



Caffè, non solo caffeina

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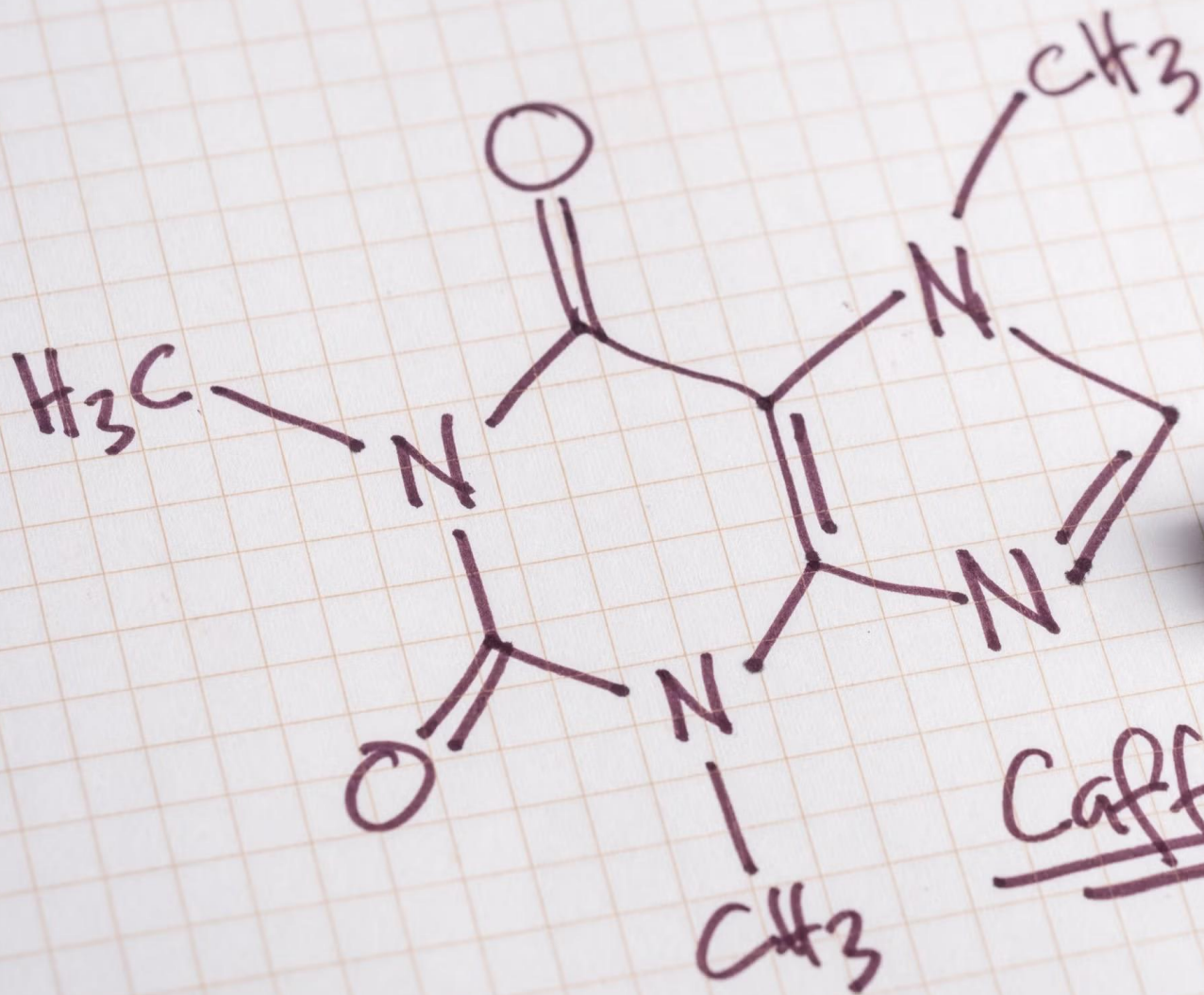
SOS PRESSIONE ALTA



CIBI SÌ E... CIBI NO

SPEZIE PESCE AGLIO E CIPOLLA YOGURT LEGUMI	SALE CARNE <i>rossa</i> FORMAGGI <i>stagionati</i> CAFFÈ E TÈ LEGUMI
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DONNA MODERNA



