Eat, drink……… exercise

Talya Wolak

SZMC

> Circulation. 1975 Jul;52(1):146-51. doi: 10.1161/01.cir.52.1.146.

Blood pressure, sodium intake, and sodium related hormones in the Yanomamo Indians, a "no-salt" culture

W J Oliver, E L Cohen, J V Neel

PMID: 1132118 DOI: 10.1161/01.cir.52.1.146

Table 1

Blood Pressures Obtained in the Yanomamo Indians

Age	No of subjects	Systolic		Diastolic	
		Mean	SD	Mean	SD
Males					
0–9	59	93.2	8.9	58.6	9.2
10–19	63	107.5	9.6	66.9	8.6
20–29	58	108.4	8.6	69.1	7.3
30–39	30	105.9	8.9	69.4	5.7
40–49	27	106.6	7.6	67.1	6.8
50+	7	100.0	8.2	63.7	8.1
Females					
0–9	60	95.7	12.0	61.6	8.0
10–19	72	104.9	9.7	64.5	10.8
20–29	62	99.8	10.0	62.6	6.6
30–39	32	99.5	10.5	62.9	6.3
40–49	19	97.6	11.4	62.2	16.8
50+	17	105.7	17.7	64.1	7.3

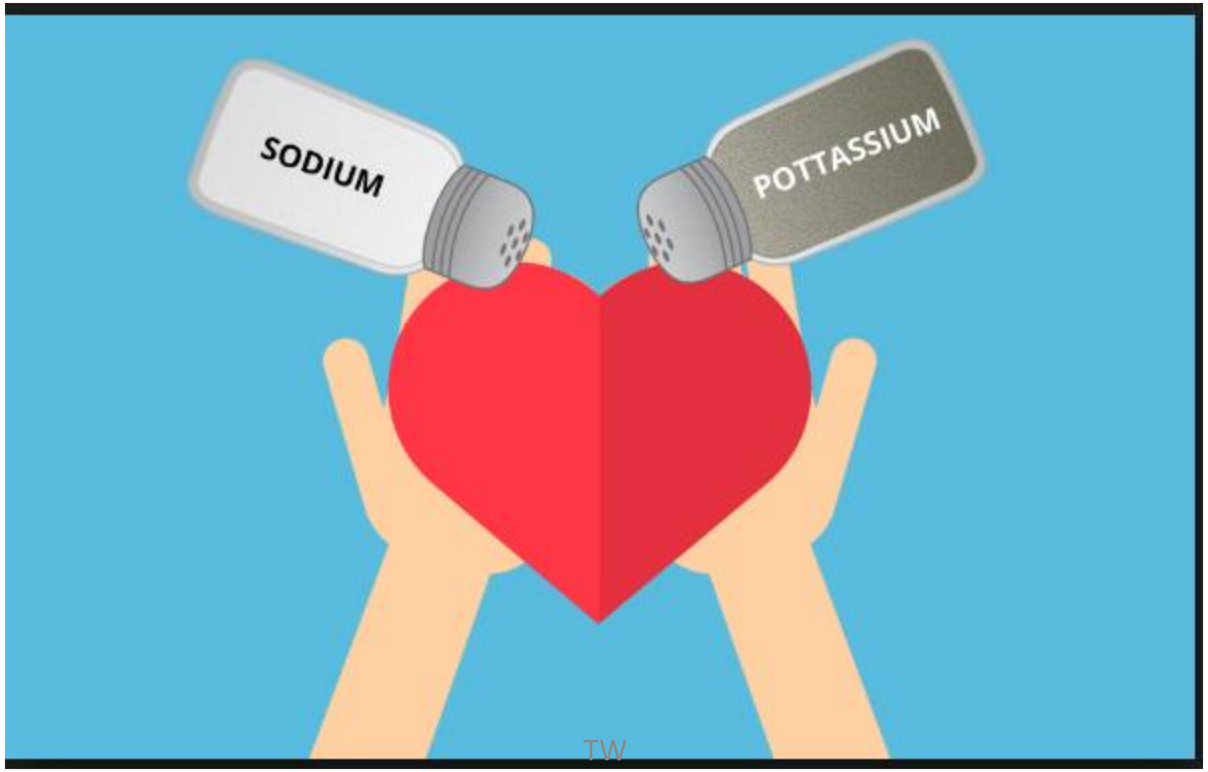
Table 5

Urinary Excretion of Sodium, Potassium, Chloride and Aldosterone Compared with Plasma Renin Activity and Blood Pressure in Yanomamo Indians and Control Subjects

Subjects	Na^+ mEq/24 hr	K^+ mEq/24 hr	Cl^- mEq/24 hr	Aldosterone excretion (μg/24 hr)	Renin activity (ng/ml/hr)	Blood pressure†
Indians						
1622*	3.44	152.64	7.06	76.9	7.92	102/60
1631	.53	234.36	6.05	155.4	3.93	98/72
1668	.30	128.00	5.44	59.9	8.68	88/52
1671	.33	150.00	6.38	74.3	19.97	104/60
1690	.31	175.74	9.31	65.8	11.36	94/40
1691	.38	114.03	7.56	49.8	7.96	94/60
1699	.71	194.36	12.56	27.3	10.21	90/50
16104	.90	390.72	15.18	164.9	7.98	98/50
16116	.61	178.56	16.37	42.0	53.79	102/50
16119	.42	194.65	29.58	62.9	8.91	122/60
16120	6.76	291.10	22.58	40.5	3.43	120/52
Mean ± SD	1.34 ±2.01	200.38 ±80.17	12.55 ±7.80	74.52 ±44.94	13.10 ±14.17	
Controls						
E.M.	208	75	241.9	3.8	2.52	120/80
H.S.	254	54	233	3.5	9.61	142/82
W.O.	193	52	201	1.0	1.46	122/78
A.B.	142‡	44‡	171.9‡	—	6.19	120/82

