

Mesures non médicamenteuses pour prévenir et traiter une hypertension artérielle

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Disclosure

- No competing interest to declare about this topic

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Hypertension

April 2014

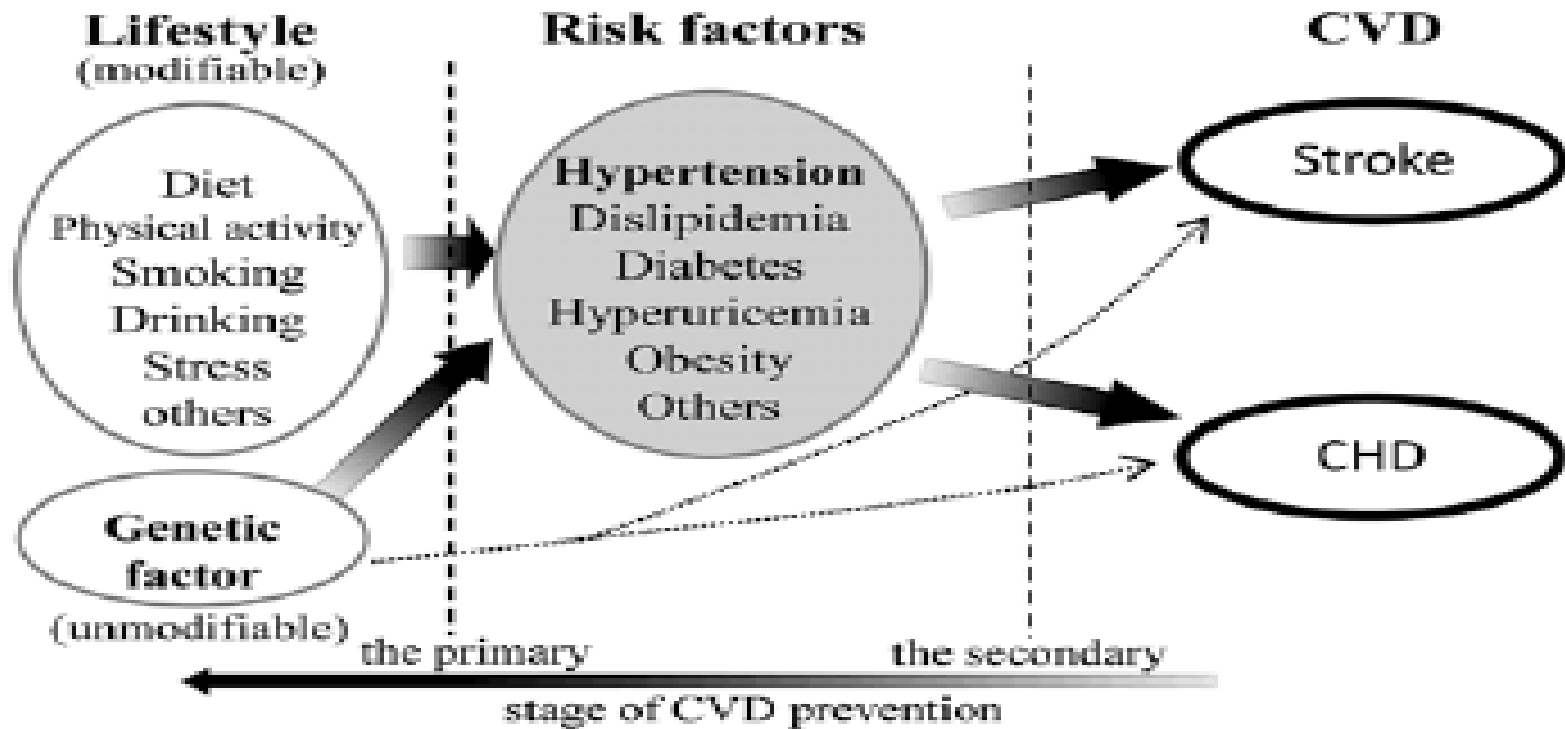


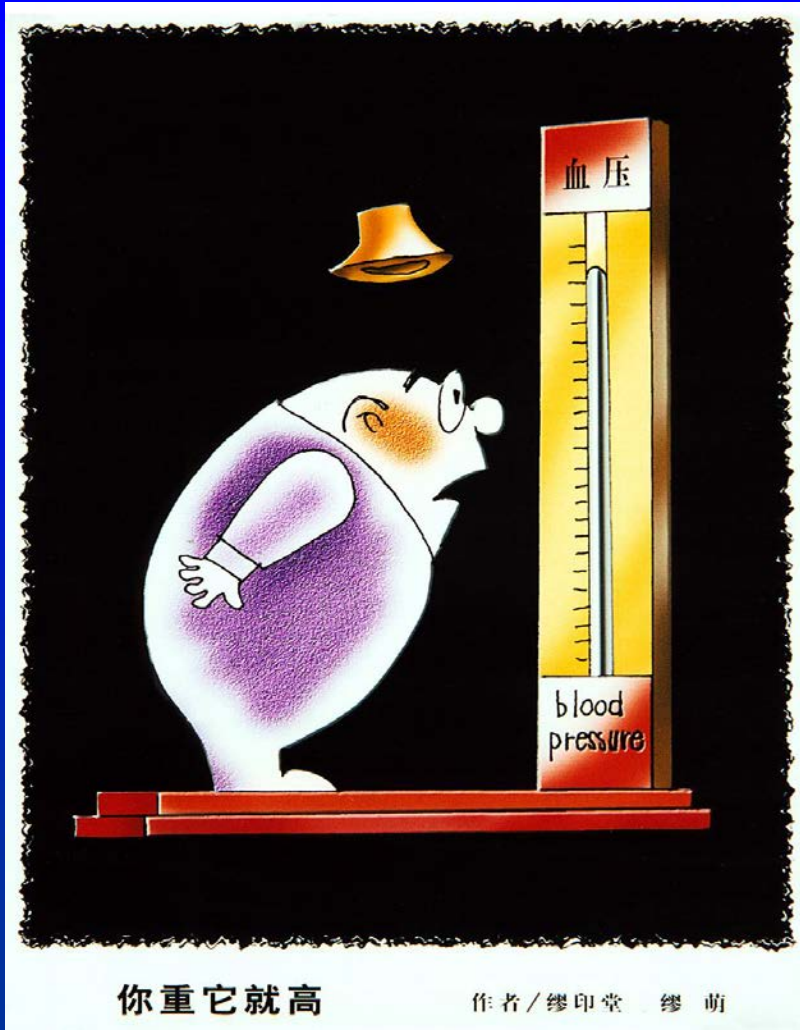
Figure. Schema of the progression from lifestyle changes to the incidence of hypertension and cardiovascular disease (CVD). CHD indicates coronary heart disease.

Effects of non pharmacological methods on BP in HTA

A. Single non pharmacological approach in the treatment of HTA

- Weight loss
- Exercise
- Lowering dietary sodium
- Increasing dietary potassium
- Decreasing alcohol intake