Caffeine

Summary of the effects of Xantines

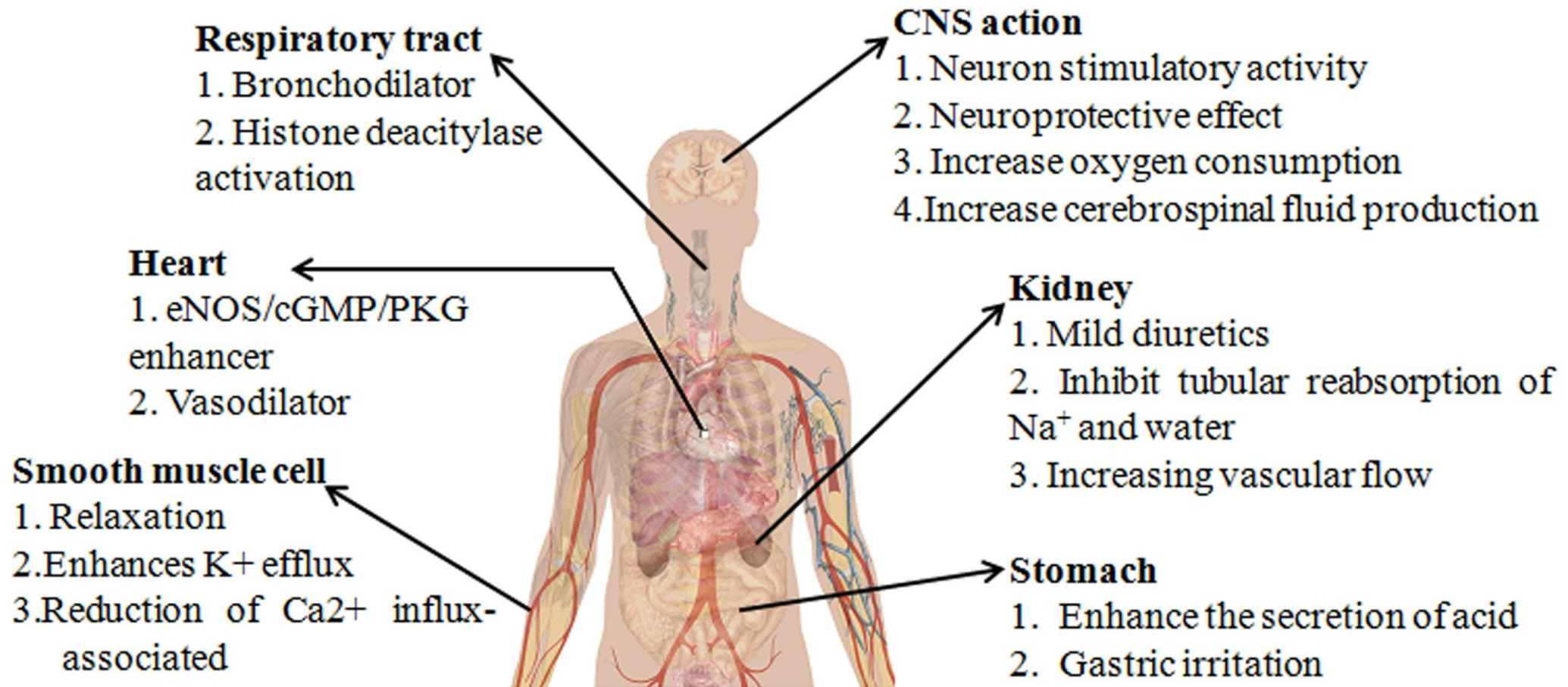
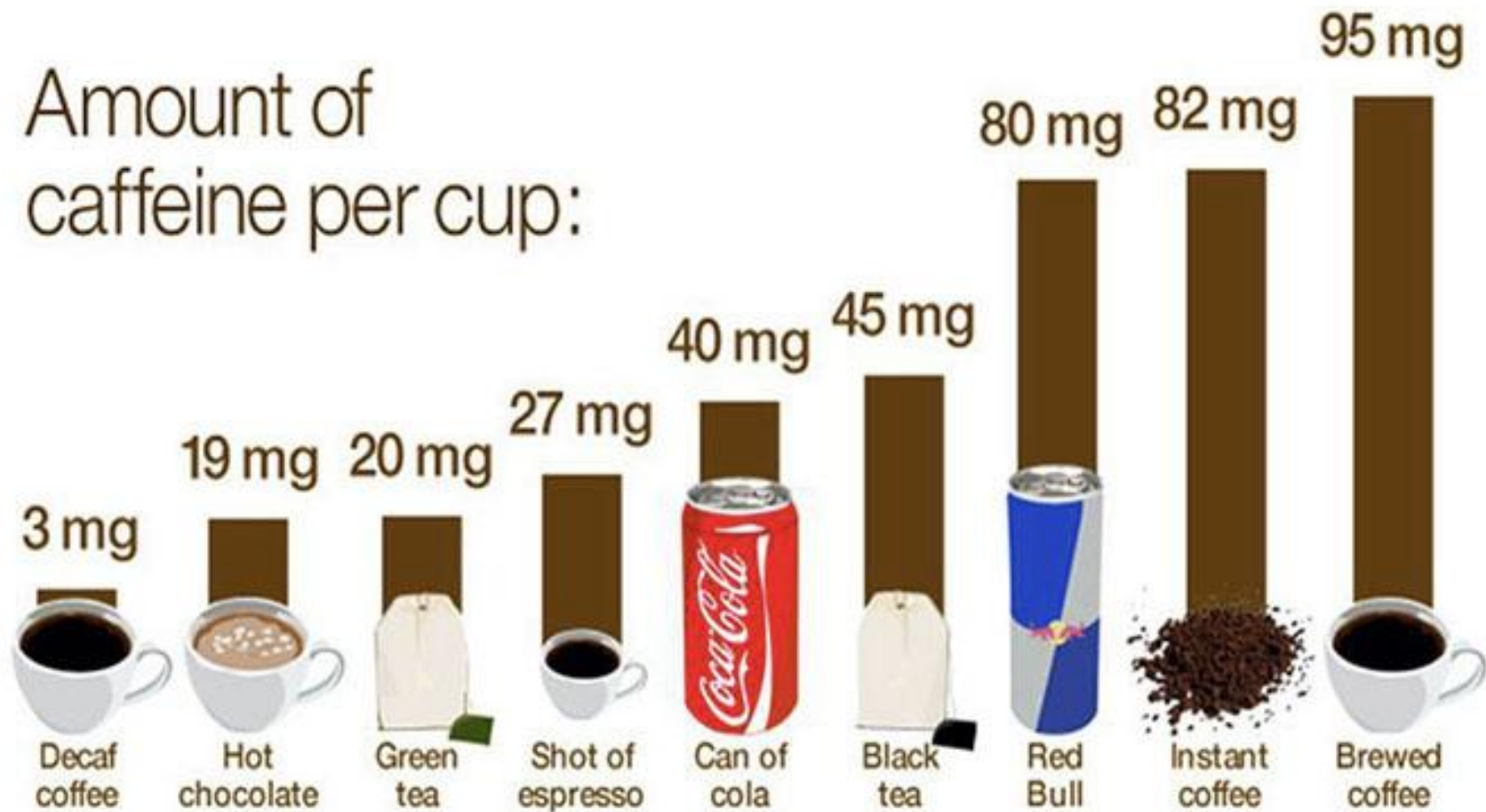


Table 1 Characteristics of *Coffea arabica*, *Coffea robusta*, and *Coffea liberica* [14–16]

Characteristics	Type of coffee		
	<i>Coffea arabica</i>	<i>Coffea canephora</i>	<i>Coffea liberica</i>
The main place of cultivation	Brazil, Central America and Africa	Vietnam, Brazil, Indonesia and Africa	Malaysia, some regions of the Philippines and Africa (Liberia)
Bean			
Participation in the global coffee market	64%	35%	1%
The aroma of the coffee	++	+++	+
Mean concentration of biological components [g/100g]			
Caffeine	1.61	2.26	1.23
Water	8-12	8-12	11
Protein	9.8	9.5	14
Sucrose + reducing sugars	8.1	4.4	8
Polysaccharides	49.8	54.4	42
Lipids	16.2	10	12
Chlorogenic acid	6.5	10	7
Minerals	4.2	4.4	4

Amount of
caffeine per cup:

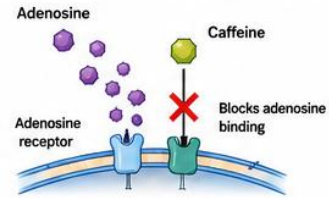


THE EFFECTS OF CAFFEINE

Mechanisms of Action, Physiological Effects, Benefits, and Potential Adverse Effects

1. PRIMARY MECHANISM OF ACTION

Caffeine is a competitive antagonist of adenosine receptors (A1 and A2A) in the central nervous system and several peripheral tissues.



Result: ↑ Neurotransmitter release
(dopamine, norepinephrine, acetylcholine)
→ ↑ alertness, attention, and mood.

3. EFFECTS ON BRAIN FUNCTION AND MOOD

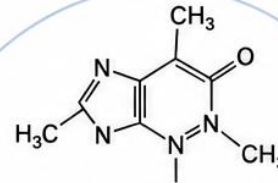


- Increases alertness, vigilance, and wakefulness
- Improves cognitive performance (memory, reaction time)
- Enhances mood and reduces perceived fatigue
- Reduces sleepiness

2. CARDIOVASCULAR EFFECTS



- Acute increase in heart rate and cardiac output
- Mild transient increase in blood pressure
- Vasodilation in skeletal muscle and cerebral circulation
- Habitual consumption is generally not associated with increased cardiovascular risk in healthy individuals



CAFFEINE (1,3,7-trimethylxanthine)

A naturally occurring psychoactive compound found in coffee, tea, cocoa, energy drinks, and some medications and supplements.

