentile rank [reference population, n=1593, age 39±13 yrs]) is a possible way to integrate the partial information spread across multiple autonomic variables and represents a proxy of *quality* of autonomic regulation against a benchmark population. It, considering both static and oscillatory information embedded in HRV, is capable of detecting the graded changes in cardiac neural regulation occurring along the continuum from dysfunction in patients to improvement in endurance athletes, and might be part of e therapeutic or preventive programs, such as in the emerging field of personalized medicine



NORMAL vs.	p
FIT	<·001
OBESITY	<·001
HYPERTENSION	<·001
DM1	·202
DM2	<·001
CAD	<·001
ELITE ENDURANCE	<·001

Figure 3 Schematic representation of the position of the mean value of percentile rank for the various groups (left) and projected mean values of tests groups (elite endurance, diabetes type 1, diabetes type 2, coronary artery disease, CAD). Significance of differences against normal (reference population of controls) is indicated in the bottom left panel (Dunnett's test). A 0–100 reference scale (white) is provided in the bar.

Thank for your kind
attention