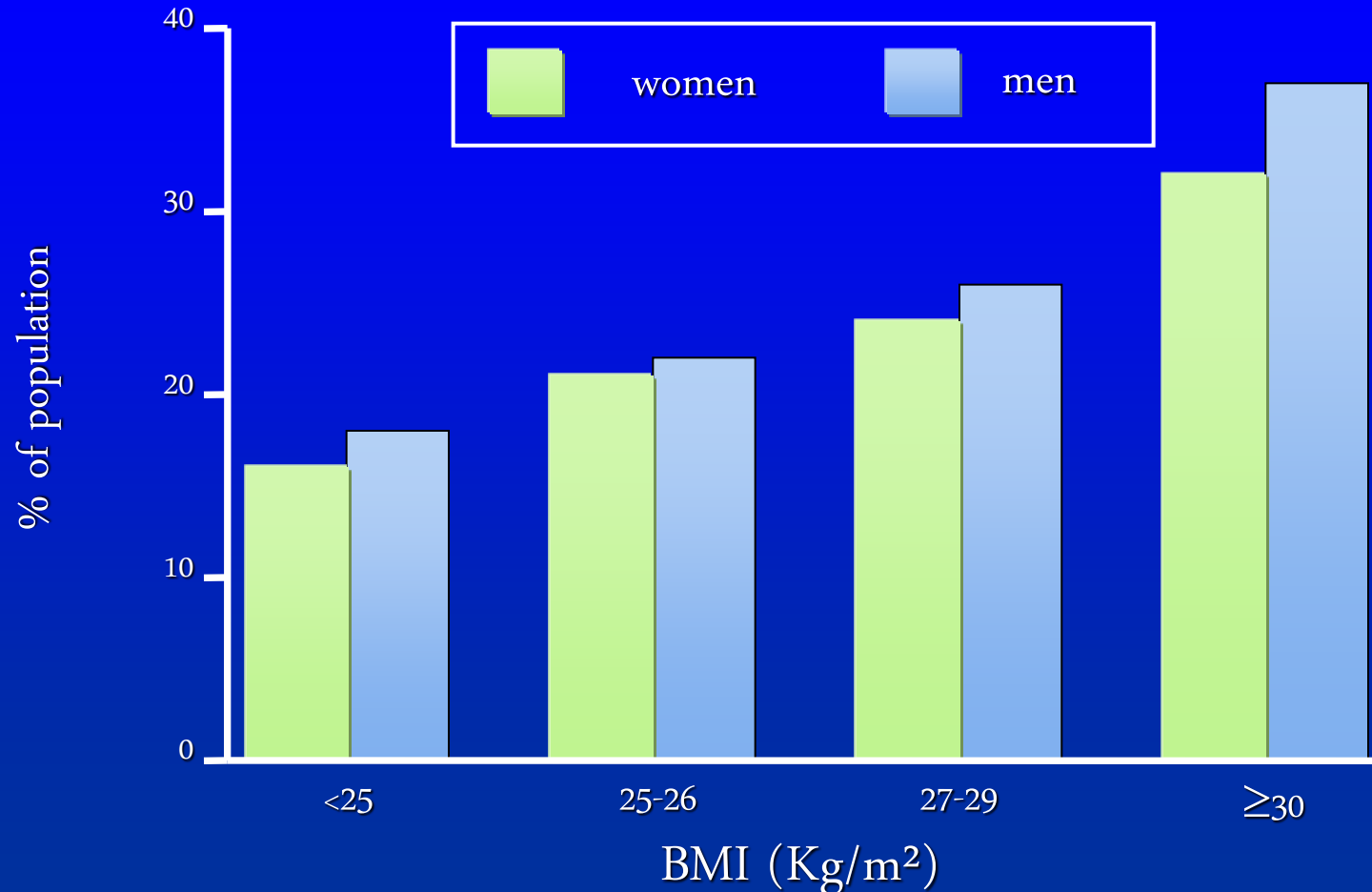
HTA and overweight or obesity



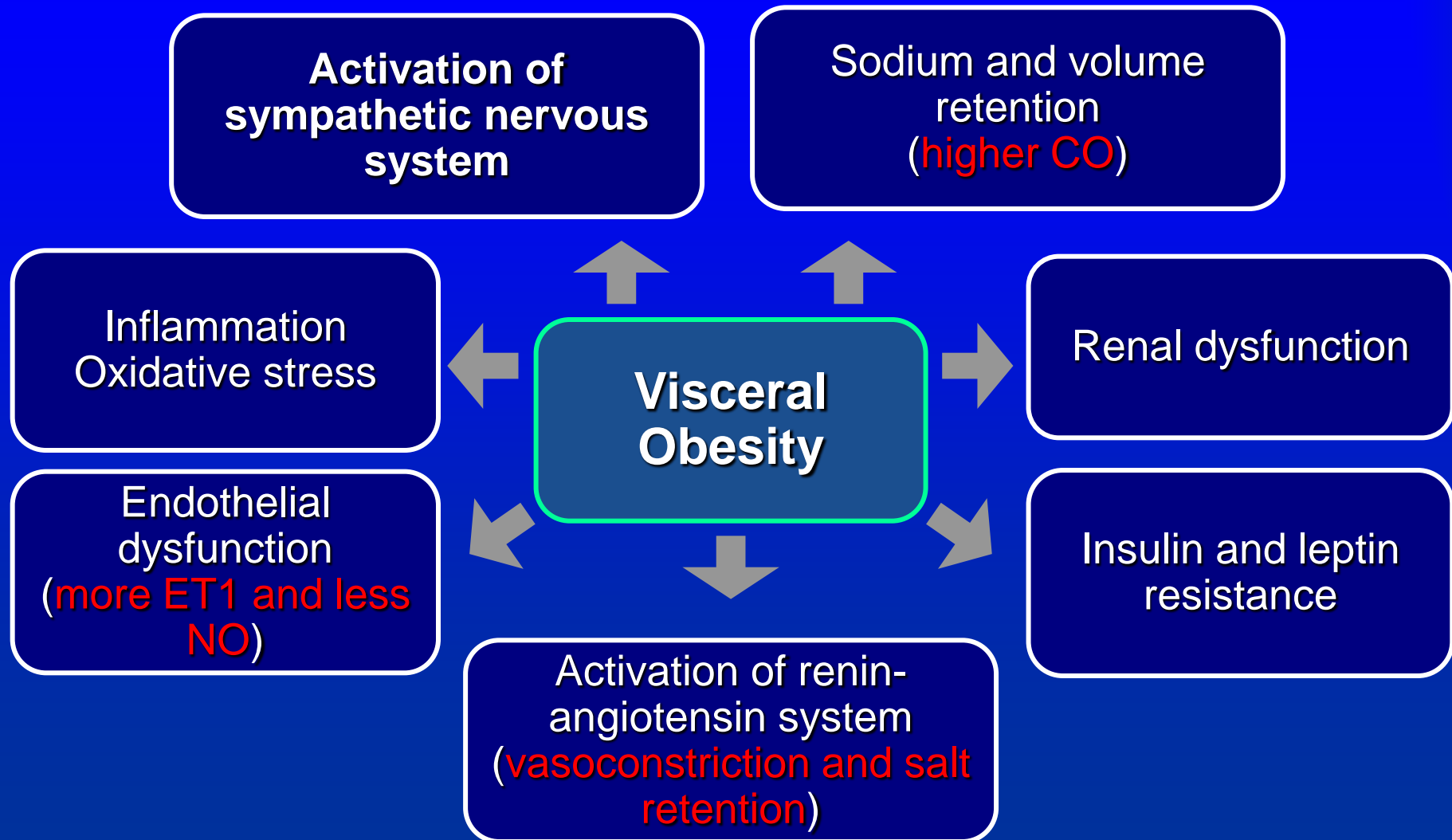
WHL International Art
Competition 2003
Obesity-HTA

First Place Winner
Miao Yin-tang from China

Obesity is associated with an increased prevalence of hypertension



Mechanisms linking obesity to hypertension



Influence of Weight Reduction on Blood Pressure

A Meta-Analysis of Randomized Controlled Trials

Judith E. Neter, Bianca E. Stam, Frans J. Kok, Diederick E. Grobbee, Johanna M. Geleijnse

Hypertension. 2003;42:878-884.

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- 25 RCT from 1966 to 2002
- 4878 participants, $\frac{1}{2}$ HT, $\frac{1}{4}$ under antiHTA drugs
- FU 8 to 260 weeks (mean 66.6 w)
- Mean duration to maximal effect: 35 weeks
- **Per 1 Kg weight loss, reduction of S and DBP of 1 mmHg** (1.1 and 0.9 mmHg, respectively)
- Larger decrease in BP when under antiHTA treatment.
- Drop out < 5%

Long-Term Weight Loss From Lifestyle Intervention Benefits Blood Pressure?

A Systematic Review

Lorna Aucott, Helen Rothnie, Linda McIntyre, Mohan Thapa, Charles Waweru, Denise Gray

Hypertension. 2009;54:756-762.

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Obese adults 18-65y old (mean BMI <math><35 \text{ Kg/m}^2</math>)

- Systematic review of studies with a **FU = or > 2y** between 1990 and 2008
- Results are very variable:
 - Difference in weight: -11 to + 4 Kg
 - Difference in SBP: -13 to +6 mmHg
 - Difference in DBP: -7 to +2 mmHg

Recommendations for overweight or obese hypertensive patients

- Try to lose weight by dietary advices (and simultaneously by stimulating exercise).
- Try to motivate the patients for continuing their effort at long term. The medical FU is thus important!



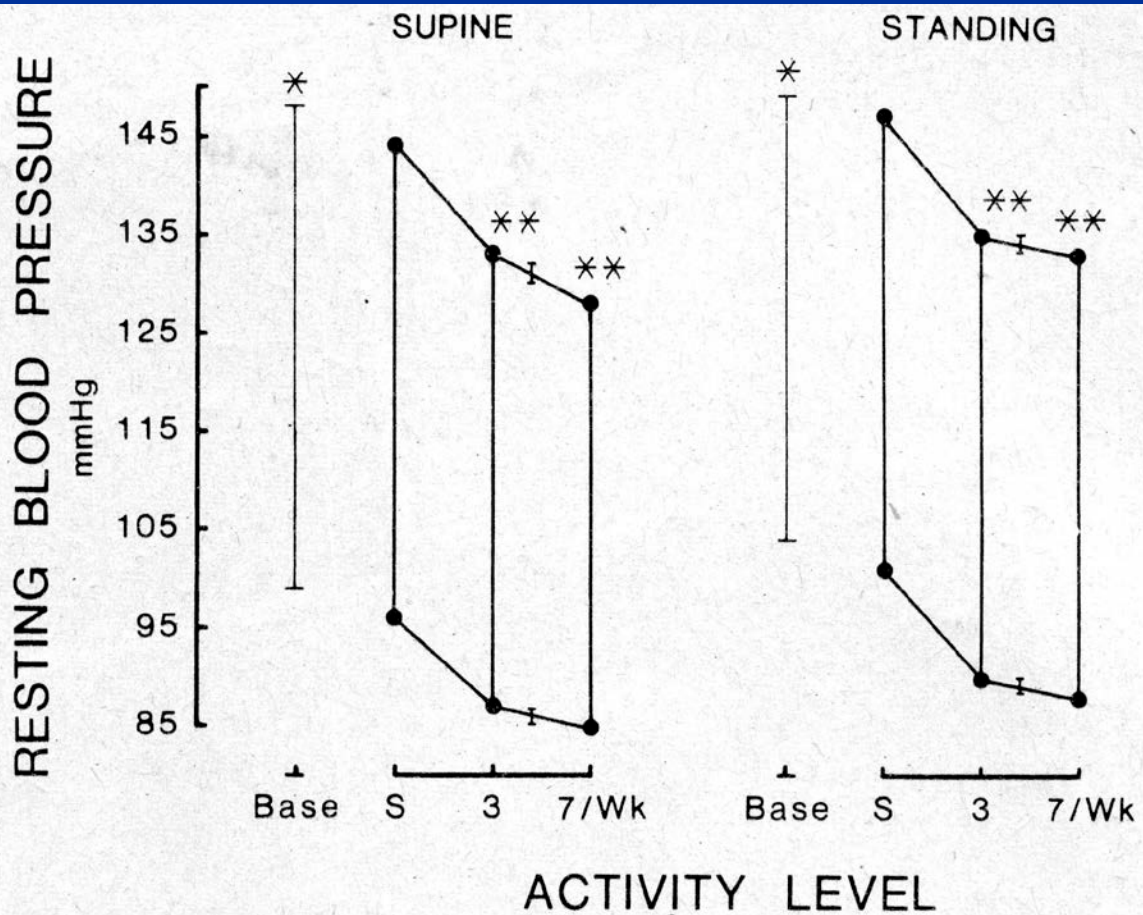


Fig 1—Resting supine and standing blood-pressure at 3 levels of physical activity.