4. EFFECTS ON METABOLISM AND PHYSICAL PERFORMANCE



- Increases lipolysis and fat oxidation
- Improves exercise performance (endurance, strength, power)
- May improve insulin sensitivity and glycemic control
- Increases thermogenesis and energy expenditure

5. POTENTIAL ADVERSE EFFECTS



Anxiety, nervousness, irritability



Insomnia and sleep disturbances



Gastrointestinal symptoms (nausea, reflux)



Palpitations and tachycardia



Headache



Tolerance and psychological dependence



Adverse effects are more likely with high doses (>400 mg/day), individual sensitivity, or consumption close to bedtime.

6. SPECIAL POPULATIONS



Pregnancy

Limit intake to <200 mg/day
Possible association with low birth weight



Children and Adolescents

Greater sensitivity to caffeine effects
High doses should be avoided



Older Adults

Slower metabolism
Increased susceptibility to adverse effects



Drug Interactions

Caffeine may interact with several medications, including:
• Theophylline
• Fluoroquinolones
• Clozapine

7. DOSAGE AND SAFETY



Generally Safe Intake
Up to 400 mg/day
(~3–5 cups of coffee)



Onset of effects: 15–45 minutes
Peak plasma concentration: 30–120 minutes
Half-life: 3–7 hours
(varies according to genetics, age, pregnancy, smoking, and medications)

KEY MESSAGE



When consumed in moderation, caffeine may improve alertness, physical performance, and mood, and is generally considered safe for most healthy adults. Excessive intake or use in susceptible individuals may lead to adverse effects, highlighting the importance of an individualized approach.

Sources: EFSA, FDA, ACSM, American Heart Association, and contemporary scientific literature.

The NEW ENGLAND JOURNAL of MEDICINE

REVIEW ARTICLE

Edward W. Campion, M.D., *Editor*

Coffee, Caffeine, and Health

Rob M. van Dam, Ph.D., Frank B. Hu, M.D., Ph.D.,
and Walter C. Willett, M.D., Dr.P.H.



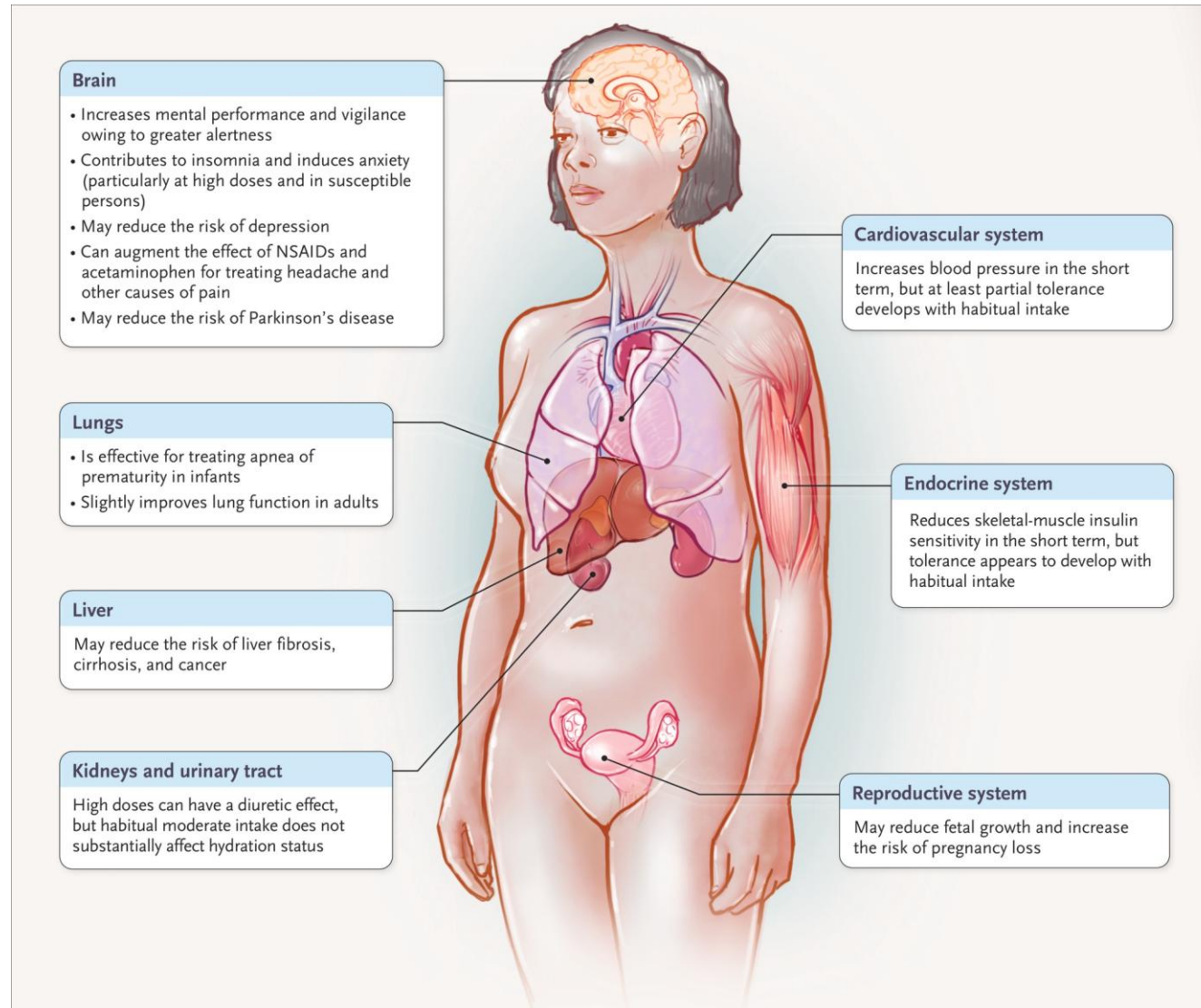
The NEW ENGLAND
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N Engl J Med 2020;383:369-78.