TW

Sodium and Potassium

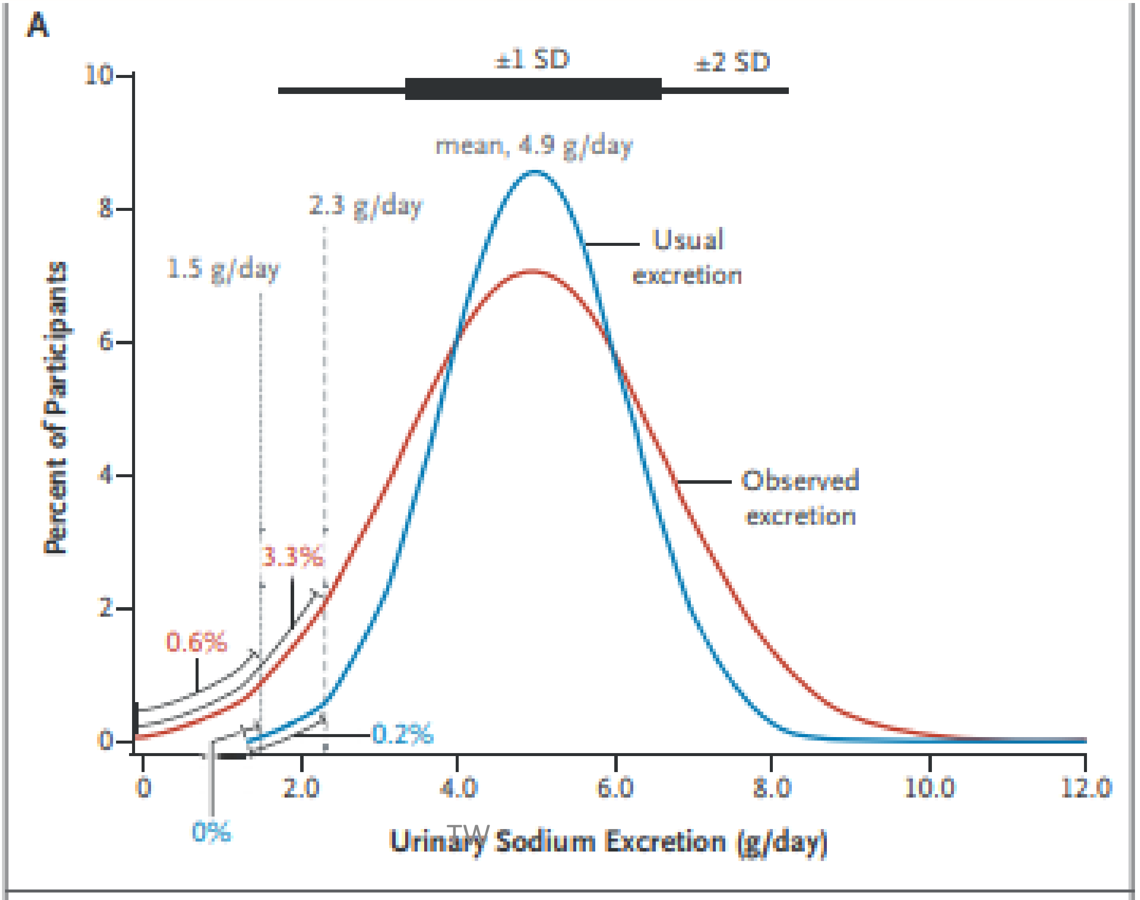


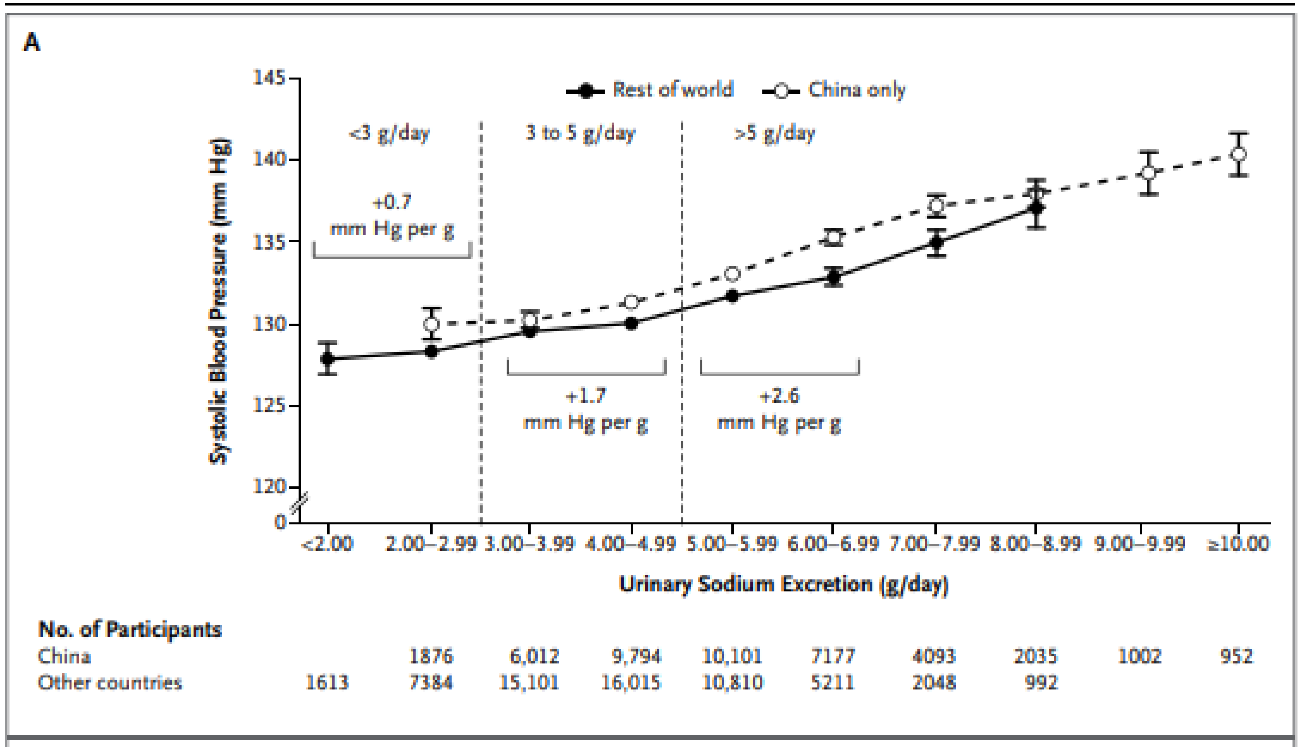
Sodium

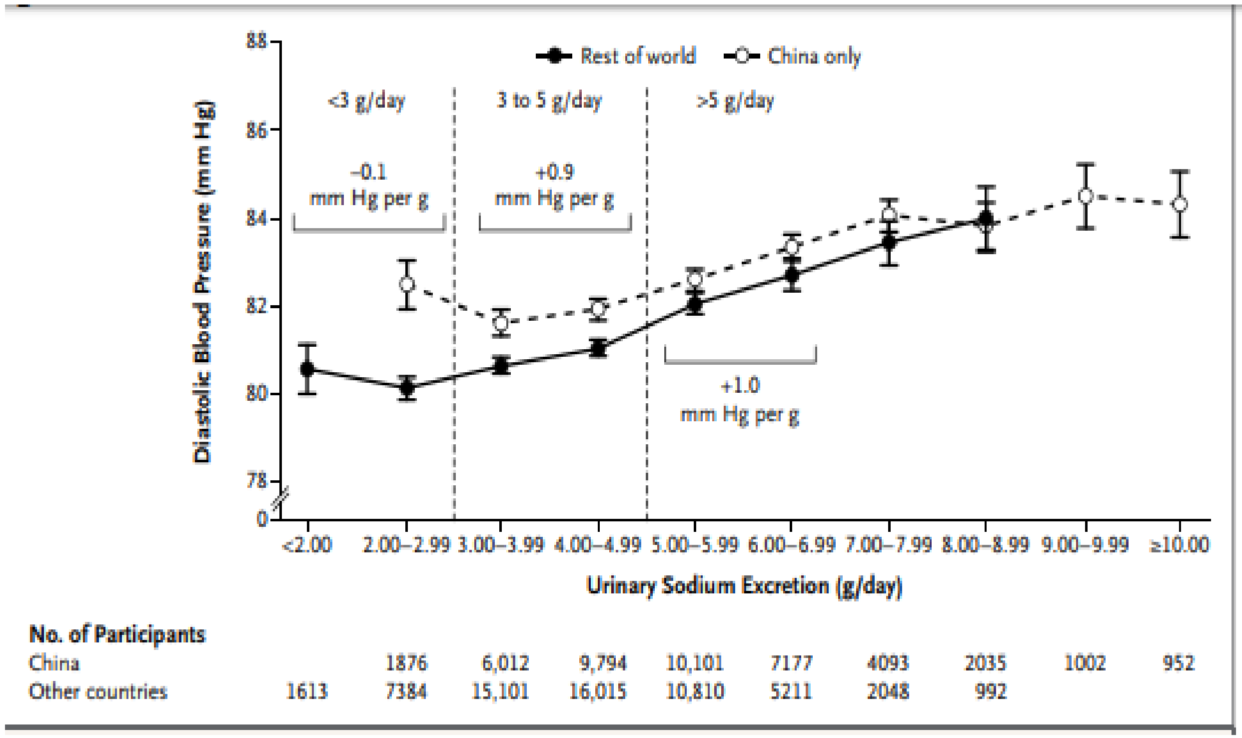
Globally, usual sodium intake is between 3.5 and 5.5 g/day (which corresponds to 9–12 g of salt per day

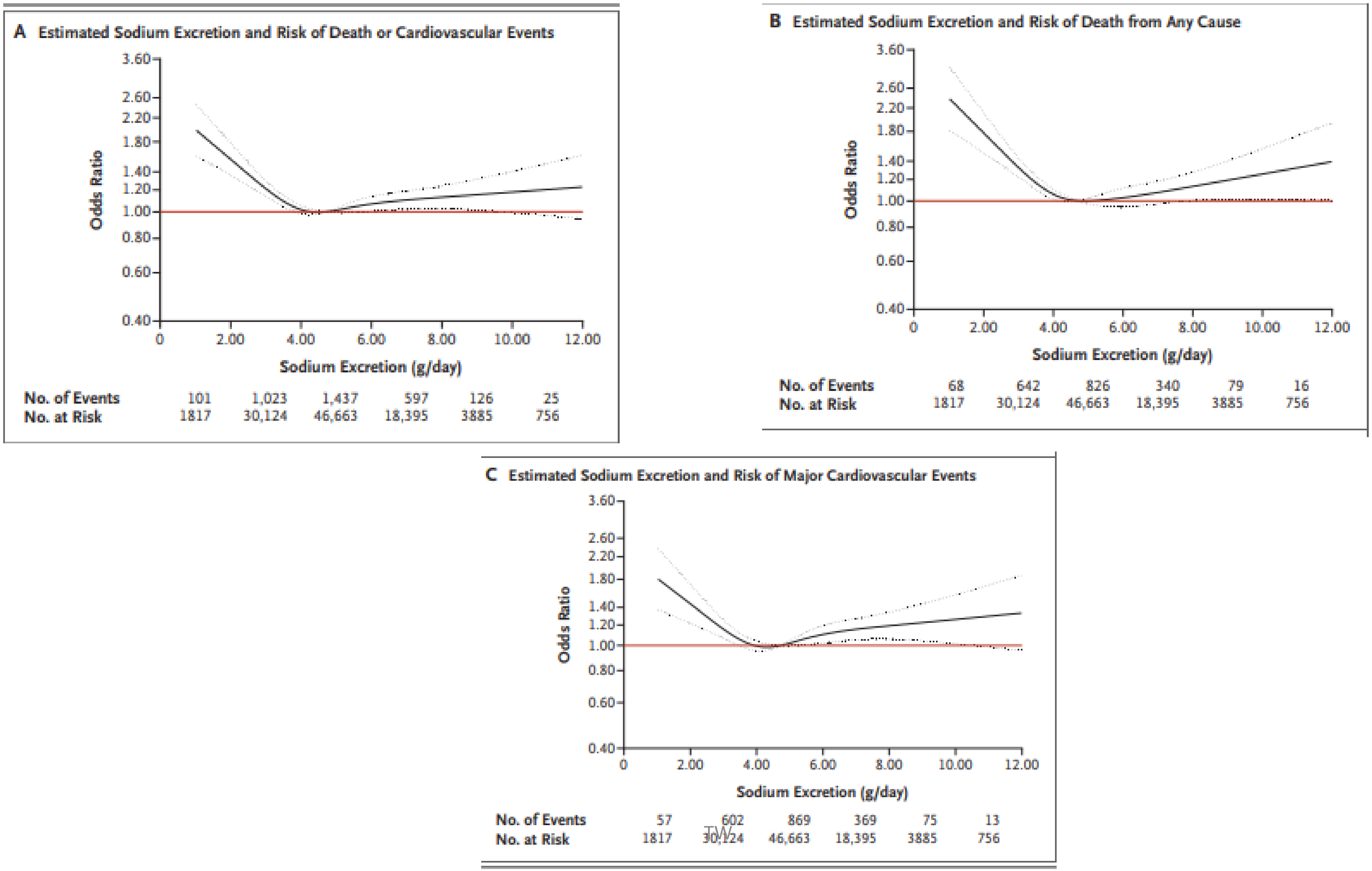
Table 1. Characteristics of the Participants in the Sodium Study and the Overall PURE Study Cohort.*

Characteristic	Sodium Study (N=102,216)	Overall Study (N=157,543)
Sodium excretion — g/day†	4.93±1.73	

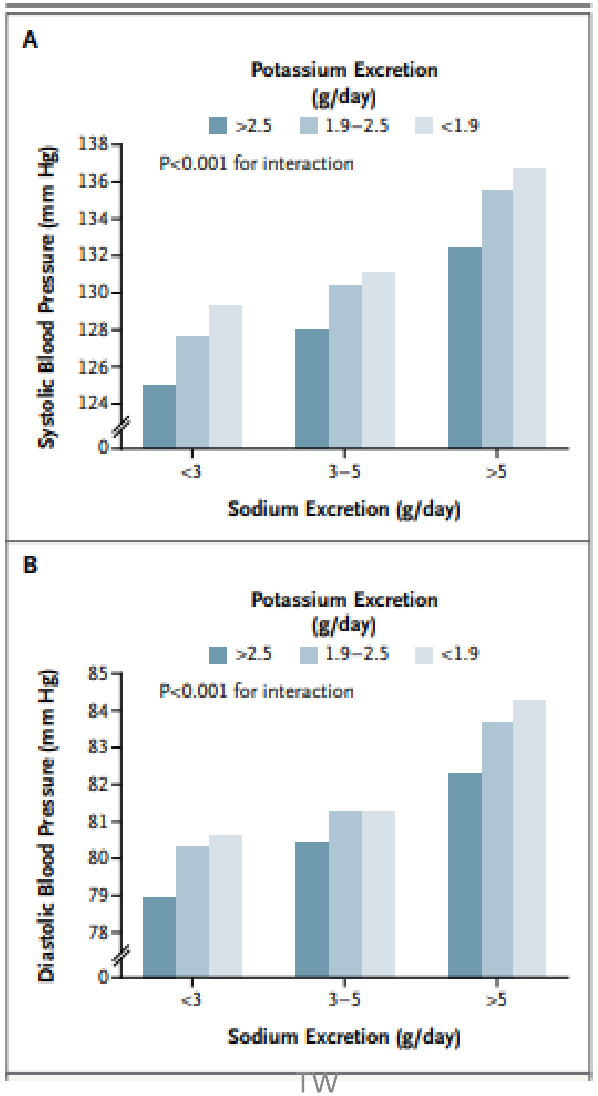



A
Systolic Blood Pressure (mm Hg)
145
140
135
130
125
120
0
Rest of world
China only
<3 g/day
3 to 5 g/day
>5 g/day
+0.7 mm Hg per g
+1.7 mm Hg per g
+2.6 mm Hg per g
<2.00
2.00–2.99
3.00–3.99
4.00–4.99
5.00–5.99
6.00–6.99
7.00–7.99
8.00–8.99
9.00–9.99
≥10.00
Urinary Sodium Excretion (g/day)
No. of Participants
China 1876 6,012 9,794 10,101 7177 4093 2035 1002 952
Other countries 1613 7384 15,101 16,015 10,810 5211 2048 992

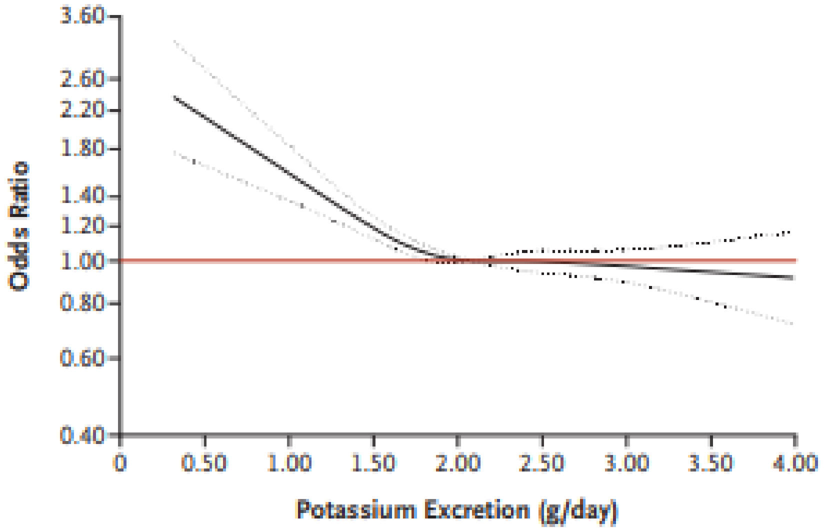

Diastolic Blood Pressure (mm Hg)
88
86
84
82
80
78
0
Rest of world
China only
<3 g/day
3 to 5 g/day
>5 g/day
−0.1 mm Hg per g
+0.9 mm Hg per g
+1.0 mm Hg per g
<2.00
2.00–2.99
3.00–3.99
4.00–4.99
5.00–5.99
6.00–6.99
7.00–7.99
8.00–8.99
9.00–9.99
≥10.00
Urinary Sodium Excretion (g/day)
No. of Participants
China 1876 6,012 9,794 10,101 7177 4093 2035 1002 952
Other countries 1613 7384 15,101 16,015 10,810 5211 2048 992


A Estimated Sodium Excretion and Risk of Death or Cardiovascular Events
Odds Ratio
3.60
2.60
2.20
1.80
1.40
1.20
1.00
0.80
0.60
0.40
0
2.00
4.00
6.00
8.00
10.00
12.00
Sodium Excretion (g/day)
No. of Events 101 1,023 1,437 597 126 25
No. at Risk 1817 30,124 46,663 18,395 3885 756
B Estimated Sodium Excretion and Risk of Death from Any Cause
Odds Ratio
3.60
2.60
2.20
1.80
1.40
1.20
1.00
0.80
0.60
0.40
0
2.00
4.00
6.00
8.00
10.00
12.00
Sodium Excretion (g/day)
No. of Events 68 642 826 340 79 16
No. at Risk 1817 30,124 46,663 18,395 3885 756
C Estimated Sodium Excretion and Risk of Major Cardiovascular Events
Odds Ratio
3.60
2.60
2.20
1.80
1.40
1.20
1.00
0.80
0.60
0.40
0
2.00
4.00
6.00
8.00
10.00
12.00
Sodium Excretion (g/day)
No. of Events 57 602 869 369 75 13
No. at Risk 1817 30,124 46,663 18,395 3885 756