Baseline measurement (Base), sedentary activity (S), 3 times/week exercise (3), and 7 times/week exercise (7). * $p < 0.05$, difference from sedentary value for both systolic and diastolic blood-pressure.

Meta-analysis Dynamic
exercise Cornelissen et al
HTA 2005 :
- 7 / - 5 mmHg in HT patients

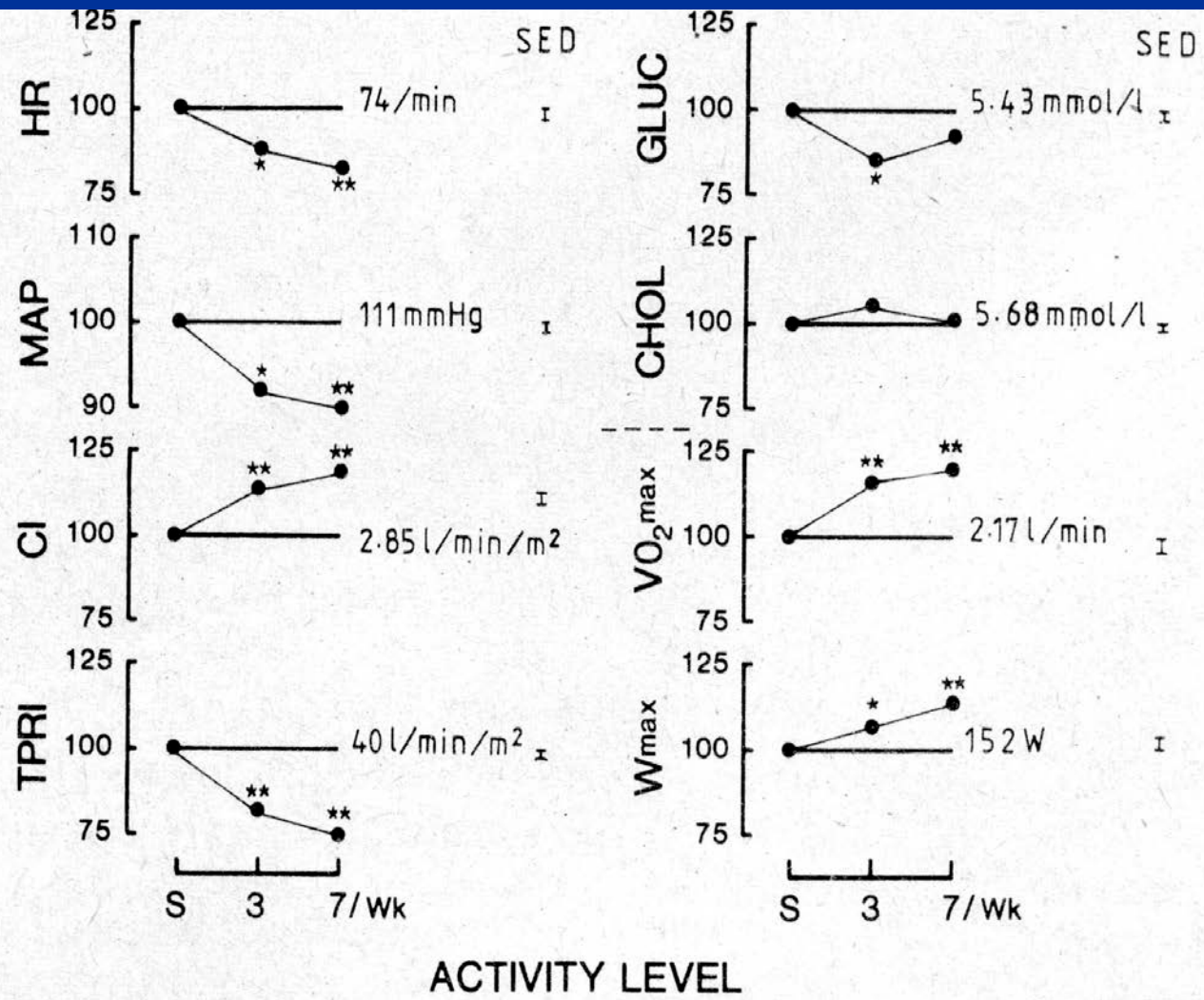


Fig 2—Heart-rate (HR), mean arterial pressure (MAP), cardiac index (CI), total peripheral resistance index (TPRI), plasma total cholesterol (CHOL) and glucose (GLUC), oxygen consumption (VO₂ max), and maximum work capacity (Wmax) at 3 levels of physical activity.

Beyond Medications and Diet: Alternative Approaches to Lowering Blood Pressure

A Scientific Statement From the American Heart Association

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Hypertension. 2013;61:1360-1383.

- Exercise-based regimens (aerobic, dynamic resistance, and isometric handgrip) modalities have stronger supportive evidence, especially dynamic aerobic exercise (IA).

RECOMMENDATIONS

American College of Sports Medicine Position Stand: Exercise and Hypertension

Pescatello, Franklin, Fagard, Farquhar, Kelley & Ray
Medicine and Science in Sports and Exercise 2004; 36: 533-553

- **Exercise is a cornerstone therapy for the primary prevention, treatment and control of hypertension**
- **Based upon the current evidence the following exercise prescription is recommended:**
 - **frequency: on most, preferably all days of the week**
 - **intensity: moderate intensity (40 - <60% of $\dot{V}O_2$ reserve)**
 - **time: ≥ 30 min of continuous or accumulated physical activity per day**
 - **type: primarily endurance physical activity supplemented by resistance exercise**

Salt and BP

Reduce your sodium intake, and you'll soon find you crave less salt.