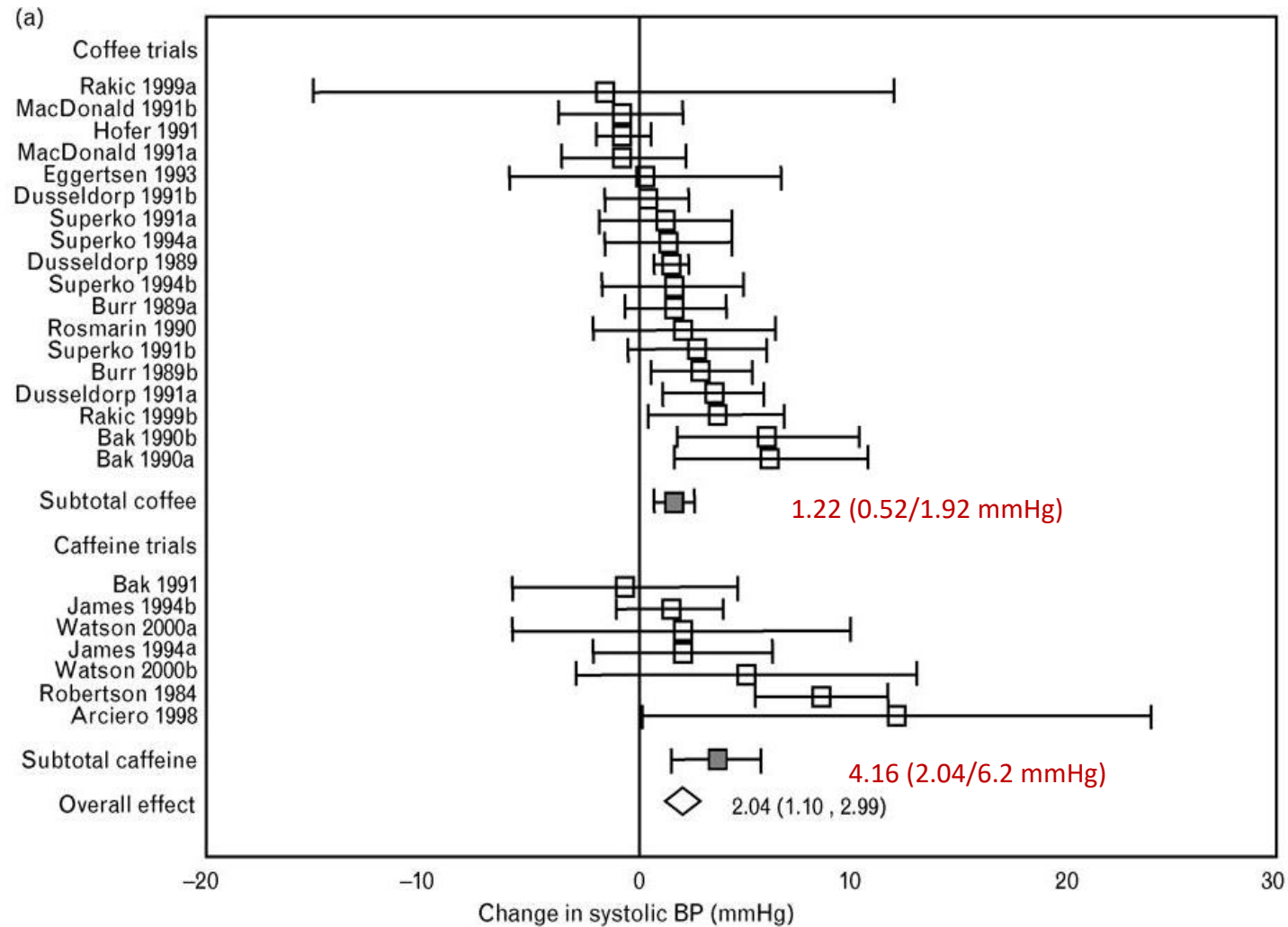
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Effects of Caffeine Intake on Health, According to Organ System.