Potassium

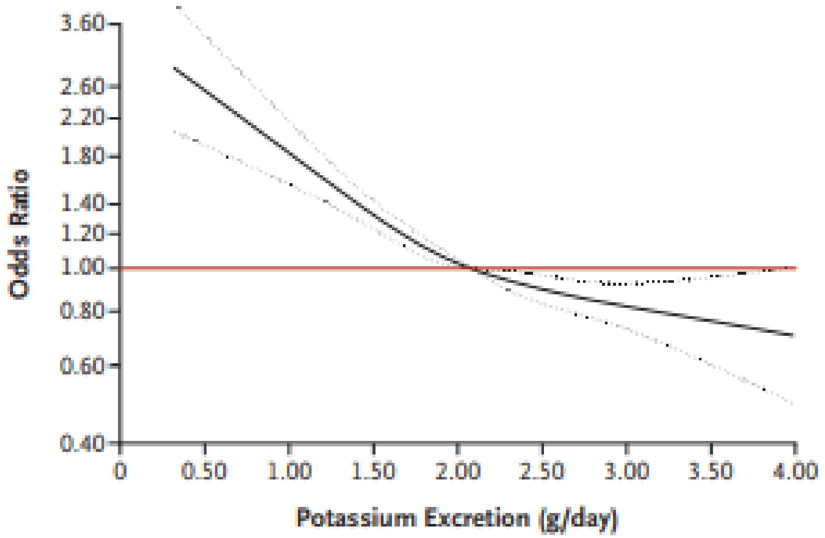

A
Potassium Excretion (g/day)
>2.5
1.9–2.5
<1.9
P<0.001 for interaction
Systolic Blood Pressure (mm Hg)
138
136
134
132
130
128
126
124
0
<3
3–5
>5
Sodium Excretion (g/day)
B
Potassium Excretion (g/day)
>2.5
1.9–2.5
<1.9
P<0.001 for interaction
Diastolic Blood Pressure (mm Hg)
85
84
83
82
81
80
79
78
0
<3
3–5
>5
Sodium Excretion (g/day)

A Estimated Potassium Excretion and Risk of Death or Cardiovascular Events



No. of Events	0	92	481	1,050	942	522	173	41
No. at Risk	6	1730	12,526	31,466	30,956	17,171	6128	1507

B Estimated Potassium Excretion and Risk of Death from Any Cause

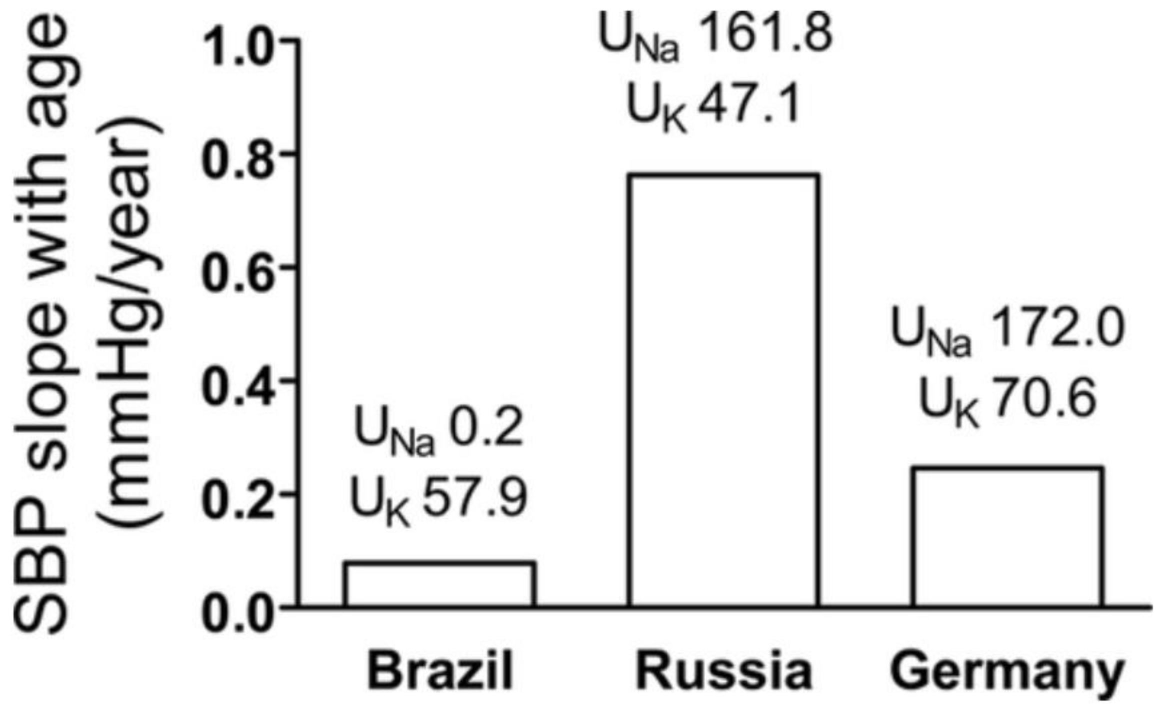


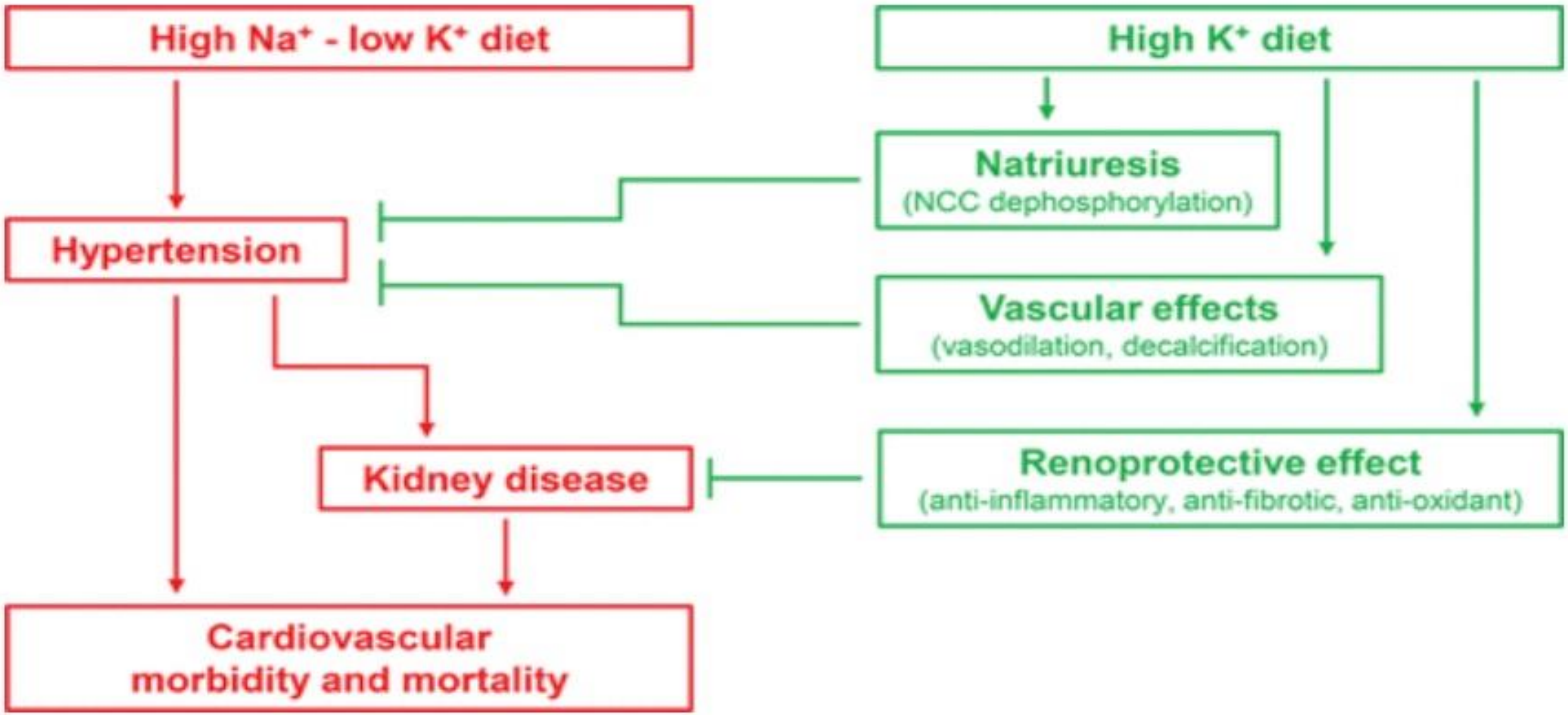
No. of Events	0	75	362	641	537	261	71	24
No. at Risk	6	1730	12,526	31,466	30,956	17,171	6128	1507

- In Paleolithic times, the estimated daily intake of Na^+ and K^+ was ≈33 mmol (768 mg) and 269 mmol (10 500 mg) per day. In contrast, our current diet contains ≈238 mmol Na^+ (5.5 g) and 70 mmol K^+ (2.8 g) per day

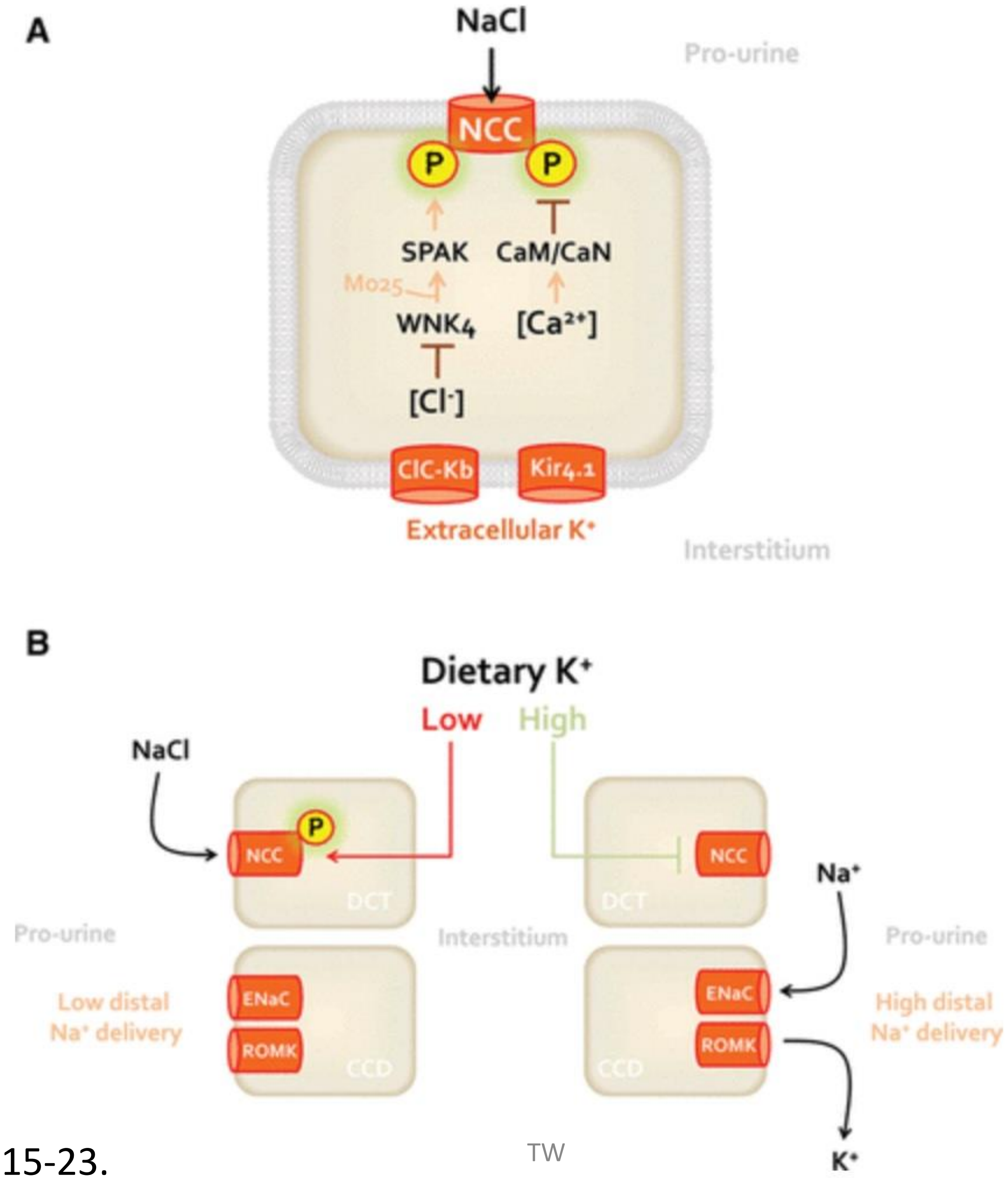
Hypertension. 2019 Jan;73(1):15-23.