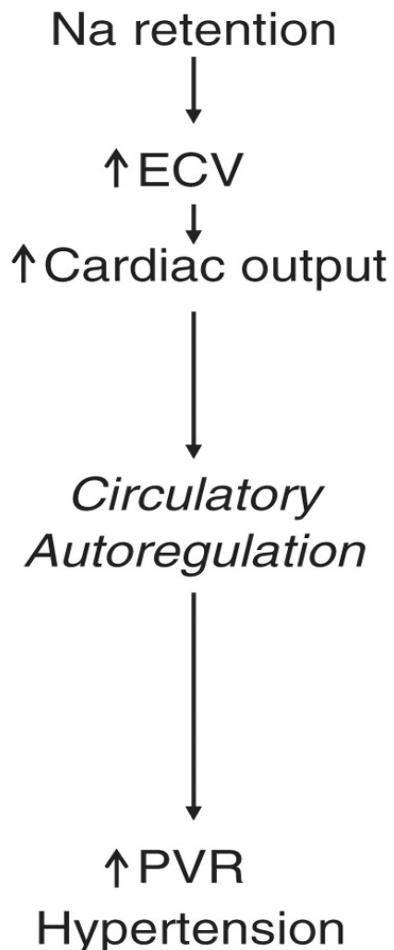
P. Turner

Salt restriction in HTA

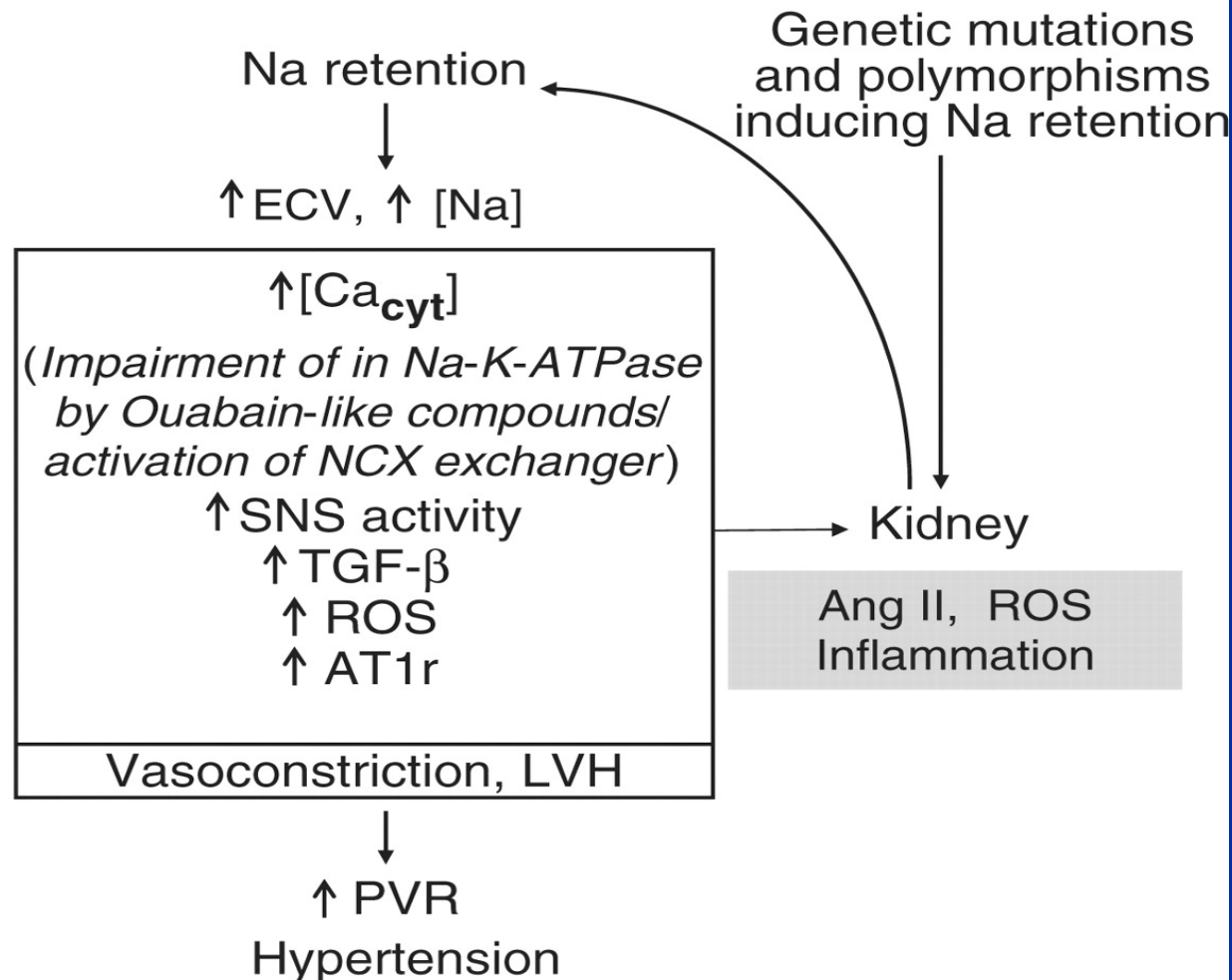
- It is not a « one size fits all » approach!
- Presence of SS and SR patients
- Role of race, age, CKD, severity of HTA, and genetics

Etiopathogenesis of salt-sensitive hypertension

Guyton, 1960–70's



Salt-sensitive hypertension 2000's



Effect of longer-term modest salt reduction on blood pressure (Review)

He FJ, Li J, MacGregor GA



This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library* 2013, Issue 4

<http://www.thecochranelibrary.com>



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Low salt , BP
changes and
metabolic
consequences?

Cochrane Library
2013

Main results of the meta-analysis

- 34 trials (3230 participants), > 4 weeks duration
- **Mean change in uNa : -75 mmol/24h (- 4.4 g Salt)**
- **Mean change in BP: - 4.2 mmHg SBP (CI -5.1 to -3.2)
- 2.1 mmHg DBP (CI -2.7 to -1.4)**
- In HT, - 5.4/ -2.8 mmHg for S and DBP, respectively
- In NT, -2.4/-1 mmHg
- Meta-regression: age, race, BP status and change in 24-h uNa were all significantly associated with the fall in S and D BP
- Small increase in PRA, Aldo , NA and A but no change in lipids levels.

International recommendations: max 5g/d of NaCl in HT
WHO, Guideline: Sodium intake for adults and children 2012

Table 1 | UK strategy for reducing salt

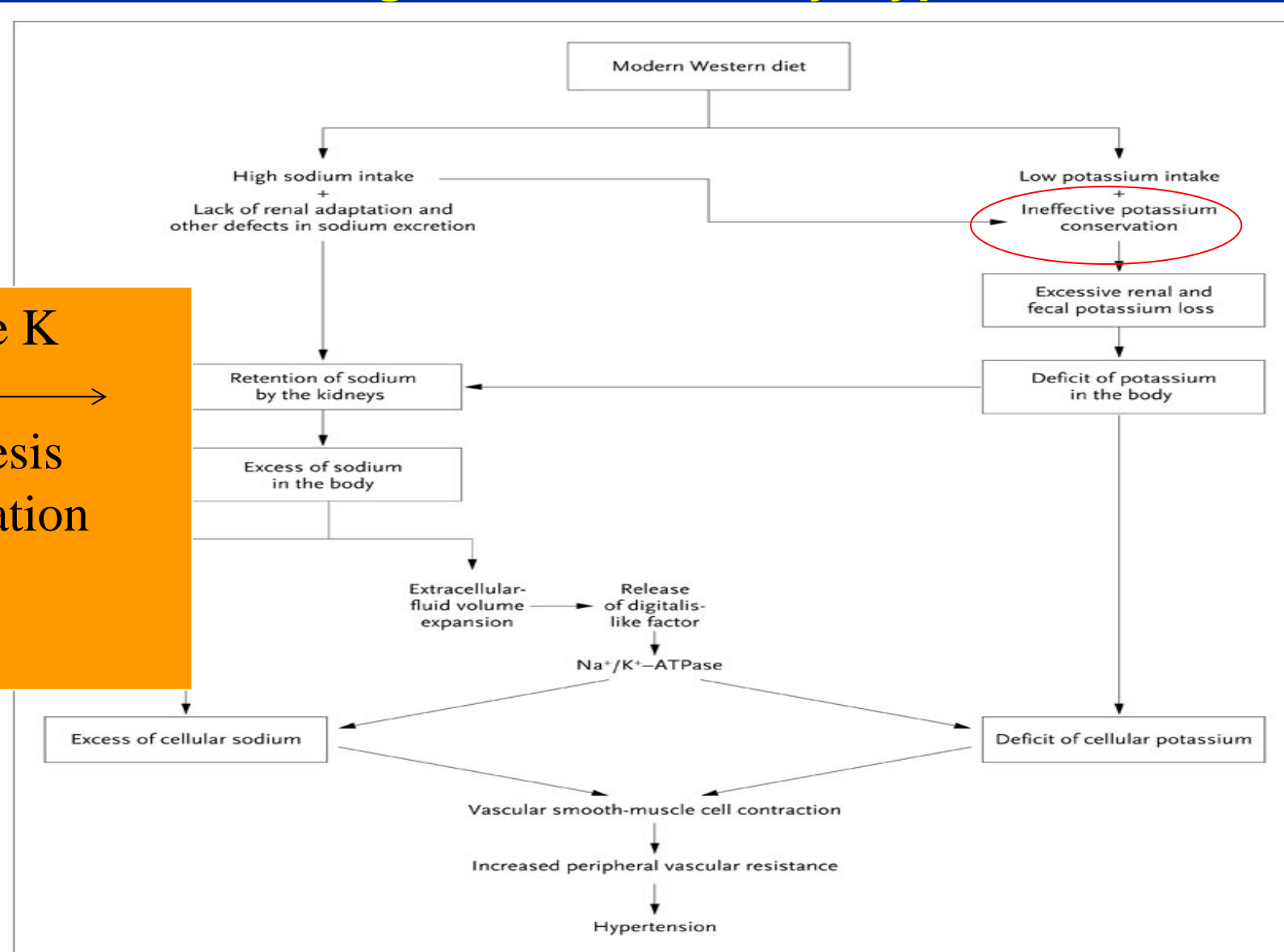
Salt intake			
Source	g/day	Reduction needed	Target intake (g/day)
Table/cooking (15%)	1.4 g	40% reduction	0.9 g
Natural (5%)	0.5 g	No reduction	0.5 g
Food industry (80%)	7.6 g	40% reduction	4.6 g
Total: 9.5 g			Target: 6.0 g

Increase in potassium intake and BP



HIGH POTASSIUM FOODS TO AVOID:
Avocado, banana, orange, beets, broccoli,
brussel sprouts, carrots (raw), lentils, spinach,
tomatoes, nuts/seeds, peanut butter, yogurt

Interaction of the Modern Western Diet and the Kidneys in the Pathogenesis of Primary Hypertension



Increase K intake →
Natriuresis
vasodilation

Daily potassium intake and sodium-to-potassium ratio in the reduction of blood pressure: a meta-analysis of randomized controlled trials

Aristea Binia^a, Jonathan Jaeger^b, Youyou Hu^b, Anurag Singh^b, and Diane Zimmermann^c