Net change in systolic BP and coffee and chronic caffeine trials



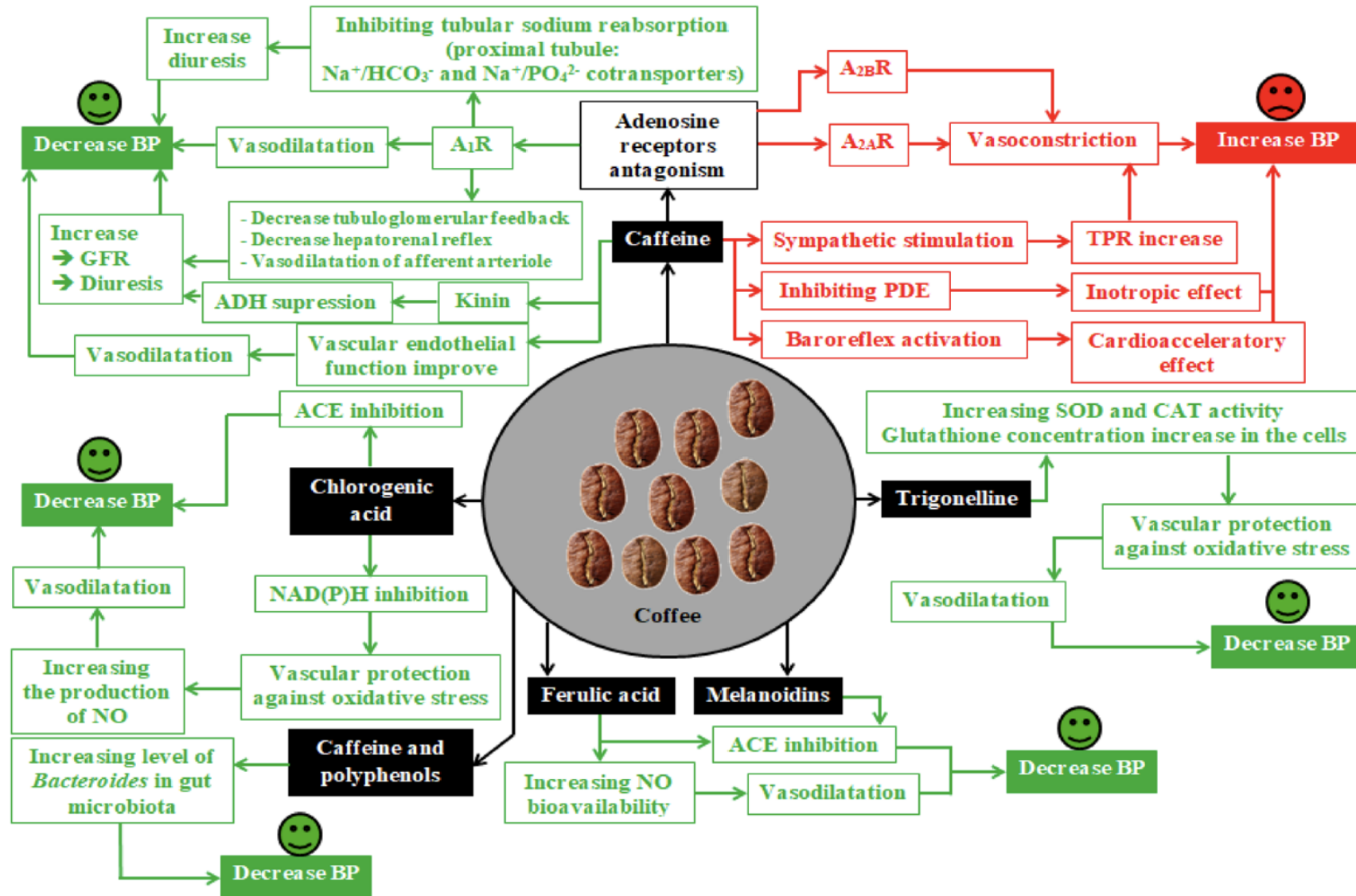


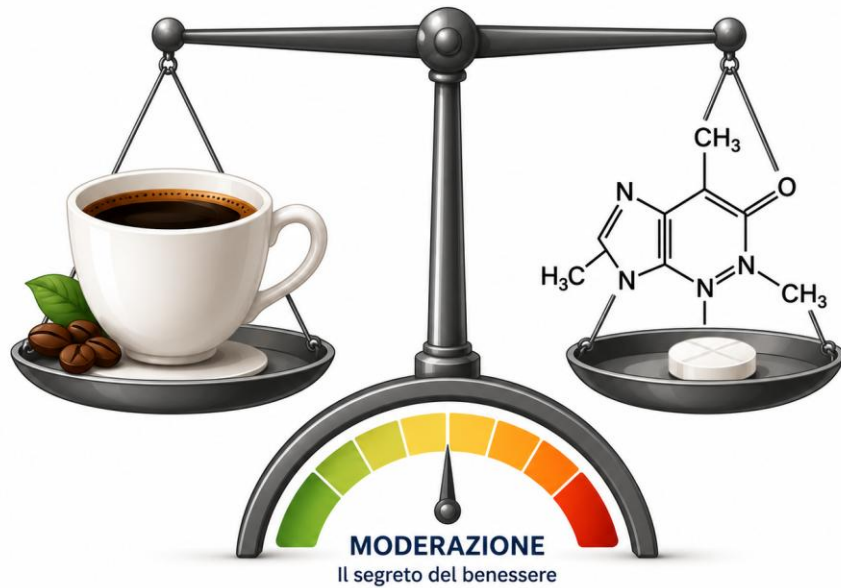
Figure 2 Effects of major compounds derived from coffee on BP [17–26]. A₁R—adenosine A₁ receptor; A_{2A}R—adenosine A_{2A} receptor; A_{2B}R—adenosine A_{2B} receptor; GFR—glomerular filtration rate; PDE—phosphodiesterase; ACE—angiotensin-converting enzyme; TPR—total

peripheral resistance; SOD—superoxide dismutase; CAT—catalase; BP—blood pressure; NO—nitric oxide; NAD(P)H—nicotinamide adenine dinucleotide phosphate oxidase

E' possibile che gli
effetti della caffeina
possano essere
prevalenti nell'impatto
salutistico del caffè?



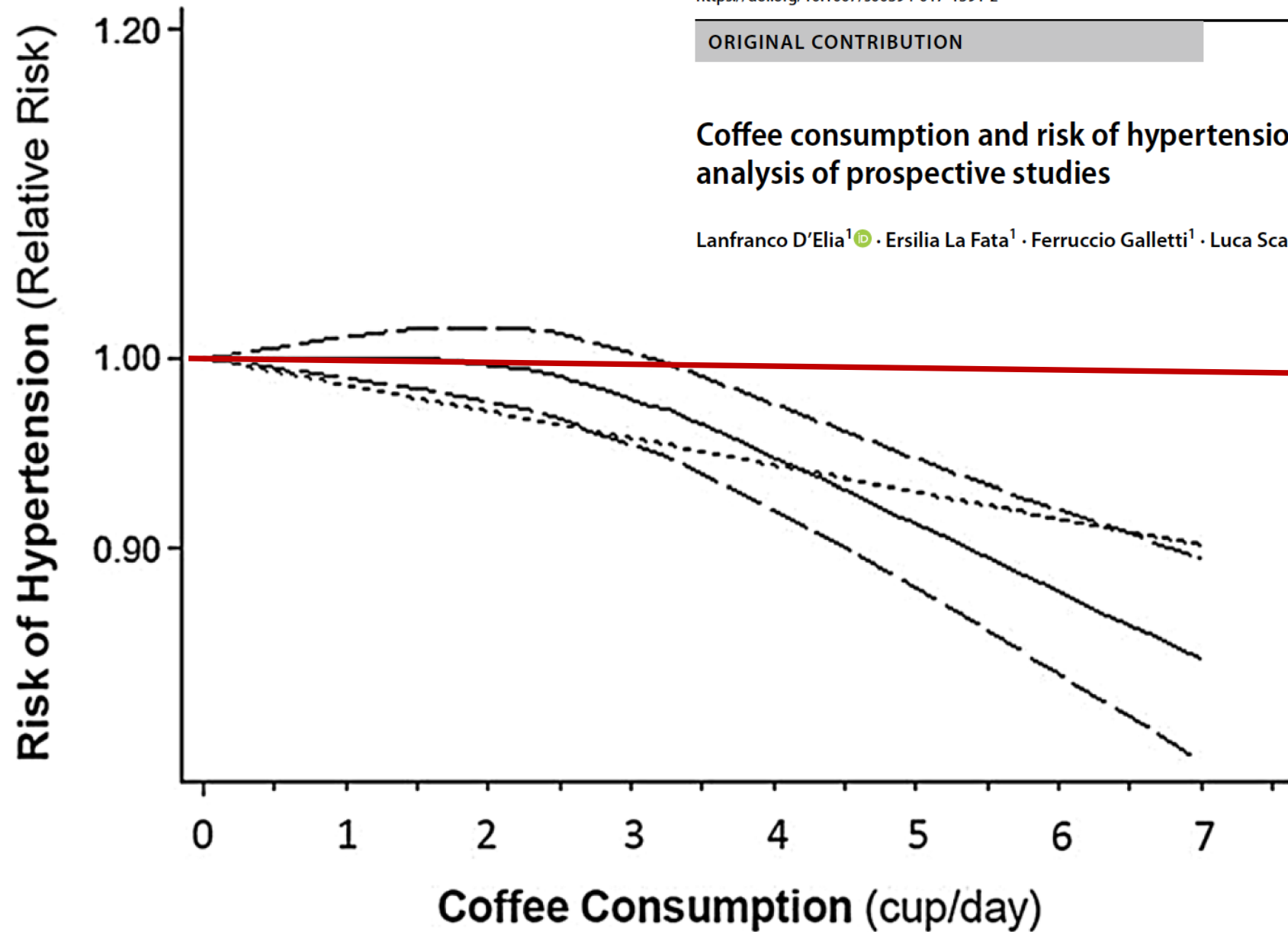
Caffè e ipertensione arteriosa





Coffee consumption and risk of hypertension: a dose–response meta-analysis of prospective studies