Mild increase in BP with aging





Hypertension. 2019 Jan;73(1):15-23.

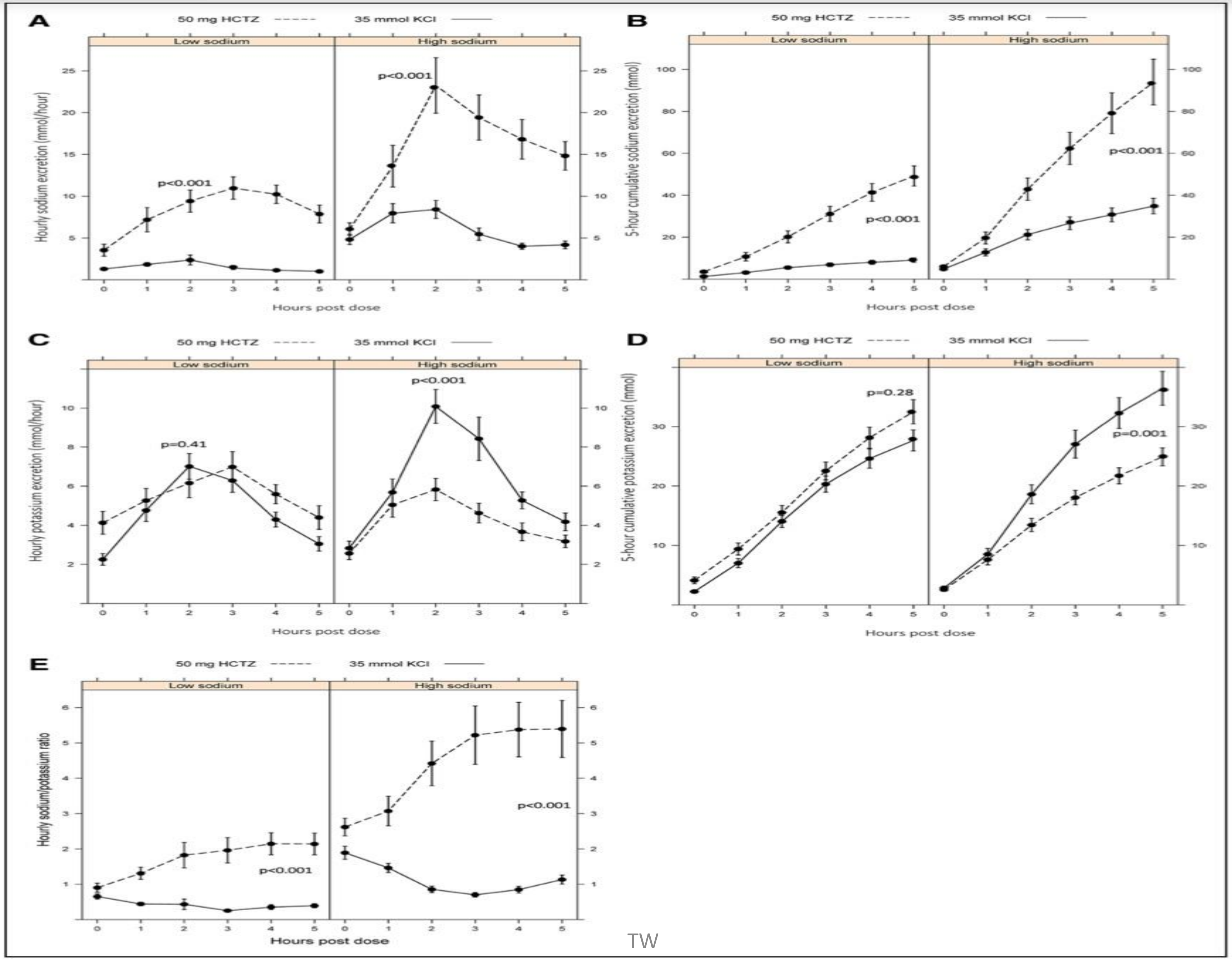


Hypertension. 2019 Jan;73(1):15-23.

TW

Characterization of Potassium-Induced Natriuresis in Hypertensive Postmenopausal Women During Both Low and High Sodium Intake

***Hypertension*. 2022;79**



omparison of 35 mmol KCl vs 50 mg hydrochlorothiazide.

- clinical benefit of potassium-induced natriuresis could be greater in hypertensives consuming a high sodium diet.
- consistent with the results of the DASH diet that the impact of chronically raising potassium intake via increasing fruits and vegetables is substantially greater in patients with higher baseline sodium intake.

Salt recomndation consumption

2018 ESC/ESH Guidelines for the management of arterial hypertension: The Task Force for the management of arterial hypertension of the European Society of Cardiology and the European Society of Hypertension

- Recommend sodium intake to be limited to approximately 2.0 g/day (equivalent to approximately 5.0 g salt per day) in the general population and to try to achieve this goal in all hypertensive patients
- A reduction in population salt intake remains a public health priority but requires a combined effort between the food industry, governments, and the public in general, as 80% of salt consumption involves hidden salt in processed foods

2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults

A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines

- Sodium reduction interventions may prevent CVD
- Lifestyle change (behavioral) interventions usually reduce sodium intake by about 25% (approximately 1,000 mg per day)

יתר לחץ דם בישראל
אבחנה, טיפול ואיזון

כולל ההנחיות העדכניות לאבחון וטיפול ביתר לחץ דם במבוגרים ובילדים - 2019

הגבלת צריכת נתרן

יש להפחית את צריכת הנתרן ב-1 גרם ליום לכל הפחות (1). בנבדק עם יל"ד יש להגיע לצריכה של עד 2,000 מ"ג או 88 מילימול נתרן (כ-5,000 מ"ג נתרן כלור ליום) (2). בעיקר במטופלים שהינם רגישים למלח (salt sensitive) הכוללים: מבוגרים, סוכרתיים, מטופלים עם תסמונת מטבולית, משקל יתר ומחלת כליה כרונית (3).

בהינתן היענות טובה, יש לשאוף בנבדק עם יל"ד לצריכת מלח של 1500 מ"ג או 65 מילימול נתרן (כ-4,000 מ"ג נתרן כלור ליום).

עליה בצריכת אשלגן

במטופלים עם תפקוד כליה תקין מומלץ לצרוך מזון עשיר באשלגן. הצריכה המומלצת הינה 3.5-4.7 גרם אשלגן ליום (8, 9). כאשר מקור האשלגן הוא במזון ולא בכדורי אשלגן כלוריד.

3.1. Nutrition and Diet

Recommendations for Nutrition and Diet
Referenced studies that support recommendations are summarized in Online Data Supplements 4 and 5.

COR	LOE	Recommendations
I	B-R	1. A diet emphasizing intake of vegetables, fruits, legumes, nuts, whole grains, and fish is recommended to decrease ASCVD risk factors.[S3.1-1–S3.1-11]
IIa	B-NR	2. Replacement of saturated fat with dietary monounsaturated and polyunsaturated fats can be beneficial to reduce ASCVD risk.[S3.1-12,S3.1-13]
IIa	B-NR	3. A diet containing reduced amounts of cholesterol and sodium can be beneficial to decrease ASCVD risk.[S3.1-9,S3.1-14–S3.1-16]
IIa	B-NR	4. As a part of a healthy diet, it is reasonable to minimize the intake of processed meats, refined carbohydrates, and sweetened beverages to reduce ASCVD risk.[S3.1-17–S3.1-24]
III: Harm	B-NR	5. As a part of a healthy diet, the intake of *trans* fats should be avoided to reduce ASCVD risk.[S3.1-12,S3.1-17,S3.1-25–S3.1-27]

TW

Circulation. 2019;140:e596–e646

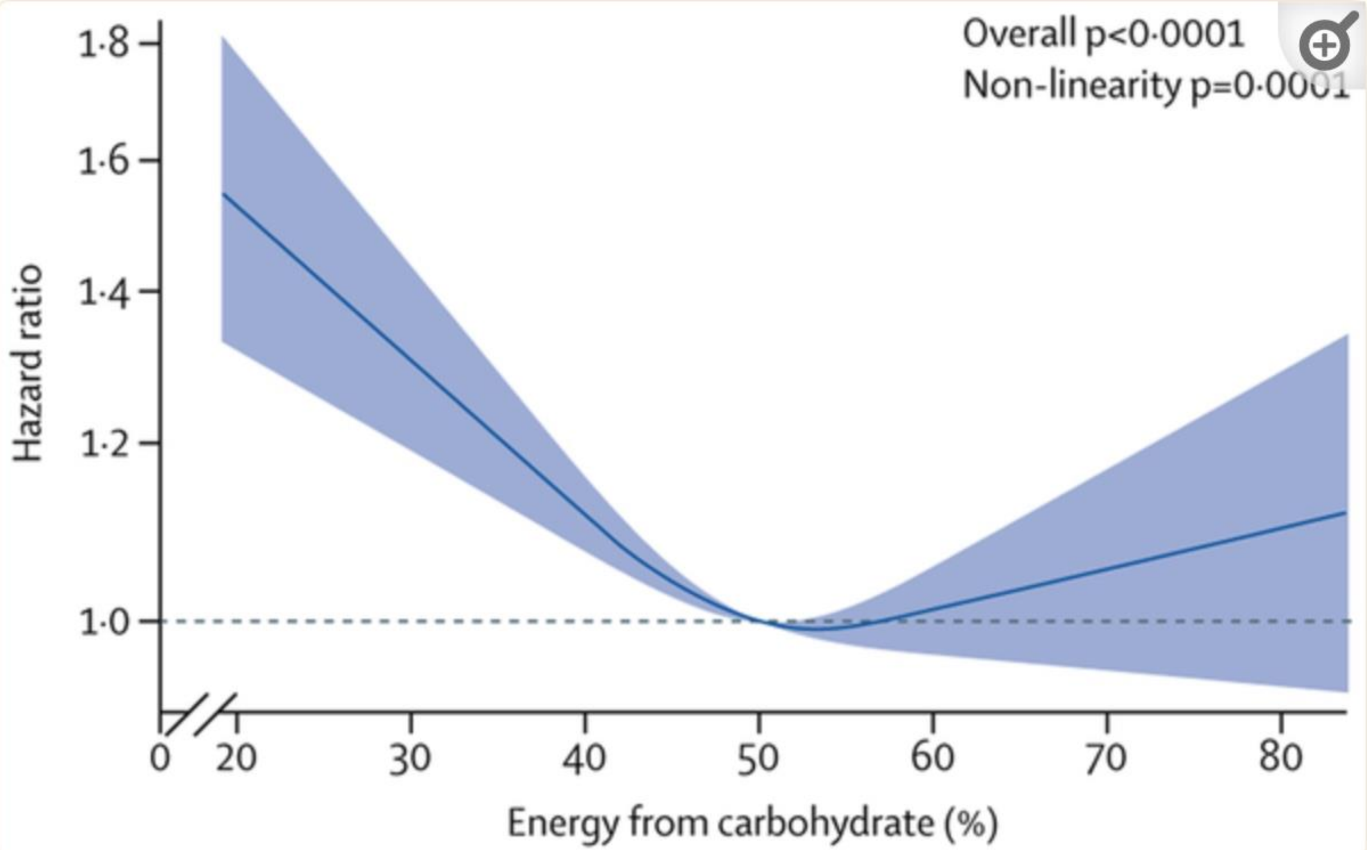
harmful or increase risk of ASCVD.

- Sugar-sweetened and artificially sweetened beverages
- fried food
- added fats
- organ processed meats

Low-carbohydrate–high-protein diet and long-term survival in a general population cohort

- higher mortality were high values of the additive low carbohydrate–high protein score (per 5 units, mortality ratio 1.22 with 95% CI 1.09 – to 1.36).
- Positive associations of this score were noted with respect to both cardiovascular and cancer mortality.

Dietary carbohydrate intake and mortality: a prospective cohort study and meta-analysis



[Lancet Public Health. 2018 Sep; 3(9): e419–e428.]