Paleolithic diet : K 150-290 mmol/d
Na 20-40 mmol/d

Modern diet : K 30-70 mmol/d
Na 80-250 mmol/d

So urinary Na/K around 3

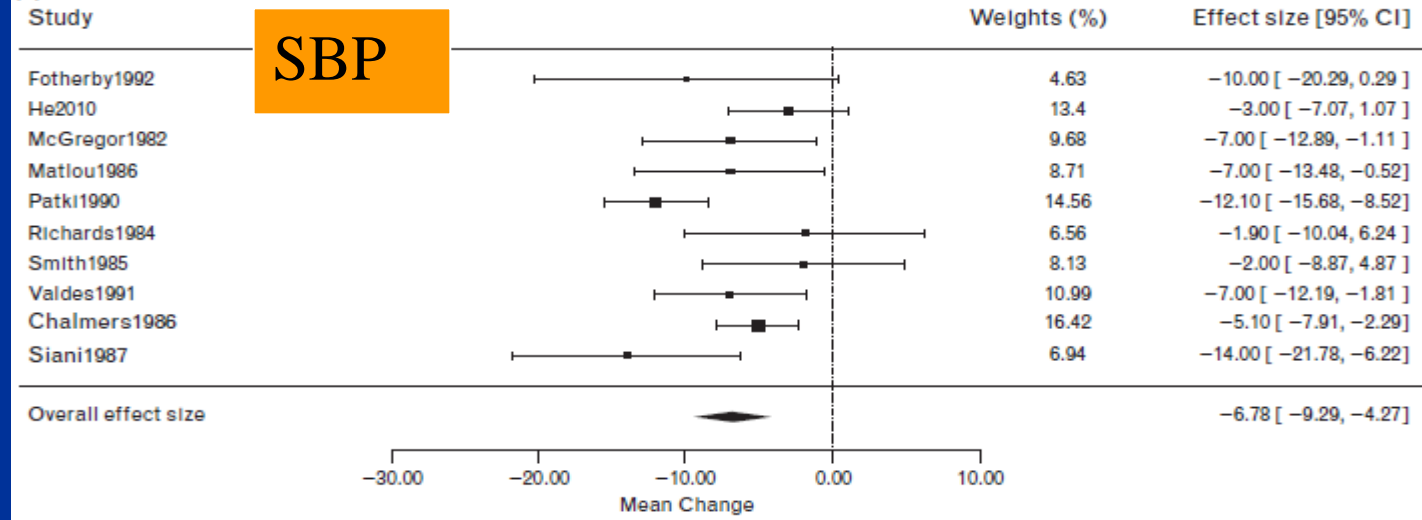
Journal of Hypertension 2015, 33:1509–1520

hypertensive patients without medication



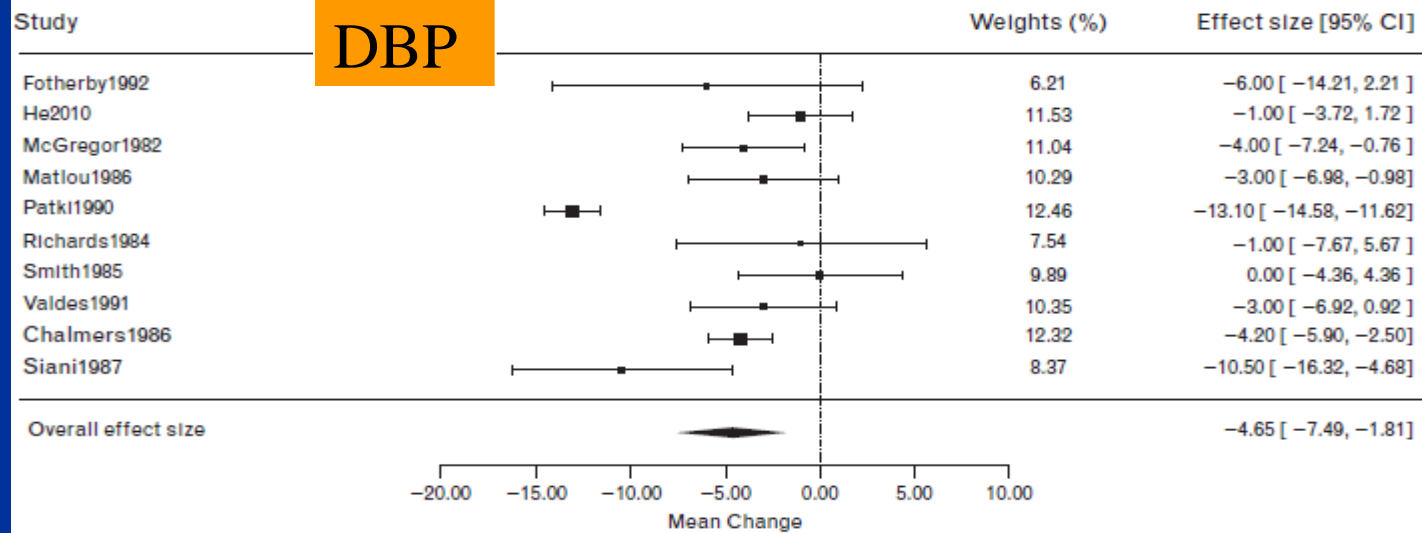
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(a)



Effect size	Std error	95% CI lower bound	95% CI upper bound	P value	I ²
-6.779	1.283	-9.293	-4.265	<0.001	54.08%

(b)



Effect size	Std error	95% CI lower bound	95% CI upper bound	P value	I ²
-4.652	1.450	-7.495	-1.810	0.001	87.38%

Journal of Hypertension 2015, 33:

Adding 60-100 mmol K /d:
Decrease of SBP 6.8 mmHg
Decrease of DBP 4.6 mmHg

Recommendations for Potassium and BP

WHO recommendation (Weaver C Adv Nut 2013):

The ideal would be to lower sodium intake to < 100 mmol/d
and to increase potassium intake to > 90 mmol/d,
so the **urinary Na/K ratio should be near 1**

Alcohol and blood pressure.



Direct and indirect (acetaldehyde)
effects on blood pressure.

Alcohol and BP

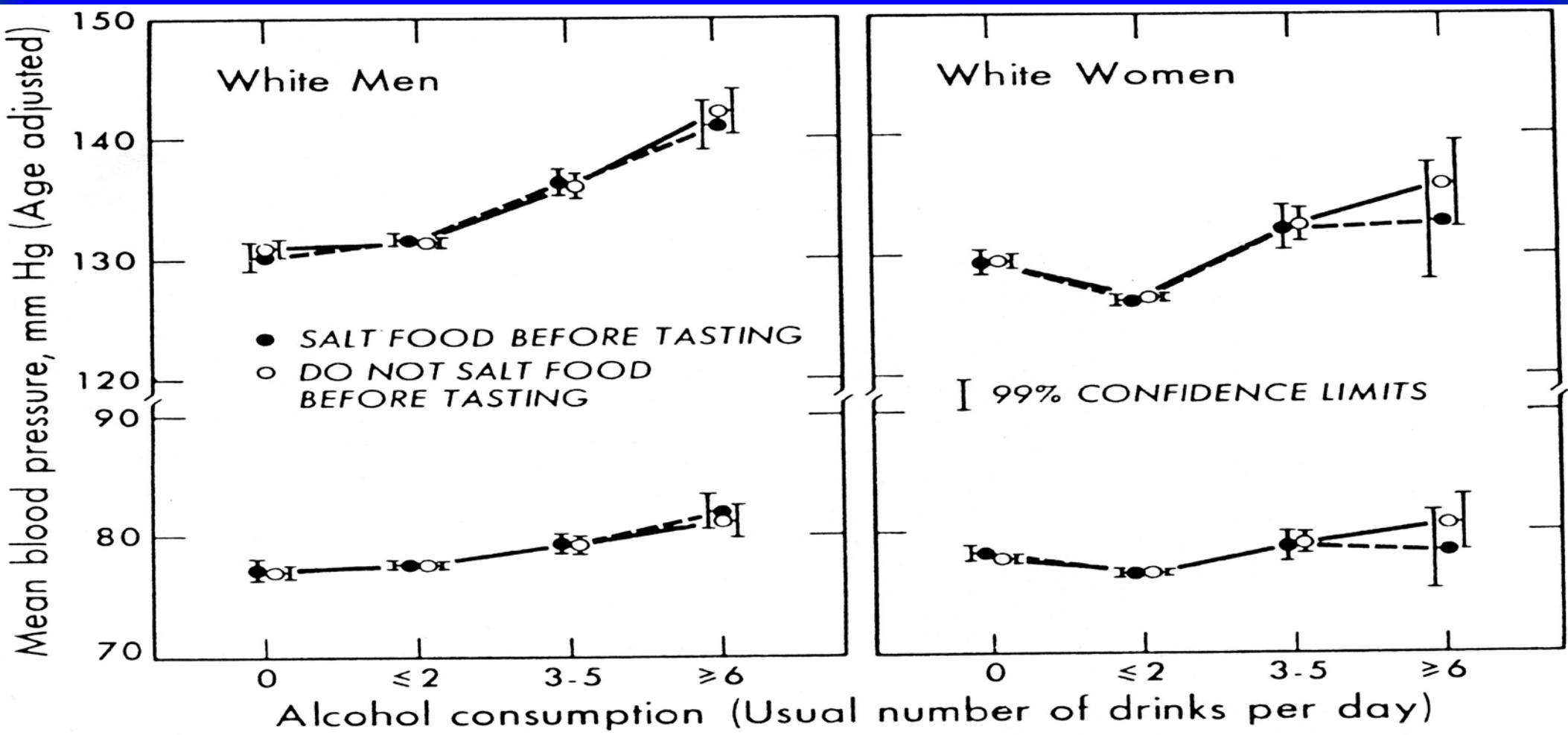


Figure 23-3. Mean systolic blood pressures (*upper graphs*) and diastolic blood pressures (*lower graphs*) for white men and women with known drinking habits according to usual salt use habit. (From Klatsky AL, Friedman GD, Siegelau AB. Alcohol and hypertension. *Compr Ther* 4:60, 1978.)

- 15 RCT trials, 2234 participants, majority are males, FU 1 week to 2 years.
- Decreasing alcohol reduces BP in a dose-dependent manner
- Mean BP decrease for reducing alcohol by 2/3:
 - 3.3 mmHg SBP
 - 2.1 mmHg DBP

Recommendation for Alcohol in HTA

- Try to drink alcohol less than 3 glasses/d for men
- For women, try not to drink more than 1 glass /d, due mainly to general negative effect on health.