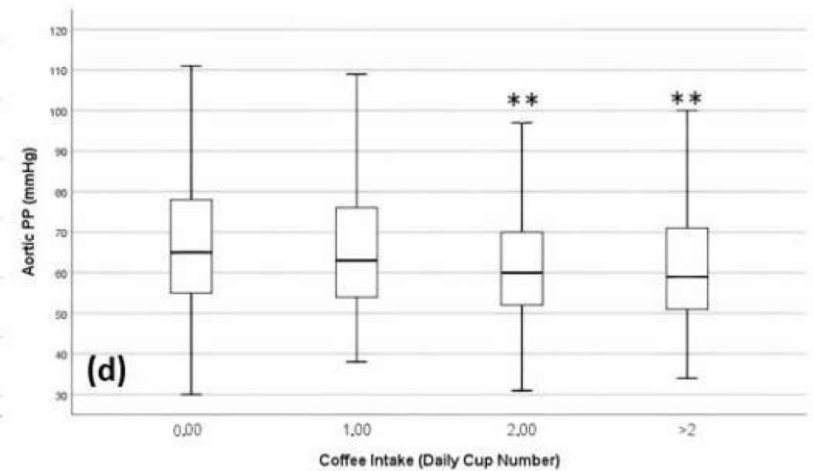
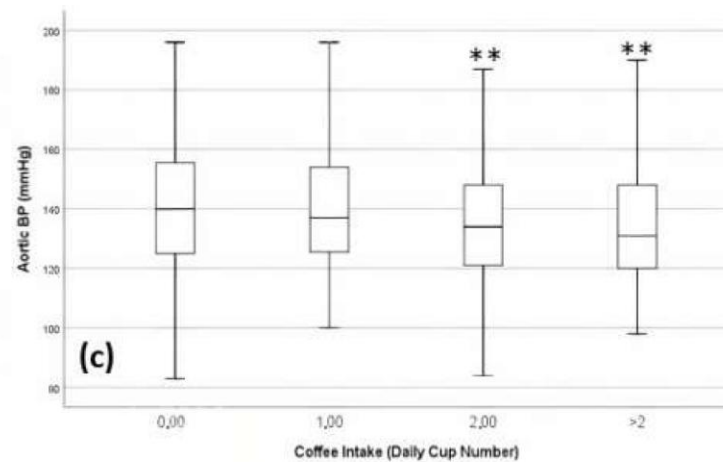
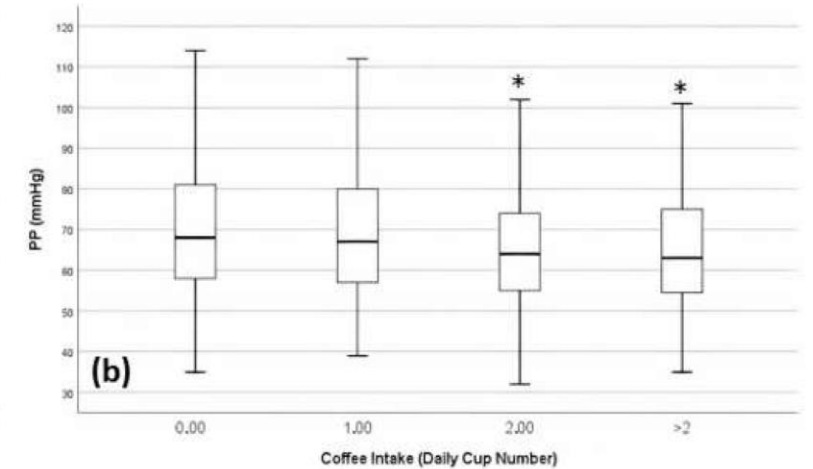
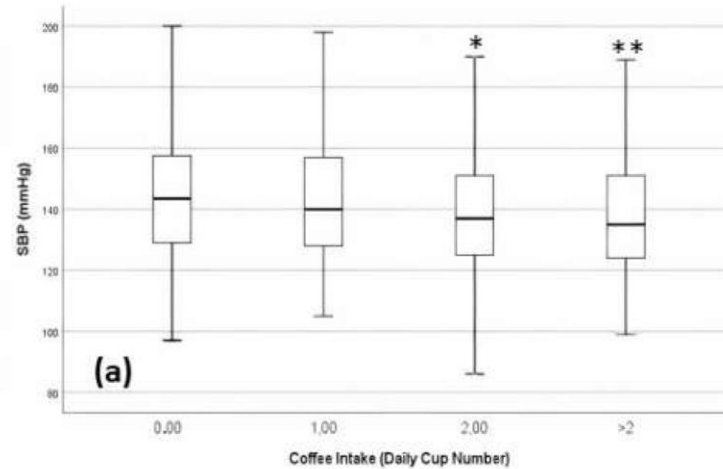
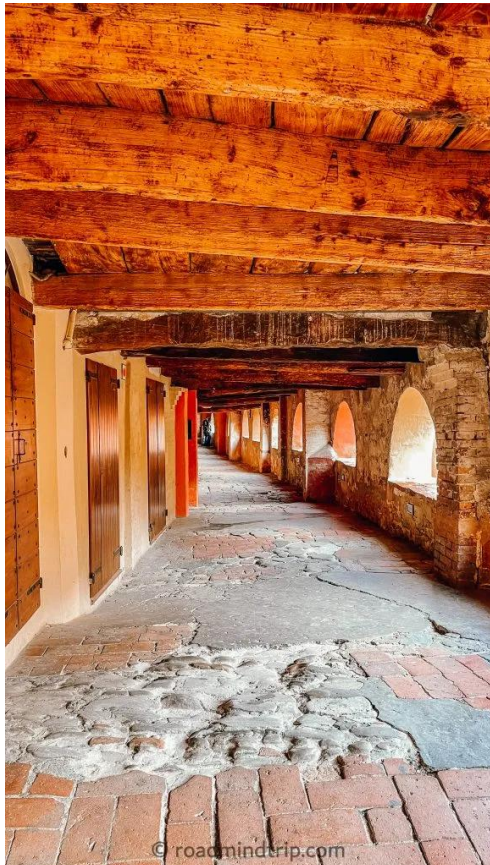
Lanfranco D'Elia¹  · Ersilia La Fata¹ · Ferruccio Galletti¹ · Luca Scalfi² · Pasquale Strazzullo¹



Article

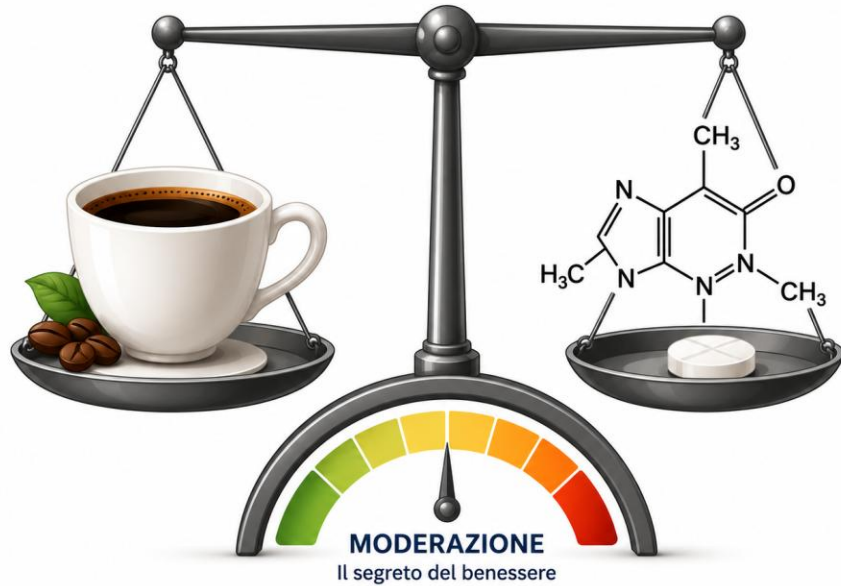
Self-Reported Coffee Consumption and Central and Peripheral Blood Pressure in the Cohort of the Brisighella Heart Study