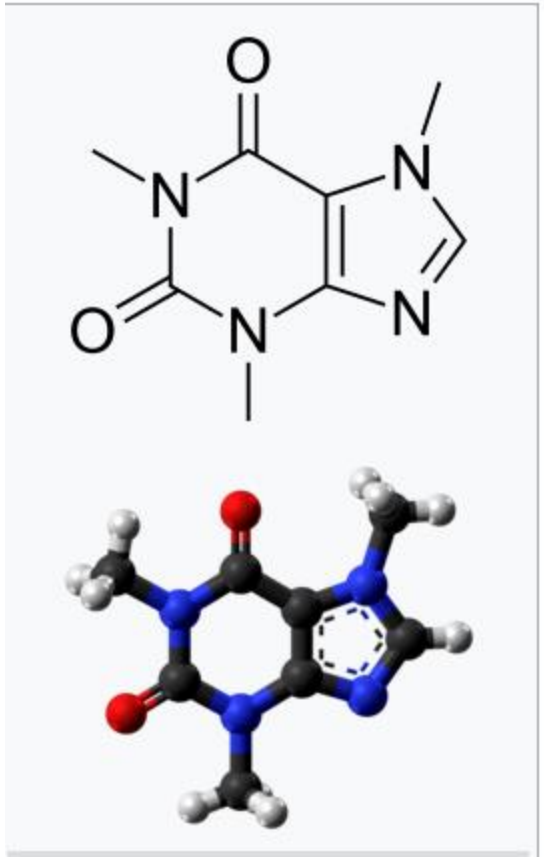
TW

Source of macronutrients

- mortality increased when carbohydrates were exchanged for animal-derived fat or protein (1·18, 1·08–1·29)
- mortality decreased when the substitutions were plant-based (0·82, 0·78–0·87).

Caffeine

Caffeine is a central nervous system stimulant of the methylxanthine class



Caffeine

- Hydroxyl hydroquinone (HHQ)- apoptotic and anti-cancer properties of HHQ via PPARγ
- Chlorogenic acid (CGA)- major component of coffee

Beverage	Caffeine (g)	Volume (mL)
Cup of hot chocolate	10 mg	250 mL
Arizona green iced tea	15 mg	470 mL
Arizona black iced tea	32 mg	470 mL
Can of Coca Cola	32 mg	375 mL
Cup of Lipton green tea	35 mg	150 mL
Cup of Lipton black tea	55 mg	150 mL
Starbucks Café Latte – short	75 mg	236 mL
Red Bull Energy drink	80 mg	250 mL
Iced coffee	99 mg	500 mL
Espresso shot	106 mg	25 mL
Starbucks Café Latte – grande	150 mg	473 mL
Monster Energy drink	160 mg	473 mL
Wired X344 Energy drink	344 mg	473 mL
Fixx Energy drink	500 mg	591 mL

TW

Trends Cardiovasc Med. 2018 Oct 4

The effect of coffee on blood pressure and cardiovascular disease in hypertensive individuals: a systematic review and meta-analysis

TABLE 2

Meta-analysis of the acute effects of caffeine on blood pressure in hypertensive individuals, stratified by caffeine intake, caffeine abstinence before the start of the trial, and use of antihypertensive medication

	Systolic blood pressure			Diastolic blood pressure		
	Net change[1]	95% CI	*P* value[2]	Net change[1]	95% CI	*P* value[2]
	mm Hg	*mm Hg*		*mm Hg*	*mm Hg*	
Amount of caffeine						
200 mg (26)	9.33	(2.69, 15.98)		4.50	(1.06, 7.94)	
250 mg (21, 27)	9.56	(4.30, 14.83)	0.958	3.11	(0.35, 5.87)	0.537
>250–300 mg (18, 19)	7.40	(4.32, 10.48)	0.605	8.82	(6.21, 11.43)	0.050
Caffeine abstinence before the trial						
9 h (26)	9.33	(2.69, 15.98)		4.50	(1.06, 7.94)	
12 h (18, 19, 21, 27)	7.68	(4.96, 10.41)	0.653	6.19	(3.87, 8.51)	0.353
48 h (21)	12.99	(1.18, 24.80)	0.597	3.53	(−2.00, 9.06)	0.770
Use of antihypertensive medication						
No (18, 19, 21)	7.49	(4.60, 10.37)		6.21	(3.77, 8.65)	
Yes (26, 27)	9.93	(5.16, 14.69)	0.391	4.51	(1.82, 7.16)	0.240

The American Journal of Clinical Nutrition,
Volume 94, Issue 4, 1 October 2011, Pages 1113–1126

TW

Reference	Country, duration of follow-up	Population data	BP criteria for inclusion as hypertensive	Exposure/categories[2]	Outcome (*n*)	Confounding factors	Multivariate-adjusted results	Conclusions
Martin (36), 1988	United States, 4 y	M/F, 30–69 y (*n* = 10,064)	DBP ≥90 mm Hg (*n* = 10,064)	Caffeinated beverage consumption: 0, >0–2, >2–4, or >4 cups/d	Total mortality (*n* = 589), cerebrovascular mortality (*n* = 64), other CVD mortality (*n* = 272)	Age, sex, race, body weight, initial DBP, fasting plasma glucose, total cholesterol, and marital status	RR of total mortality for categories of consumption: 1.0, 0.82 (0.65, 1.03), 0.82 (0.62, 1.82), and 0.90 (0.63, 1.28); RR of cerebrovascular mortality for categories of consumption: 1.0, 0.73 (0.37, 1.46), 0.61 (0.26, 1.44), and 1.30 (0.56, 3.04); RR of other CVD mortality for categories of consumption: 1.0, 0.93 (0.66, 1.30), 0.81 (0.53, 1.23), and 0.80 (0.46, 1.39)	Caffeinated beverage consumption not associated with increased cerebrovascular or other CVD mortality
Hakim (37), 1998	United States, 25 y	M, 55–68 y (*n* = 8006)	BP ≥140/90 mm Hg (*n* = 499)	Coffee consumption: 0, 4–8, 12–16, and ≥20 oz/d	Thromboembolic stroke (*n* = 76)	Age, SBP, total cholesterol, triglycerides, diabetes, physical activity, and alcohol consumption	RR for consumption of ≥20 oz/d: 2.1 (1.2, 3.7), *P*-trend = 0.006 (information for other categories not available)	Coffee consumption associated with increased risk of thromboembolic stroke
Greenberg (38), 2007	United States, 8.8 y	M/F, 32–86 y (*n* = 6594)	Stage 1: BP 140–159/90–99 mm Hg (*n* = 512); stage 2: BP ≥160/100 mm Hg (*n* = 290)	Caffeinated beverage consumption: <1.5 and ≥1.5 cups/d	Heart disease mortality (*n* = 147)	Age, sex, smoking, BMI, race, physical activity, alcohol consumption, income, educational level, and American-style diet	RR for consumption of ≥1.5 cups/d in stage 1 hypertensive subjects: 0.62 (0.39, 0.99); RR for consumption of ≥1.5 cups/d in stage 2 hypertensive subjects: 0.81 (0.47, 1.41)	Caffeinated beverage consumption not associated with increased heart disease mortality

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Larsson (40), 2008	Finland, 13.6 y	M, 50–69 y (*n* = 26,556)	BP ≥140/90 mm Hg (number of hypertensive individuals not reported)	Coffee consumption: <2, 2–3, 4–5, 6–7, and ≥8 cups/d	Cerebral infarction (*n* = 1729 cases in those with SBP ≥ 140 mm Hg and 1455 in those with DBP ≥ 90 mm Hg)	Age, number of cigarettes smoked daily, BMI, leisure-time physical activity, alcohol intake, SBP and DBP at baseline, serum total cholesterol, serum HDL cholesterol, histories of diabetes and CHD, and tea consumption	RR for categories of consumption in those with SBP ≥ 140 mm Hg: 1.0, 0.92 (0.77, 1.10), 0.90 (0.76, 1.07), 0.79 (0.65, 0.95), and 0.76 (0.63, 0.93), *P*-trend = 0.001; RR categories of consumption in those with DBP ≥ 90 mm Hg: 1.0, 0.88 (0.72, 1.06), 0.88 (0.73, 1.06), 0.75 (0.61, 0.92), and 0.70 (0.57, 0.87), *P*-trend < 0.001	Coffee consumption was associated with lower risk of cerebral infarction
Greenberg (39), 2008	United States, 10.1 y	M/F, ≥65 y (*n* = 1354)	BP ≥160/100 mm Hg (*n* = 302)	Coffee consumption: 0 and ≥1 cups/d	CHD mortality (*n* = 39), heart valve disease (*n* = 20)	Age, sex, smoking, BMI, physical activity, alcohol consumption, marital status, BP, history of CVD, and antihypertensive medication use	RR of CHD mortality for consumption of ≥1 cup/d: 0.87 (0.44, 1.72), *P*-trend = 0.48; RR of heart valve disease for consumption of ≥1 cup/d: 1.72 (0.41, 7.25), *P*-trend = 0.04	Coffee consumption was not associated with increased risk of CHD mortality or heart valve disease
Lopez-Garcia (13), 2009	United States, 24 y	F, mean age: 56 y (*n* = 83,076)	BP ≥140/90 mm Hg (*n* = 12,960)	Coffee consumption: <1 cup/mo, 1 cup/mo to 4 cups/wk, 5–7 cups/wk, 2–3 cups/d, and ≥4 cups/d	Stroke (*n* = 900)	Age, smoking, BMI, physical activity, alcohol consumption, menopausal status, use of hormone replacement therapy, aspirin use, glycemic load, and intakes of total energy, calcium, potassium, sodium, folate, whole grain, fruit, vegetables, and fish	RRs for categories of coffee consumption: 1.0, 0.97 (0.76, 1.24), 0.90 (0.72, 1.11), 0.98 (0.77, 1.24), and 1.10 (0.76, 1.58), *P*-trend = 0.53	Coffee consumption not associated with increased risk of stroke

TW

Larsson (41), 2011	Sweden, 10.4 y	F, 49–83 y (*n* = 34,670)	Self-reported history of hypertension (number of hypertensive individuals not reported)	Coffee consumption:<1, 1–2, 3–4, and ≥5 cups/d	Cerebral infarction (*n* = 482)	Age, smoking status, pack-years of smoking, education, BMI, total physical activity, history of diabetes, aspirin use, family history of myocardial infarction, and intakes of total energy, alcohol, red meat, fish, fruit, and vegetables	RR for categories of consumption: 1.0, 0.82 (0.61, 1.11), 0.95 (0.70, 1.29), and 0.73 (0.49, 1.09), *P*-trend = 0.29	Coffee consumption not associated with increased risk of cerebral infarction

The American Journal of Clinical Nutrition,
Volume 94, Issue 4, 1 October 2011, Pages 1113–1126

TW

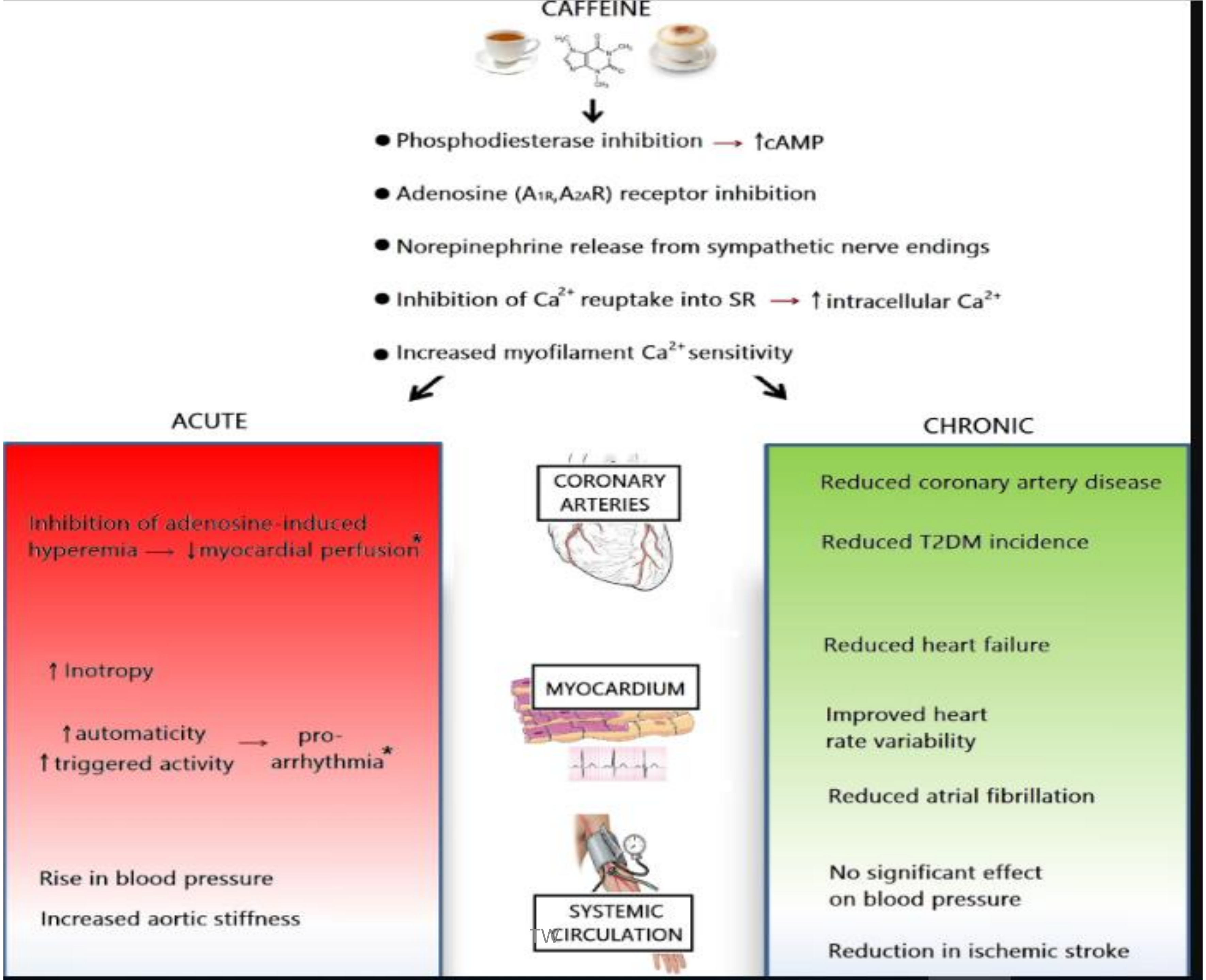
HRs (95% CIs) of incident hypertension according to quintile of caffeine intake: Women's Health Initiative Observational Study