B. Multifactorial approach on BP in HTA



A CLINICAL TRIAL OF THE EFFECTS OF DIETARY PATTERNS
ON BLOOD PRESSURE

LAWRENCE J. APPEL, M.D., M.P.H., THOMAS J. MOORE, M.D., EVA OBARZANEK, PH.D., WILLIAM M. VOLLMER, PH.D.,
LAURA P. SVETKEY, M.D., M.H.S., FRANK M. SACKS, M.D., GEORGE A. BRAY, M.D., THOMAS M. VOGT, M.D., M.P.H.,
JEFFREY A. CUTLER, M.D., MARLENE M. WINDHAUSER, PH.D., R.D., PAO-HWA LIN, PH.D., AND NJERI KARANJA, PH.D.,
FOR THE DASH COLLABORATIVE RESEARCH GROUP*

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(N Engl J Med VOLUME 336

APRIL 17, 1997

- **DASH: Dietary approach to stop HTA**

Methods We enrolled 459 adults with systolic blood pressures of less than 160 mm Hg and diastolic blood pressures of 80 to 95 mm Hg. For three weeks, the subjects were fed a control diet that was low in fruits, vegetables, and dairy products, with a fat content typical of the average diet in the United States. They were then randomly assigned to receive for eight weeks the control diet, a diet rich in fruits and vegetables, or a "combination" diet rich in fruits, vegetables, and low-fat dairy products and with reduced saturated and total fat. Sodium intake and body weight were maintained at constant levels.

TABLE 2. PRERANDOMIZATION CHARACTERISTICS OF THE STUDY SUBJECTS, ACCORDING TO DIET.*

CHARACTERISTICS	CONTROL DIET (N = 154)	FRUITS-AND-VEGETABLES DIET (N = 154)	COMBINATION DIET (N = 151)
Age (yr)	44±11	45±11	44±10
Female sex (%)	47.4	48.7	51.0
Race or ethnicity (%)			
Nonminority	35.1	35.7	31.1
Black	59.7	58.4	61.6
Other minority	5.2	5.8	7.3
Household income (%)			
<\$30,000	37.1	36.7	36.0
\$30,000–\$59,999	41.7	36.7	42.7
≥\$60,000	21.2	26.7	21.3
Weight (kg)			
Men	87.7±13.7	86.6±13.9	88.0±15.7
Women	75.4±12.2	77.1±12.5	78.9±11.7
Body-mass index†			
Men	27.7±3.6	27.5±3.6	28.1±4.0
Women	28.3±4.0	28.9±4.3	29.0±3.9
Blood-pressure medication discontinued (%)	5.8	5.8	4.6
Ever received blood-pressure medication (%)	20.8	25.3	20.5
Alcohol (drinks/wk)	1.3±2.5	1.1±2.2	1.3±2.5
Blood pressure			
Systolic (mm Hg)‡	132±10.7	132.3±10.5	131.2±10.0
≥140 (%)	24.7	25.3	20.5
Diastolic (mm Hg)‡	85.3±4.0	84.8±3.9	85.1±3.6
≥90 (%)	14.9	14.3	11.9
Ambulatory systolic (mm Hg)§	130.9±11.3	132.0±10.8	131.9±10.7
Ambulatory diastolic (mm Hg)§	83.3±7.4	83.9±8.0	83.6±6.8

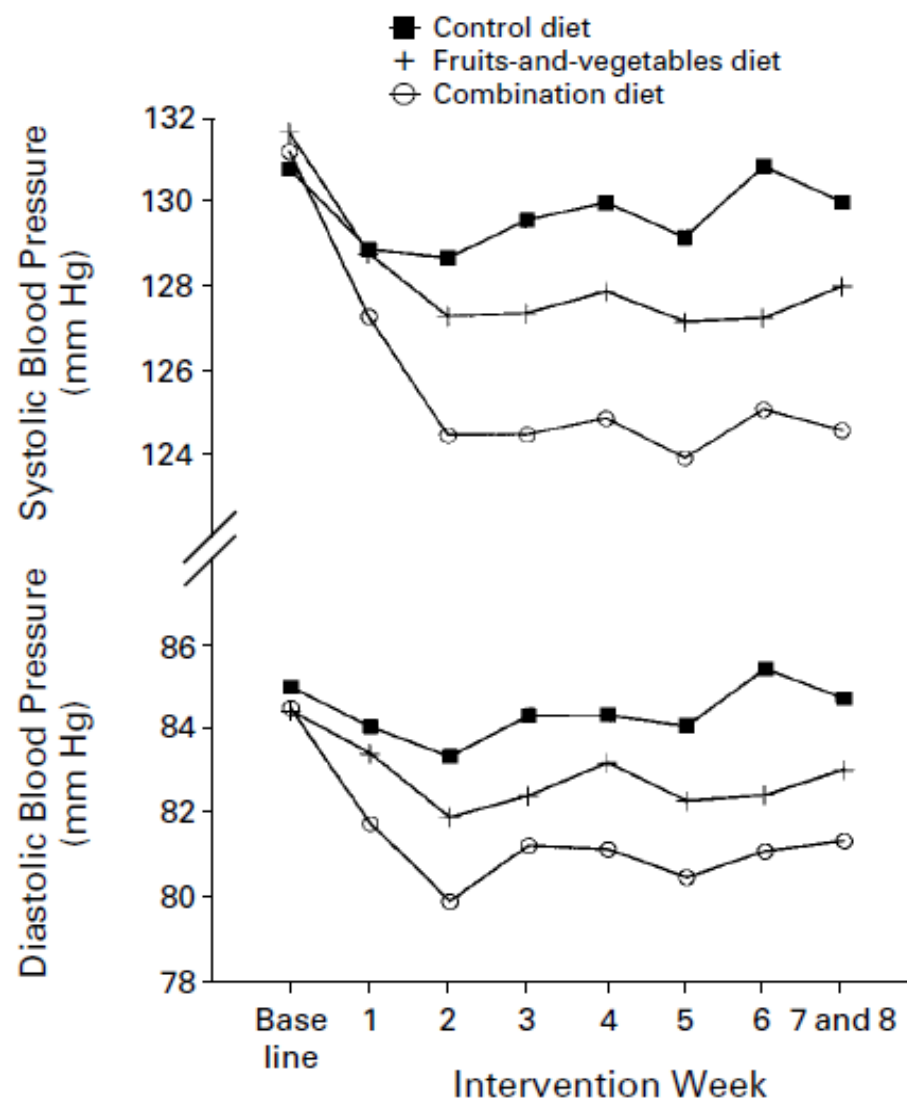


Figure 1. Mean Systolic and Diastolic Blood Pressures at Base Line and during Each Intervention Week, According to Diet, for 379 Subjects with Complete Sets of Weekly Blood-Pressure Measurements.

Conclusions A diet rich in fruits, vegetables, and low-fat dairy foods and with reduced saturated and total fat can substantially lower blood pressure. This diet offers an additional nutritional approach to preventing and treating hypertension. (N Engl J Med 1997;336:1117-24.)



EFFECTS ON BLOOD PRESSURE OF **REDUCED DIETARY SODIUM** AND THE DIETARY APPROACHES TO STOP HYPERTENSION (DASH) DIET

FRANK M. SACKS, M.D., LAURA P. SVETKEY, M.D., WILLIAM M. VOLLMER, PH.D., LAWRENCE J. APPEL, M.D.,
GEORGE A. BRAY, M.D., DAVID HARSHA, PH.D., EVA OBARZANEK, PH.D., PAUL R. CONLIN, M.D.,
EDGAR R. MILLER III, M.D., PH.D., DENISE G. SIMONS-MORTON, M.D., PH.D., NJERI KARANJA, PH.D., AND PAO-HWA LIN, PH.D.,
FOR THE DASH COLLABORATIVE GROUP

**TABLE 2. URINARY EXCRETION AND BODY WEIGHT ACCORDING TO
DIETARY SODIUM LEVEL AND ASSIGNED DIET.**

VARIABLE	HIGH SODIUM LEVEL		INTERMEDIATE SODIUM LEVEL		LOW SODIUM LEVEL	
	DASH DIET	CONTROL DIET	DASH DIET	CONTROL DIET	DASH DIET	CONTROL DIET
	mean ± SD					
Urinary excretion						
Sodium						
mmol/day	144±58	141±55	107±52	106±44	67±46	64±37
g/day	3.3±1.3	3.3±1.3	2.5±1.2	2.4±1.0	1.5±1.0	1.5±0.8
Potassium						
mmol/day	75±27	40±14	81±31	41±14	81±29	42±14
g/day	2.9±1.1	1.6±0.5	3.2±1.2	1.6±0.5	3.2±1.1	1.6±0.5
Phosphorus (mg/day)	778±285	666±248	825±350	646±264	783±286	672±243
Urea nitrogen (g/day)	11.5±4.0	9.6±3.2	12.4±4.5	9.7±3.4	11.8±4.1	10.0±3.3
Creatinine (g/day)	1.4±0.5	1.5±0.5	1.5±0.6	1.5±0.6	1.4±0.5	1.6±0.6
Weight (kg)	82.3±14.5	85.3±15.6	82.1±14.4	85.1±16.0	82.2±14.5	85.0±15.7

Figure 1. The Effect on Systolic Blood Pressure (Panel A) and Diastolic Blood Pressure (Panel B) of Reduced Sodium Intake and the DASH Diet.