Arrigo F. G. Cicero ^{1,2,*}, Federica Fogacci ^{1,†}, Sergio D'Addato ², Elisa Grandi ², Elisabetta Rizzoli ², Claudio Borghi ^{1,2} and on behalf of the Brisighella Heart Study [‡]



Caffè e ipertensione arteriosa

Caffè e controllo della pressione arteriosa





Coffee and Arterial Hypertension

Stanisław Surma^{1,2} · Suzanne Oparil³

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Abstract

Purpose of Review Coffee is a very popular drink and an estimated 2.25 billion cups worldwide are consumed daily. Such popularity of coffee makes it the most consumed drink next to water. Numerous studies have shown a beneficial effect of habitual and moderate coffee consumption on the functioning of the nervous, digestive, and cardiovascular systems, as well as on kidney function. Taking into account the very high prevalence of arterial hypertension in the world (31.1% of adults), much controversy has been raised about the influence of coffee consumption on blood pressure and the risk of arterial hypertension. Moreover, there have been extensive discussions about the safety of coffee consumption for hypertensive persons.

Recent Findings There are over 1000 chemical compounds in coffee. The best characterized of these are caffeine, chlorogenic acid, trigonelline, kahweol, cafestol, ferulic acid, and melanoidins. These compounds have bidirectional influences on blood pressure regulation. The results of numerous studies and meta-analyses indicate that moderate and habitual coffee consumption does not increase and may even reduce the risk of developing arterial hypertension. Conversely, occasional coffee consumption has hypertensive effects. Moderate habitual coffee consumption in hypertensive persons does not appear to increase the risk of uncontrolled blood pressure and may even reduce the risk of death from any cause.

Summary Moderate and habitual consumption of coffee (1–3 cups / day) does not adversely affect blood pressure in most people, including those with arterial hypertension.

Keywords Coffee · Caffeine · Blood pressure · Arterial hypertension

Introduction

Coffee is the most consumed drink for humans next to water. According to the National Coffee Association USA, about 2.25 billion cups are drunk worldwide every day, totaling about 500 billion cups/year [1]. The

available data indicate that the inhabitants of Finland consume the most coffee—on average over 10 kg per capita/year [2]. In the USA and Poland, coffee consumption is 4.4 kg and over 3 kg per capita/year, respectively [2]. Results of numerous studies indicate beneficial effects of regular moderate coffee consumption on the nervous, cardiovascular (CV), and digestive systems, as well as on kidney function [3–7]. Recent research findings indicate that regular consumption of 2–3 cups of coffee a day reduces the risk of nonfatal and fatal CV diseases, type 2 diabetes, endometrial cancer, and melanoma and non-melanoma skin cancer in the US population [8]. There are reviews of the literature that summarize the knowledge about the impact of coffee consumption on global health [9]. In contrast, the effects of coffee consumption on blood pressure (BP) and the risk of arterial hypertension are controversial. Given the very high prevalence of arterial hypertension (31.1% of adults worldwide) [10] and the significant influence of diet on its pathogenesis, this article reviews the impact of coffee consumption on the risk of its occurrence.

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Table 2 Effect of habitual and non-habitual coffee consumption on blood pressure and the risk of arterial hypertension—summary of studies results and meta-analysis

Author	Year	Type of study	Sample size	Results	Effect on blood pressure or risk of hypertension
Habitual coffee consumption					
Miranda A. et al. [36]	2021	Cohort	8780 persons	Over the period of 3.9 years of follow-up, hypertension developed in 1285 people. The effect of coffee on the risk of hypertension was related to the number of cups consumed: ✓ ≤ 1 cup → [RR = 0.86; 95% CI 0.67–1.10] ✓ 1–3 cups → - 18% [RR = 0.82; 95% CI 0.68–0.97] ✓ > 3 cups → [RR = 0.85; 95% CI: 0.70–1.04]	beneficial effect only in never-smokers
Ghavamli H. et al. [37]	2021	Cross-sectional	300 subjects with DMT2	Consumption of <1 to > 3 cups of coffee / day was significantly associated with a reduction in diastolic BP [r = -0.134; p = 0.022] and had no significant effect on systolic BP [r = -0.014; p = 0.809]	
van Oort S. et al. [38]	2020	Mendelian randomization	553225 subjects	Coffee consumption was not significantly associated with the risk of hypertension [OR = 1.04; 95% CI: 0.90–1.20]	
Kim J. et al. [39]	2020	Meta-analysis	4 studies	Coffee consumption <i>versus</i> not consumption 10% reduction the risk of hypertension [OR = 0.90; 95% CI: 0.83–0.98]	
D'Elia L. et al. [40]	2019	Meta-analysis	4 studies	The risk of hypertension depends on the number of cups of coffee consumed / day: ✓ 1 cup → [RR = 1.00; 95% CI 0.99–1.01] ✓ 2 cups → [RR = 0.99; 95% CI 0.97–1.02] ✓ 3–4 cups → - 3% [RR = 0.97; 95% CI: 0.94–0.99] ✓ 4–5 cups → - 6% [RR = 0.94; 95% CI: 0.91–0.97] ✓ 5–6 cups → - 10% [RR = 0.90; 95% CI: 0.86–0.93] ✓ 6–7 cups → - 14% [RR = 0.86; 95% CI: 0.82–0.91]	