(*n* = 29,985)

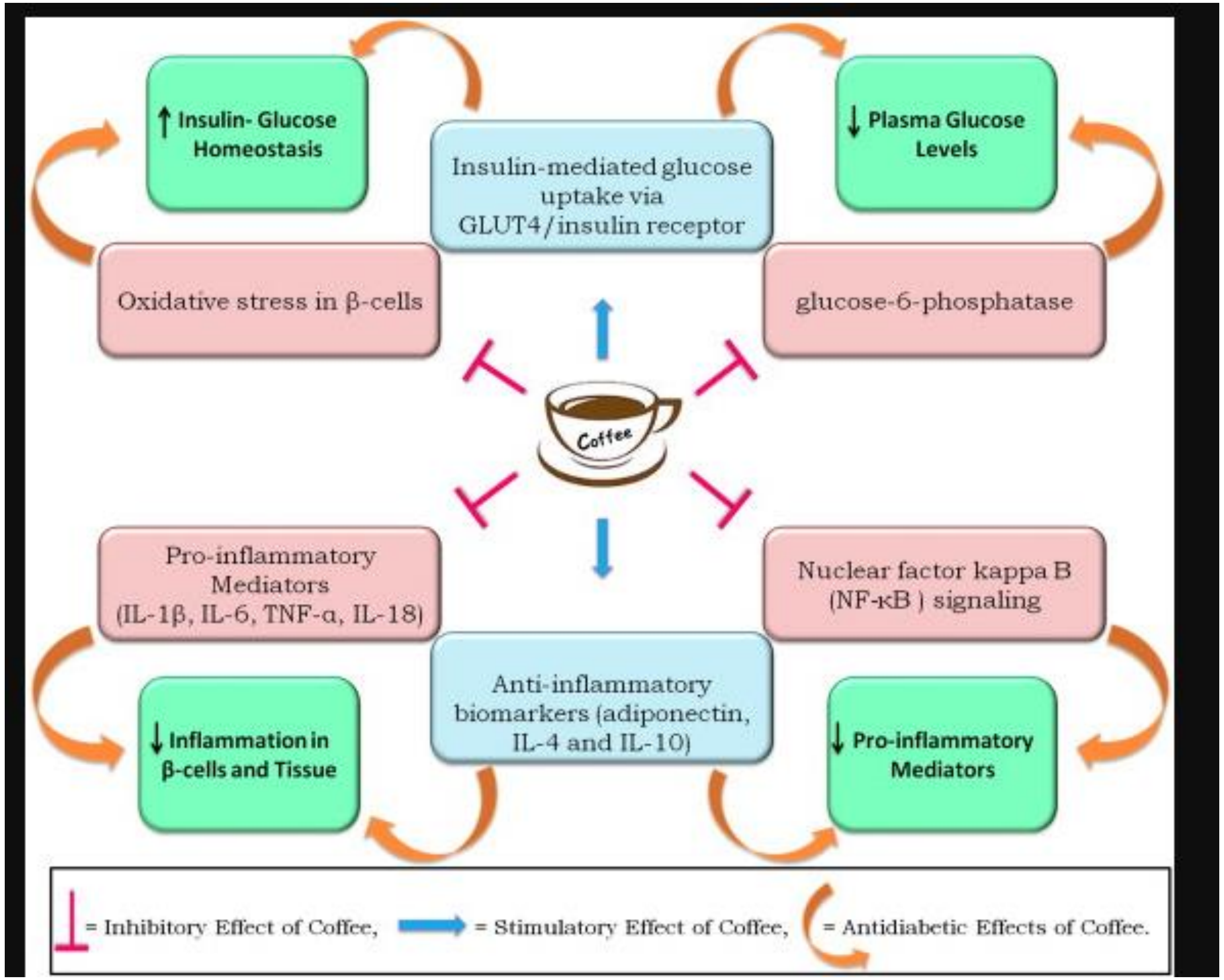
	Quintile of caffeine intake					
	1	**2**	**3**	**4**	**5**	***P*-trend**
Caffeine intake, mg	0–83	83–177	177–179	179–315	315–794	
No. of cases	1230	1131	982	1137	1086	
Person-years	22,393	22,571	22,783	22,437	22,751	
Model 1 [2]						
HR	1.00	0.94	0.82	0.98	0.92	0.11
95% CI		(0.87, 1.02)	(0.75, 0.89)	(0.90, 1.06)	(0.85, 1.00)	
Model 2 [3]						
HR	1.00	0.97	0.88	1.00	0.97	0.66
95% CI		(0.90, 1.05)	(0.81, 1.06)	(0.92, 1.09)	(0.89, 1.06)	

The American Journal of Clinical Nutrition,
Volume 103, Issue 1, 1 January 2016, Pages 210–217

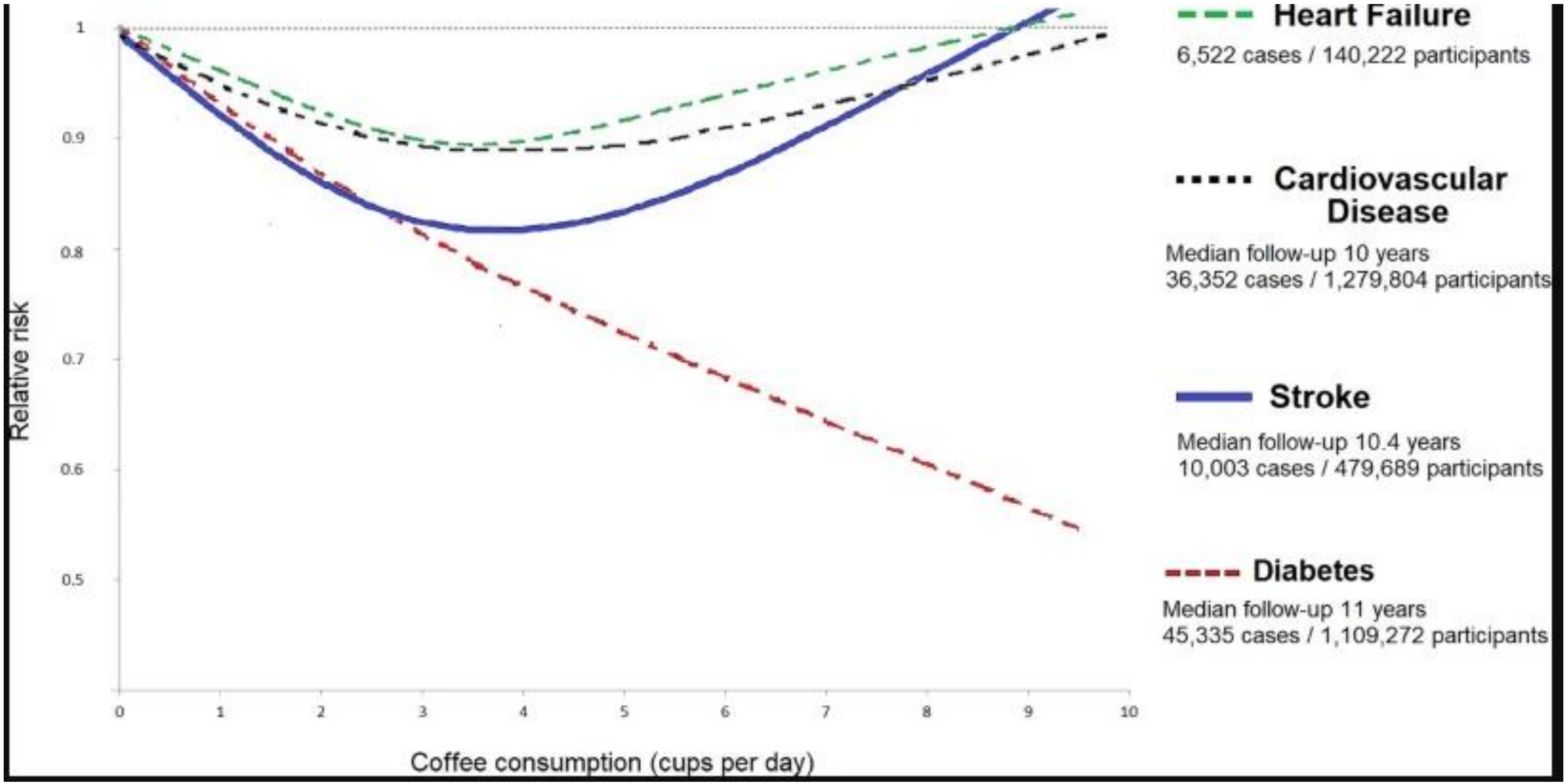
TW


CAFFEINE
Phosphodiesterase inhibition → ↑cAMP
Adenosine (A1R, A2AR) receptor inhibition
Norepinephrine release from sympathetic nerve endings
Inhibition of Ca2+ reuptake into SR → ↑intracellular Ca2+
Increased myofilament Ca2+ sensitivity
ACUTE
CHRONIC
Inhibition of adenosine-induced hyperemia → ↓myocardial perfusion*
↑ Inotropy
↑automaticity
↑triggered activity → pro-arrhythmia*
Rise in blood pressure
Increased aortic stiffness
CORONARY ARTERIES
MYOCARDIUM
SYSTEMIC CIRCULATION
Reduced coronary artery disease
Reduced T2DM incidence
Reduced heart failure
Improved heart rate variability
Reduced atrial fibrillation
No significant effect on blood pressure
Reduction in ischemic stroke

Effects of coffee on type 2 diabetes mellitus



Nutrition; Volume 30, Issues 7–8, July–August 2014, Pages 755-763



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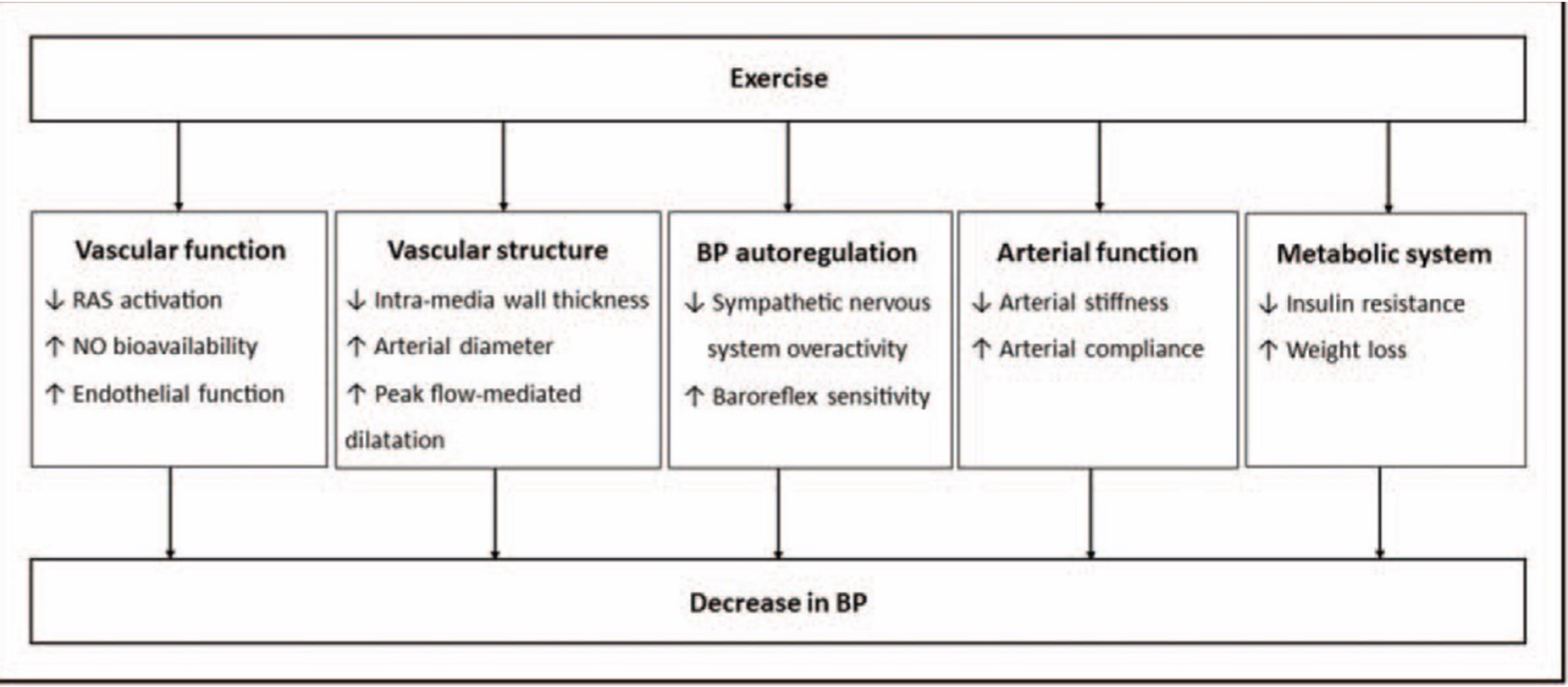
Trends Cardiovasc Med. 2018 Oct 4