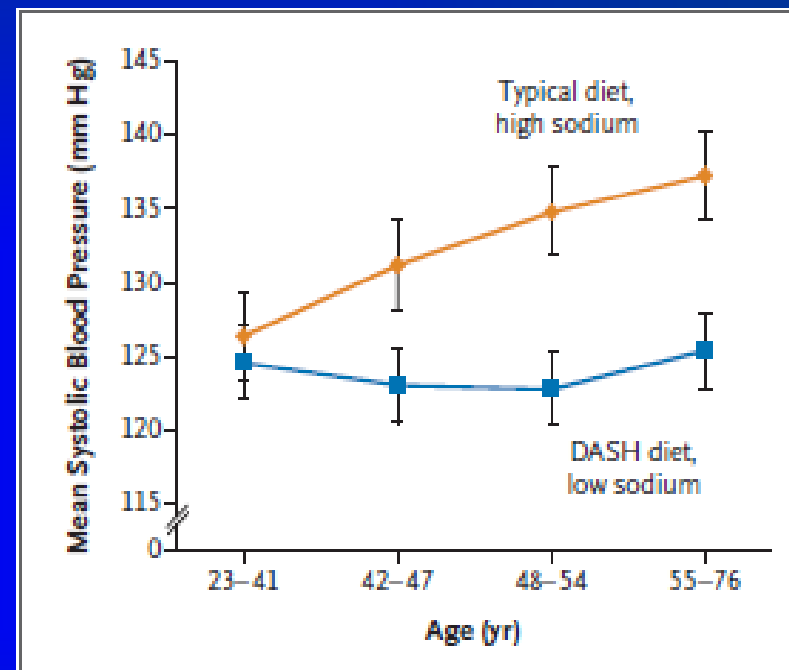
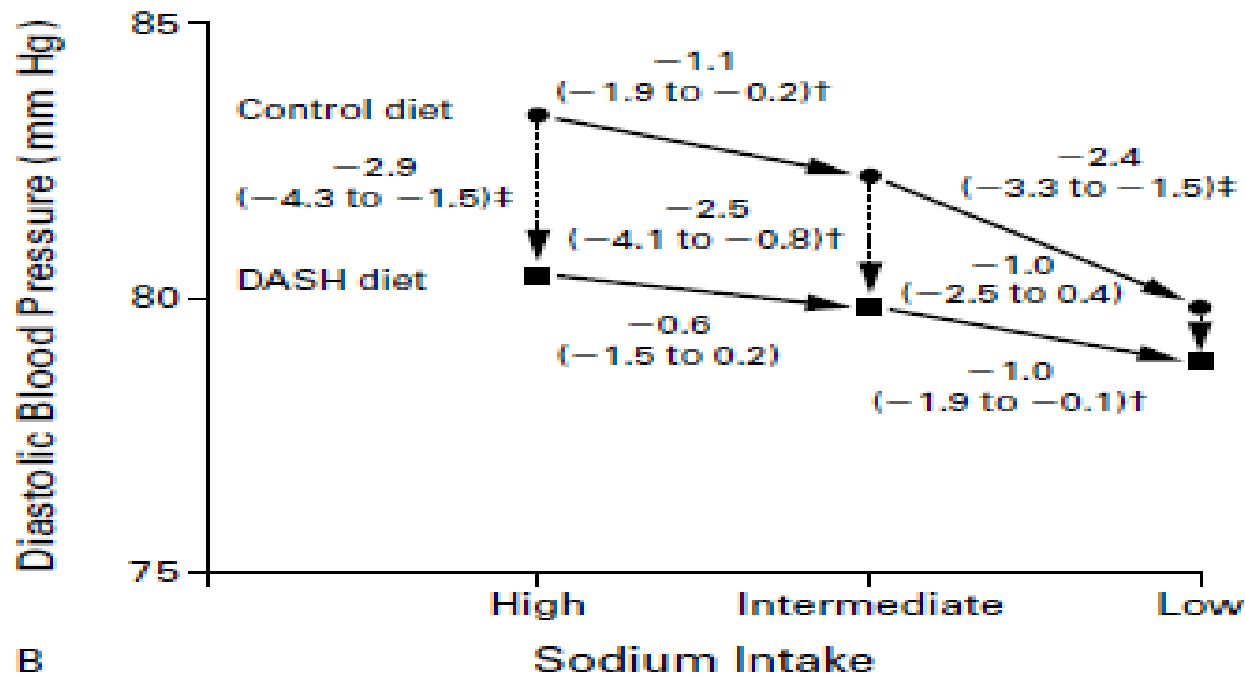
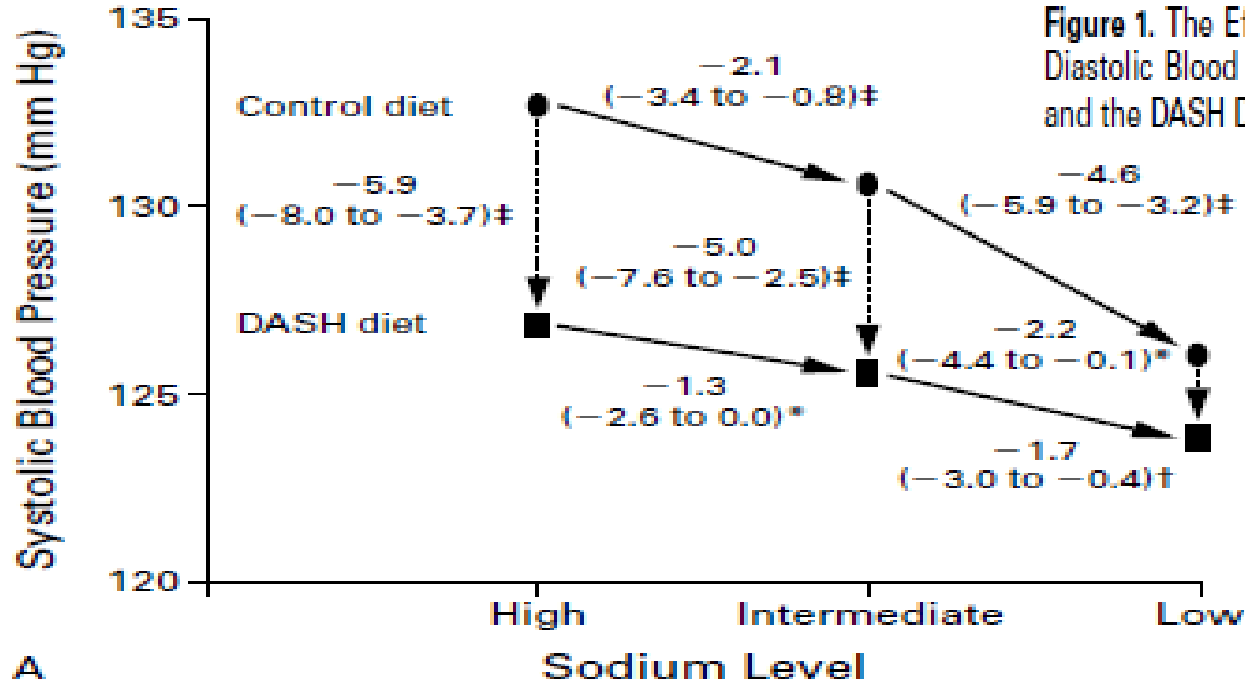


Figure 3. Effects of a Low-Sodium DASH Diet on Systolic Blood Pressure with Increasing Age.

The slope for the control group during the period of high sodium intake was 0.3 mm Hg per year, spanning 30 years. The slope for the DASH-diet group during the period of low sodium intake was 0 mm Hg per year. I bars denote 95% confidence intervals. Data are from Sacks et al.⁵³

Effects of the DASH Diet Alone and in Combination With Exercise and Weight Loss on Blood Pressure and Cardiovascular Biomarkers in Men and Women With High Blood Pressure

The ENCORE Study

Arch Intern Med. 2010;170(2):126-135

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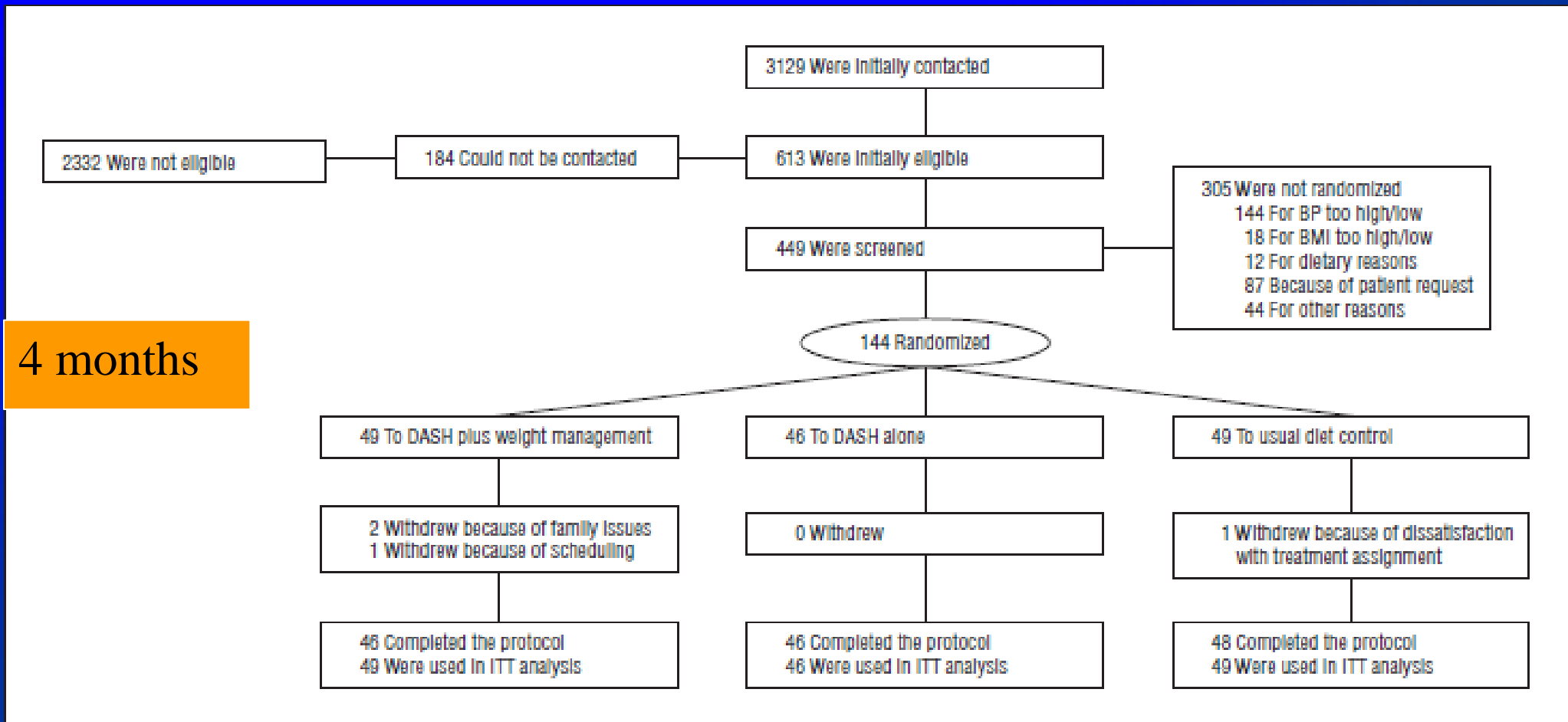