Exercise
Vascular function
↓ RAS activation
↑ NO bioavailability
↑ Endothelial function
Vascular structure
↓ Intra-media wall thickness
↑ Arterial diameter
↑ Peak flow-mediated dilatation
BP autoregulation
↓ Sympathetic nervous system overactivity
↑ Baroreflex sensitivity
Arterial function
↓ Arterial stiffness
↑ Arterial compliance
Metabolic system
↓ Insulin resistance
↑ Weight loss
Decrease in BP

Aerobic Activity

- Large muscles move in a rhythmic manner for a sustained period. Aerobic activity causes the heart rate to increase and breathing to become more labored.
- **Intensity**
  - Moderate -brisk walking
  - Vigorous -running or jogging
- **Frequency**- how often
- **Duration**- how long

Muscle-Strengthening Activity

- Resistance training and weight lifting, cause the body’s muscles to work or hold against an applied force or weight
- Work all the major muscle groups of the body—the legs, hips, back, abdomen, chest, shoulders, and arms- Lifting relatively heavy objects
- **Intensity**- how much weight or force is used
- **Frequency**
- **Sets and repetitions**

Bone-Strengthening Activity

- Bone-strengthening activities produce an impact or tension force on the bones that promotes bone growth and strength

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Balance Activities

- These kinds of activities can improve the ability to resist forces within or outside of the body that cause falls while a person is stationary or moving.
- Strengthening muscles of the back, abdomen, and legs also improves balance.

Multicomponent Physical Activity

Metabolic Equivalent of Task

- Oxygen used by a person in milliliter per minute per kilogram body mass divided by 3.5.
- MET values of activities range from 0.9 (sleeping) to 23 (running at 22.5 km/h or a 4:17 mile pace).

$$1\,\mathrm{MET} = 1\,\frac{\mathrm{kcal}}{\mathrm{kg}\times\mathrm{h}} = 4186.8\,\frac{\mathrm{J}}{\mathrm{kg}\times\mathrm{h}} = 1.163\,\frac{\mathrm{W}}{\mathrm{kg}}$$

'here

- kcal = kilocalorie,
- kg = kilogram,
- h = hour,
- J = joule,
- W = watt.

Regular physical activity and cardiovascular biomarkers in prevention of atherosclerosis in men: a 25-year prospective cohort study

BMC Cardiovasc Disord. 2016 Apr 5;16:65

Table 2 Changes in traditional cardiovascular risk factors among middle-aged men with stable physical activity level during a 25-year observation ($n=62$)

	Stable physical activity level during the 25-year observation					
	Low/moderate (<2050 kcal/week) *n*=26		High (2050-3840 kcal/week) *n*=21		Very high (>3840 kcal/week) *n*=15	
	Baseline	Follow-up	Baseline	Follow-up	Baseline	Follow-up
Age, years	37.5±7.5	61.3±9.0***	35.3±6.6	58.8±8.8***	35.8±8.1	58.8±8.1***
Current smokers, *n*	2	1	0	0	0	2
Body mass index, kg/m2	24.72±2.61	26.9±2.7	24.60±3.09	25.0±3.2	23.73±2.17	24.2±3.0
Systolic blood pressure, mmHg	119.8±8.9	132.2±14.7**	114.76±8.44	124.0±11.1**	118.93±12.59	125.4±14.9**
Diastolic blood pressure, mmHg	79.6±6.6	82.2±6.2	75.24±7.82	79.7±6.1	77.14±8.93	76.8±7.3
Total cholesterol, mmol/L	5.21±1.02	5.65±1.08*	4.83±0.45	5.48±0.85*	4.90±0.79	5.48±0.87*
LDL-C, mmol/L	3.30±1.04	3.61±1.06*	2.91±0.50	3.37±0.71	3.00±0.28	3.28±0.69[a]
Triglycerides, mmol/L	1.27±0.58	1.32±0.49	1.16±0.35	1.16±0.57	1.29±0.55	1.02±0.41[a]
HDL-C mmol/L	1.27±0.63	1.41±0.39	1.36±0.27	1.36±0.40	1.37±0.40	1.81±0.45*[a]
Glucose, mmol/L	4.07±1.07	5.25±1.08**	4.14±0.26	4.84±0.48*	4.11±0.61	4.73±0.33*[a]
Energy expenditure, kcal/week	1077.3±619.3	1029.3±225.3[b]	2919.3±651.3	2703.81±449.2[c]	7383.33±3761.44	4800.88±949.2**
PWC/kg, (W/kg)	2.14±0.5	1.58±0.4**	2.55±0.79	1.99±0.4*	3.18±0.4	2.59±0.5*

Table 4 Distribution of novel biochemical markers and indices of atherosclerosis among men with stable physical activity level patterns during 25 year-observation

	Stable physical activity level during the 25-year observation		
	Low-to-moderate (<2050 kcal/week)	High (2050-3840 kcal/week)	Very high (>3840 kcal/week)
	n=26	*n*=21	*n*=15
Age, years	61.3 ± 9.0	58.8 ± 8.8	58.8± 8.1
hsCRP, mg/L	2.93 ± 1.1	2.20 ± 1.0*	2.82 ± 1.3
Homocysteine, µmol/L	13.55 ± 9.0	14.75 ± 4.8	14.6 ± 5.5
Oxidized-LDL, ng/mL	119.76 ± 252.3	68.35 ± 67.7*	119.48 ± 113.4
(median)	(56.80)	(13.9)	(49.50)
ICAM-1, ng/mL	498.77 ± 139.2	460.00 ± 148.8	511.2 ± 102.1
VCAM-1, ng/mL	698.55 ± 328.3	743.05 ± 272.4	617.63 ± 260.3
Interleukine-6, pg/mL	2.58 ± 5.6	1.02 ± 0.9[a]	2.88 ± 2.8
Leptin, ng/mL	9.10 ± 8.1	4.71 ± 3.07*	7.79 ± 5.18
Resistin, ng/mL	4.57 ± 1.8	4.99 ± 2.48	4.50 ± 1.42
Adiponectin, µmol/L	8.13 ± 2.8	8.99 ± 2.6	7.73 ± 4.4
Irisin, µmol/L	0.54 ± 0.14	0.47 ± 0.13*	0.48 ± 0.22
Coronary artery calcium	286.1 ± 361.9	10.7 ± 28.9	106.1 ± 278.3
(median)	(121.3)	(1.7)***	(6.30)
0, *n*	1	10**	6
Intima-media thickeness, mm	0.751 ± 0.19	0.641 ± 0.26[b]	0.750 ± 0.60
>0.9, *n*	5	0	1
Reactive hyperemia index	1.69 ± 0.4	2.00 ± 0.4	2.13 ± 0.5
<1.67, *n*	12	0**	3

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BMC Cardiovasc Disord. 2016 Apr 5;16:65

TW

Correlation of Cardiac Markers and Biomarkers With Blood Pressure of Middle-Aged Marathon Runners.

Weight, kg	63.0 (5.2)
Body mass index, kg/m^2	22.0 (1.4)
Resting heart rate, beats per min	62.7 (9.1)
Maximal heart rate, beats per min	171.0 (10.1)
Resting systolic blood pressure, mm Hg	122.1 (10.9)
Resting diastolic blood pressure, mm Hg	79.4 (7.6)
Maximum systolic blood pressure, mm Hg	213.6 (26.4)
Maximum diastolic blood pressure, mm Hg	70.7 (11.9)
Peak oxygen uptake, mL/kg/min	50.3 (6.3)
Race time, min	222.1 (30.6)
Running history, y	6.6 (3.6)
Resting hypertension, %	0
Exercise-induced hypertension, No. (%)	13 (32.5)

J Clin Hypertens (Greenwich). 2015 Nov;17(11):868-73

TW

Correlation of Cardiac Markers and Biomarkers With Blood Pressure of Middle-Aged Marathon Runners.

Table 2. Changes in Cardiac Markers, Endothelin-1, and hs-CRP Over the Course of a Marathon

	Pre-Race	Post-Race	df	*P* Value
CK-MB, ng/mL	4.5 (1.3)	7.9 (2.7)	3.3 (2.0)	Increase (<.001)
cTnI, ng/mL	0.01 (0.003)	0.06 (0.10)	0.05 (0.1)	Increase (<.001)
NT-proBNP, pg/mL	27.6 (31.1)	95.7 (76.4)	68.8 (56)	Increase (<.001)
Endothelin-1, pg/mL	1.11 (0.5)	2.7 (1.16)	1.6 (0.83)	Increase (<.001)
hs-CRP, mg/dL	0.06 (0.07)	0.1 (0.09)	0.03 (0.03)	Increase (<.001)
CK, IU/L	149.2 (66.0)	315.7 (94.0)	166.5 (67.9)	Increase (<.001)
LDH, IU/L	399.8 (75.1)	552.8 (130.3)	153.0 (136.0)	Increase (<.001)

J Clin Hypertens (Greenwich). 2015 Nov;17(11):868-73

Long-Term Marathon Running Is Associated with Low Coronary Plaque Formation in Women

Characteristic	Controls ($n = 28$)	WM ($n = 26$)	P
Age (yr)[a]	61 ± 10	56 ± 10	NS
Lesion prevalence	14 (50)	5 (19)	0.014
Systolic BP (mm Hg)[a]	130 ± 21	120 ± 13	NS
Diastolic BP (mm Hg)	75 ± 11	78 ± 10	NS
Heart rate (bpm)	72.2 ± 12.1	57.1 ± 7.6	<0.001
Height (inches)	64.5 ± 2.6	65.3 ± 2.7	NS
Weight (kg)	86.4 ± 23.8	60.5 ± 9.5	<0.001
BMI ($kg \cdot m^{-2}$)[a]	32 ± 8	22 ± 3	<0.001
Total cholesterol ($mg \cdot dL^{-1}$)	198.9 ± 32.3	189.4 ± 31.9	NS
HDL ($mg \cdot dL^{-1}$)	54 ± 16	73 ± 15	<0.001
LDL ($mg \cdot dL^{-1}$)[a]	119 ± 36	103 ± 23	NS
Triglycerides ($mg \cdot dL^{-1}$)[a]	127.7 ± 60.3	70.5 ± 20.9	<0.001
Hypertension	16/25 (64)	3/26 (12)	<0.001
Hyperlipidemia	15/25 (60)	6/26 (23)	0.011
Diabetes	1/25 (4)	0/26 (0)	NS
Smoking Hx	15/27 (56)	5/25 (20)	0.011
Family Hx CAD	24/28 (86)	13/26 (50)	0.005

TW

Med Sci Sports Exerc. 2017 Apr;49(4):641-645

Long-Term Marathon Running Is Associated with Low Coronary Plaque Formation in Women

Characteristic	WM with CAC (n = 5)	WM without CAC (n = 21)	P
Age (yr)	65 [52–82]	53 [42–63]	0.10
Lesion prevalence	5	0	0.025
Systolic BP (mm Hg)	123 [106–132]	119 [88–146]	–
Diastolic BP (mm Hg)	80 [71–86]	77 [58–103]	–
BMI ($kg \cdot m^{-2}$)	25 ± 5	21 ± 4	NS
HDL ($mg \cdot dL^{-1}$)	83 ± 18	70 ± 17	NS
LDL ($mg \cdot dL^{-1}$)	122 ± 23	98 ± 19	0.10
Hypertension	1/5 (20)	2/21 (10)	NS
Hyperlipidemia	3/5 (60)	3/21 (14)	NS
Diabetes	0/5 (0)	0/21 (0)	–
Smoking Hx	1/5 (20)	4/21 (19)	NS
Family Hx CAD	2/5 (40)	11/21 (52)	NS
Mean sum five risk factors	2.6 [1–4]	1.2 [0–3]	0.085
Postmenopausal	4 (80)	11 (52)	–
Total marathons run	272 [28–99]	945 [10–157]	NS
Age started running	36 ± 13	25 ± 9	NS
Age at first marathon	38 ± 13	33 ± 7	NS
Years running marathon	27 ± 3	20 ± 7	<0.001
Marathons run	54 ± 14	45 ± 36	NS
Marathons run per year	3 ± 1.4	2 ± 1.8	NS
Peak training ($miles \cdot wk^{-1}$)	56 ± 24	59 ± 36	NS

Values are presented as mean ± SD, n (%), or [range].
P values from Student t-test.
WM, women marathoners; CAC, coronary artery calcium; BMI, body mass index; Hx, history.

Med Sci Sports Exerc. 2017 Apr;49(4):641-645

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Med Sci Sports Exerc. 2017 Apr;49(4):641-645

Prevalence of Subclinical Coronary Artery Disease in Masters Endurance Athletes With a Low Atherosclerotic Risk Profile

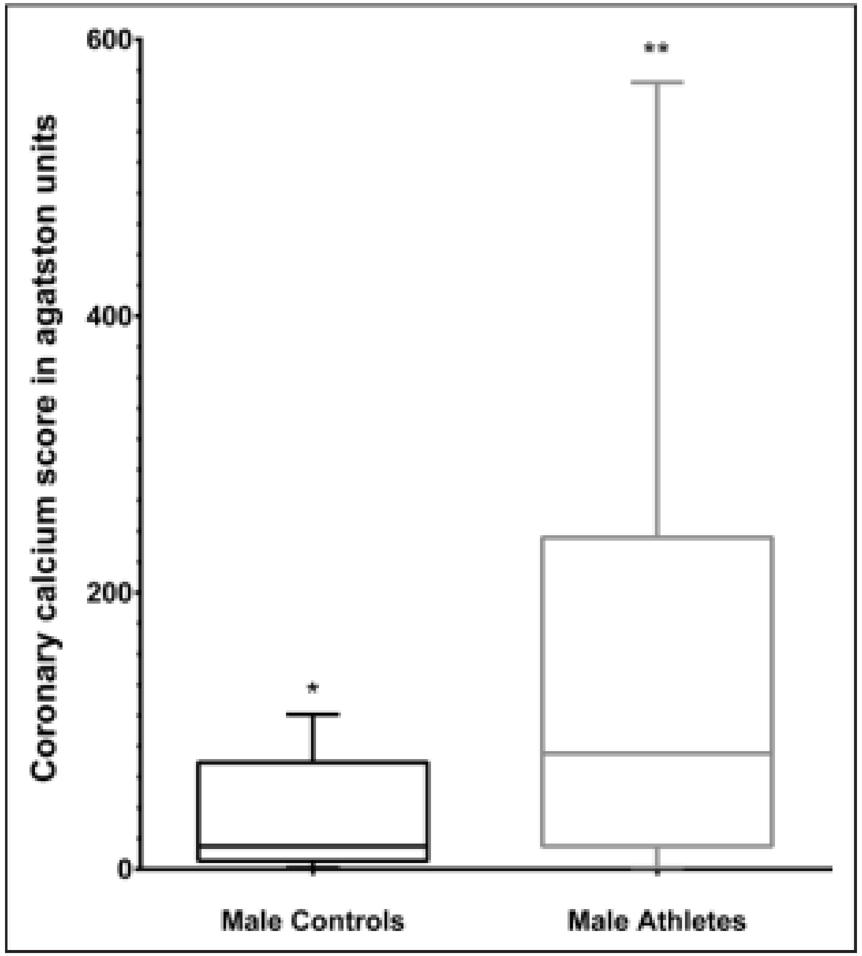
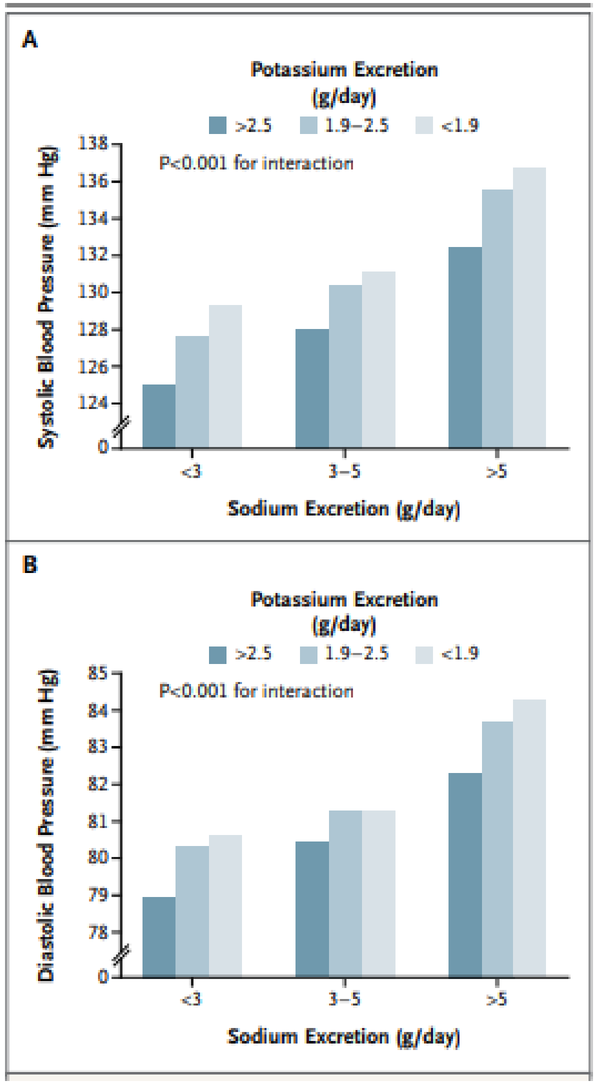


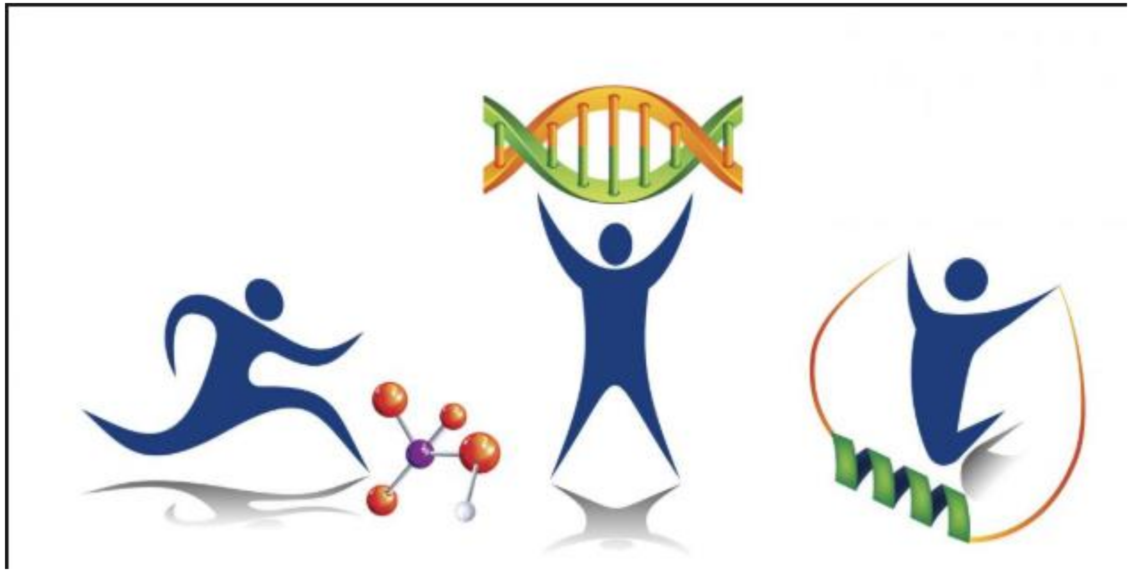
Figure 1. Tukey Box-and-whisker plot of coronary artery calcium (CAC) scores in male athletes and relatively sedentary healthy males with CAC ≥1 Agatston units.

[Circulation.](#) 2017 Jul 11;136(2):126-137

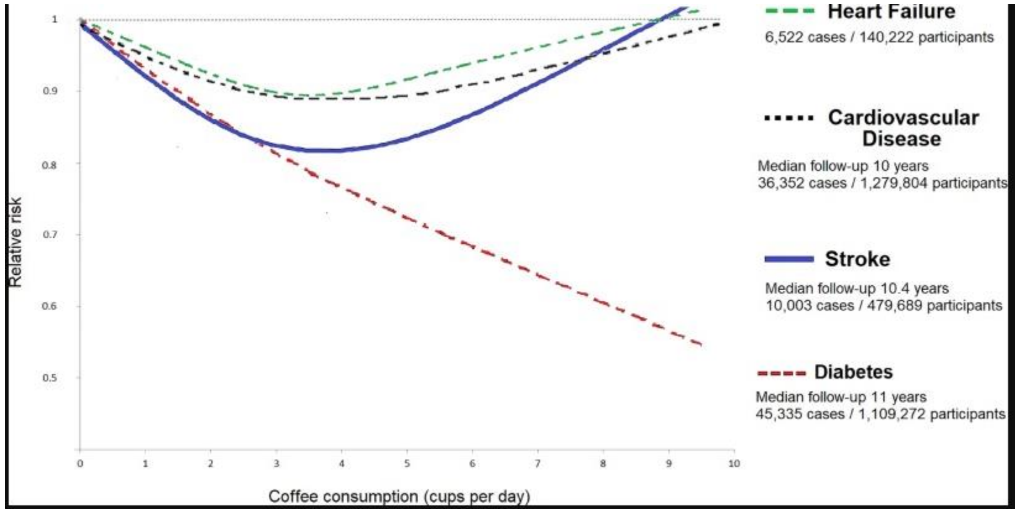
מרשם לאימון גופני

- אירובי-**עצימות**: בינונית -64-76% מהדופק המרבי האישי, **משך**: 30 דק' ויותר ביום של מאמץ אירובי רצוף, או מצטבר בקטעי מאמץ של לא פחות מ-10 ד' ברצף. **תדירות**: 5-7 ימים בשבוע
- **לאימון כוח- התנגדות**: לאנשים צעירים ולמי שיש לו ניסיון באימון גופני 60-80% מ-1RM. לאנשים מבוגרים ולמי שרק מתחיל להתאמן אחרי שנים של חוסר פעילות 40-50% מ-1RM.**מס' חזרות**: 8-12; אין להגיע לעייפות בעת ביצוע המערכה. **מס' מערכות**: 2-4. **תדירות**: 2-3 אימונים בשבוע עם פרק זמן של 48 שעות לפחות בין אימון לאימון
- גמישות- סוג: מתיחות סטטיות, **עצימות**: מתח את השריר עד תחושת מתח ואי נוחות קלה, **משך**: 10-30 שניות, **מס' חזרות**: 2-4, **תדירות:** 2-3 אימונים בשבוע


A
Potassium Excretion (g/day)
>2.5
1.9–2.5
<1.9
P<0.001 for interaction
Systolic Blood Pressure (mm Hg)
138
136
134
132
130
128
126
124
0
<3
3–5
>5
Sodium Excretion (g/day)
B
Potassium Excretion (g/day)
>2.5
1.9–2.5
<1.9
P<0.001 for interaction
Diastolic Blood Pressure (mm Hg)
85
84
83
82
81
80
79
78
0
<3
3–5
>5
Sodium Excretion (g/day)



Coffee


Heart Failure
6,522 cases / 140,222 participants
Cardiovascular Disease
Median follow-up 10 years
36,352 cases / 1,279,804 participants
Stroke
Median follow-up 10.4 years
10,003 cases / 479,689 participants
Diabetes
Median follow-up 11 years
45,335 cases / 1,109,272 participants
Relative risk
Coffee consumption (cups per day)


L1 HEIL HA-AVIR
BIGSTOCK