Figure 1. Participant flow in the ENCORE (Exercise and Nutrition interventions for Cardiovascular Health) clinical trial. BMI indicates body mass index (calculated as weight in kilograms divided by height in meters squared); BP, blood pressure; DASH, Dietary Approaches to Stop Hypertension; and ITT, intent-to-treat.

Ambulatory Blood Pressure

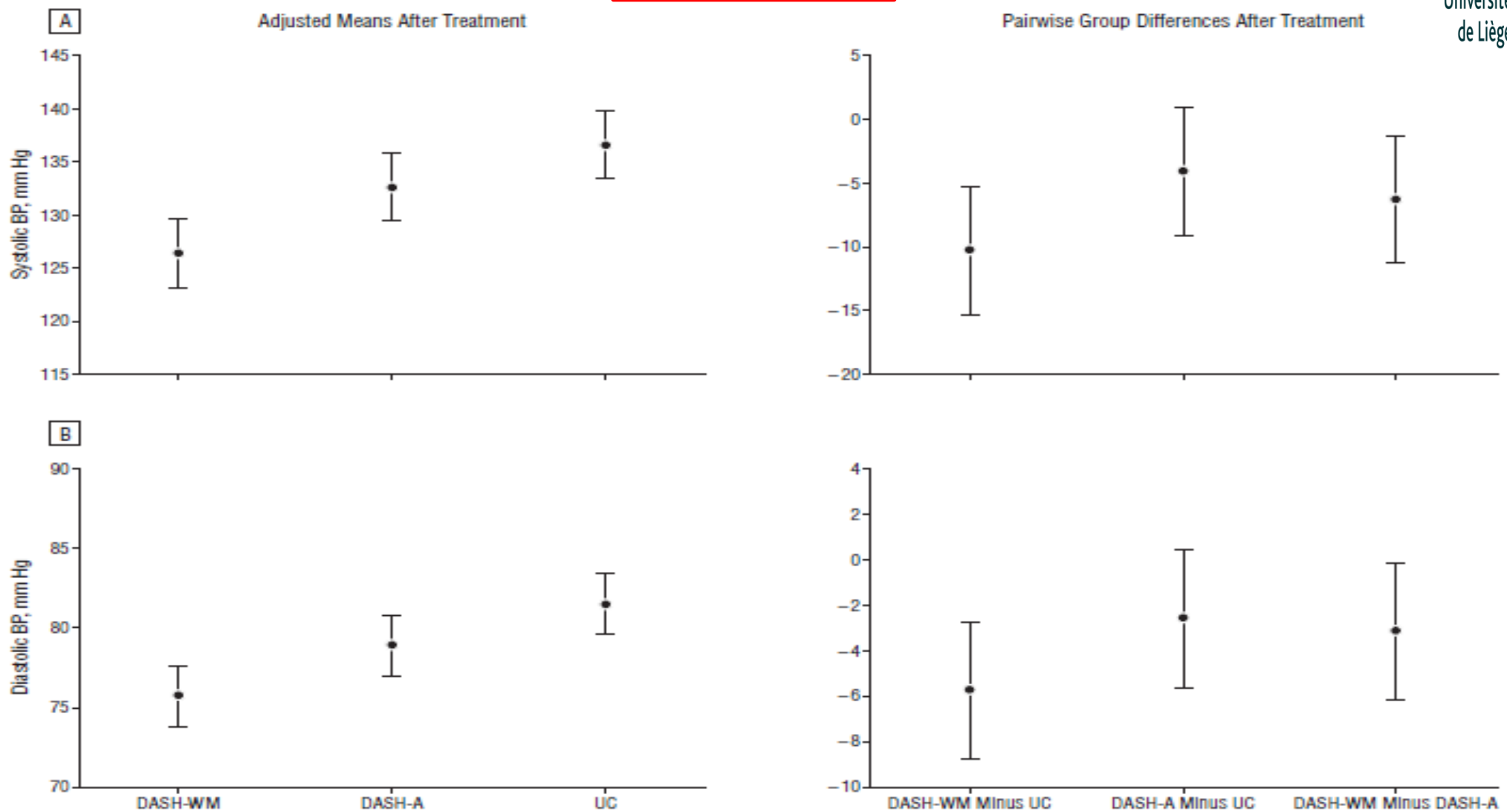


Figure 3. Comparison of posttreatment means and 95% confidence intervals for 24-hour ambulatory blood pressure (BP) using an intent-to-treat model, adjusted for age, sex, ethnicity, percentage of time in sitting or standing position, and pretreatment BP. The contrast between all active treatment groups and the usual diet control (UC) group was significant for systolic (A) and diastolic (B) BP ($P < .001$), as were the contrasts between DASH-WM (Dietary Approaches to Stop Hypertension plus weight management) vs DASH-A (DASH alone) for systolic BP ($P = .01$) and diastolic BP ($P = .03$). The right panels display the pairwise differences (mean difference and 95% confidence intervals) between the treatment groups calculated from the adjusted posttreatment Arch Intern Med. 2010;170(2):126-135

Effects of the DASH Diet Alone and in Combination With Exercise and Weight Loss on Blood Pressure and Cardiovascular Biomarkers in Men and Women With High Blood Pressure

The ENCORE Study

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Conclusion: For overweight or obese persons with above-normal BP, the addition of exercise and weight loss to the DASH diet resulted in even larger BP reductions, greater improvements in vascular and autonomic function, and reduced left ventricular mass.

Effects of non pharmacological methods for prevention of HTA

Primary Prevention of Hypertension by Nutritional-Hygienic Means Final Report of a RCTrial

Rose Stamler et al *JAMA*. 1989

- A **5-year trial**
- Men and women with **high-normal BP** at baseline
- Randomization to either nutritional-hygienic intervention or a control group:
- **8.8%** among 102 intervention group participants vs **19.2%** among 99 control group members developed HTA.
- The **odds ratio for the incidence of hypertension in the control group was 2.4.**
- Net weight loss in the intervention group averaged 2.7 kg during the trial; sodium intake was reduced by 25% and reported alcohol intake decreased by 30%. The majority of intervention participants also reported an increase in physical activity.
- Effect on BP was related particularly to degree of weight loss.

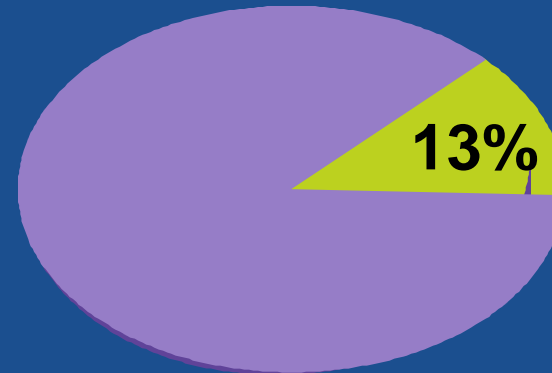
Trial of HTA prevention II (Arch Intern Med 1997)

Weight loss <5%

Weight loss >5%

2382 overweight or obese patients with high N BP
Weight reduction:
4.4 Kg at 6 mois
2 Kg at 3 ans
Risk reduction to develop HTA : 20% at 4y

TOHP II
Study
(WL goal - 4.5 kg)



3 years

Success in Maintaining Weight Loss is Low

ESH-ESC 2013 recommendations (IA)

2013 ESH/ESC Guidelines for the management of arterial hypertension

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- Restrict Salt (5-6g/d)
- Moderate your alcohol intake
- Eat more vegetables, fruits, low fat dairy products
- Practice exercise (5-7 d/ w)
- Reduce your weight if BMI > 25 Kg/m²
- Quit smoking
- (Manage your Stress)

Conclusions: HTA and non pharmacological approach

- In motivated population, there is a significant efficacy of single dietary factor or exercise on BP in high normal BP or low grade untreated HTA patients. The anti-HTA effect seems bigger when whole dietary and lifestyle patterns are put together.
- As the compliance to lifestyle and dietary modifications decreases with time, it needs repeated encouragements and realistic objectives.