Miranda A. et al. [41]	2019	Preventive – genetics	533 subjects	Coffee consumption by people predisposed to the development of hypertension [polymorphisms: CYP1A1 / CYP1A2 (rs2470893, rs2472297); CPLX3 / ULK3 (rs6495122); MTHFR (rs17367504)] has been associated with an increase in BP	in genetically predisposed subjects
Navarro A. et al. [42]	2019	Prospective cohort	13374 subjects	During 9.1 years of follow-up, it was found that coffee consumption by women was associated with a reduction in the risk of hypertension by: ✓ < 1 cup → - 28% [HR = 0.72; 95% CI: 0.57–0.92] ✓ 4 cups → - 26% [HR = 0.74; 95% CI: 0.60–0.92] ✓ 6 cups → - 26% [HR = 0.74; 95% CI: 0.61–0.91] Coffee consumption was not significantly associated with the risk of hypertension in men	beneficial effect only in women
Xie C. et al. [43]	2018	Meta-analysis	10 studies	Reduction of the risk of hypertension depending on the number of cups of coffee consumed / day: ✓ 2 cups → - 3% [RR = 0.97; 95% CI: 0.95–0.99] ✓ 4 cups → - 5% [RR = 0.95; 95% CI: 0.91–0.99] ✓ 6 cups → - 8% [RR = 0.92; 95% CI: 0.87–0.98] ✓ 8 cups → - 10% [RR = 0.90; 95% CI: 0.83–0.97] The risk of hypertension was reduced by 2% [RR = 0.98; 95% CI: 0.98–0.99] for each increase in coffee consumption by one cup per day	
Poole R. et al. [44]	2017	Meta-analysis	1246388 subjects	Coffee consumption does not significantly reduce BP [systolic: -0.66 mmHg; 95% CI: -2.71 to 1.39 mmHg and diastolic: -0.45 mmHg; 95% CI: -1.51 to 0.61 mmHg] and did not affect the risk of hypertension (OR = 1.03; 95% CI: 0.98–1.08)	

Grosso G. et al. [45]	2017	Meta-analysis	7 studies	The analysis of the entire group did not show a significant effect of coffee consumption on the risk of hypertension. Significance was shown among women: ✓ 1 cup → [RR = 1.00; 95% CI: 0.97–1.03] ✓ 2 cups → [RR = 1.00; 95% CI: 0.94–1.05] ✓ 3 cups → [RR = 0.98; 95% CI: 0.92–1.04] ✓ 4 cups → - 5% [RR = 0.95; 95% CI: 0.91–0.99] ✓ 5 cups → - 8% [RR = 0.92; 95% CI: 0.88–0.95] ✓ 6 cups → - 12% [RR = 0.88; 95% CI: 0.84–0.94] ✓ 7 cups → - 15% [RR = 0.85; 95% CI: 0.78–0.93]	beneficial effect only in women
Rhee J. et al. [46]	2016	Prospective	29985 postmenopausal women	Consumption of 1, 2–3 and 4 cups of coffee / day did not significantly affect the risk of arterial hypertension [p = 0.51]	
Grosso G. et al. [47]	2016	Cohort	2725 Polish subjects	The effect on the risk of hypertension was related to the number of cups of coffee consumed: ✓ 1–2 cups → [OR = 0.86; 95% CI: 0.68–1.07] ✓ 3–4 cups → - 25% [OR = 0.75; 95% CI: 0.58–0.95] ✓ > 4 cups → [OR = 1.58; 95% CI: 0.85–3.64]	beneficial effect only in non-smoking subjects
Steffen M. et al. [48]	2012	Meta-analysis	15 studies	Coffee consumption does not significantly reduce BP [SBP -0.55 mmHg; 95% CI: -2.46 to 1.36 mmHg and DBP -0.45 mmHg; 95% CI: -1.52 to 0.61 mmHg] and was not significantly associated with the risk of hypertension [RR = 1.03; 95% CI: 0.98–1.08]	

Zhang Z. et al. [49]	2011	Meta-analysis	6 studies	Compared to consumption of < 1 cup of coffee / day, consumption of 1–3, 3–5 and > 5 cups of coffee / day was not significantly associated with the risk of hypertension [RR = 1.09; 95% CI: 1.01–1.18; RR = 1.07; 95% CI: 0.96–1.20 and RR = 1.08; 95% CI: 0.96–1.21, respectively]. A dose-response meta-analysis showed an inverse "J-shaped" curve with hypertension risk increasing up to 3 cups/d (RR for comparison of 3 with 0 cups/d: 1.07; 95% CI: 0.97–1.20) and decreasing with higher intakes (RR for comparison of 6 with 0 cups/d: 0.99; 95% CI: 0.89–1.10)	
Noordzij M. et al. [50]	2005	Meta-analysis	16 studies	Coffee consumption had marginal effect on BP [systolic: 1.22 mmHg; 95% CI: 0.52–1.92 mmHg and diastolic: 0.49 mmHg; 95% CI: -0.06 to 1.04 mmHg]	
Winkelmayer W. et al. [51]	2005	Prospective cohort	155 594 women	The effect of coffee on the risk of hypertension depended on the number of cups consumed / day: ✓ 1 cup → + 6% [RR = 1.06; 95% CI: 1.01–1.10] ✓ 2–3 cups → [RR = 1.00; 95% CI: 0.97–1.04] ✓ 4–5 cups → - 7% [RR = 0.93; 95% CI: 0.88–0.99] ✓ ≥ 6 cups → - 12% [RR = 0.88; 95% CI: 0.80–0.98]	
Non-habitual coffee consumption					
Xu Z. et al. [52]	2021	Meta-analysis	11 studies	Coffee consumption increased systolic and diastolic BP [WMD = 3.04 mmHg; 95% CI: 2.11–3.96 mmHg and WMD = 2.45 mmHg; 95% CI: 1.18–3.72 mmHg, respectively]	the analysis also included eating other caffeinated foods

Zimmermann-Viehoff F. et al. [53]	2016	Randomized crossover	38 habitual and 39 non-habitual coffee consumers	The consumption of espresso did not significantly affect BP in people who are habitually consuming coffee. In occasional coffee drinkers, the consumption of espresso increased BP	Habitual drinkers	Non-habitual drinkers
Teng C. et al. [54]	2016	Randomized controlled	104 subjects (22 daily coffee drinkers)	Coffee consumption did not significantly increase BP [systolic: p = 0.05; diastolic: p = 0.64]. Non-habitual coffee drinkers were more likely to show an increase in systolic BP		
Hara A. et al. [55]	2014	Randomized controlled	84 non-habitual and 52 habitual coffee consumers	Coffee consumption by non-habitual coffee drinkers was associated with increases in systolic and diastolic BP [systolic: 109.3 ± 1.8 mmHg <i>versus</i> 111.3 ± 2.1 mmHg; diastolic: 65.8 ± 1.3 mmHg <i>versus</i> 65.6 ± 1.2 mmHg]. In habitual coffee drinkers, coffee consumption was associated with a slight decrease (compared to placebo) [systolic: 115.5 ± 3.3 mmHg <i>versus</i> 112.1 ± 2.3 mmHg; diastolic: 68.3 ± 1.9 mmHg <i>versus</i> 66.9 ± 1.3 mmHg]	Habitual drinkers	Non-habitual drinkers
Corti R. et al. [56]	2002	Placebo controlled	6 habitual and 9 non-habitual coffee drinkers	Coffee drinking increased BP only in non-habitual drinkers [p < 0.001]. Interestingly, both groups showed a comparable increase in muscle sympathetic nervous activity and plasma caffeine levels	Habitual drinkers	Non-habitual drinkers

Legend:
✓ the studies are listed in chronological order



no effect

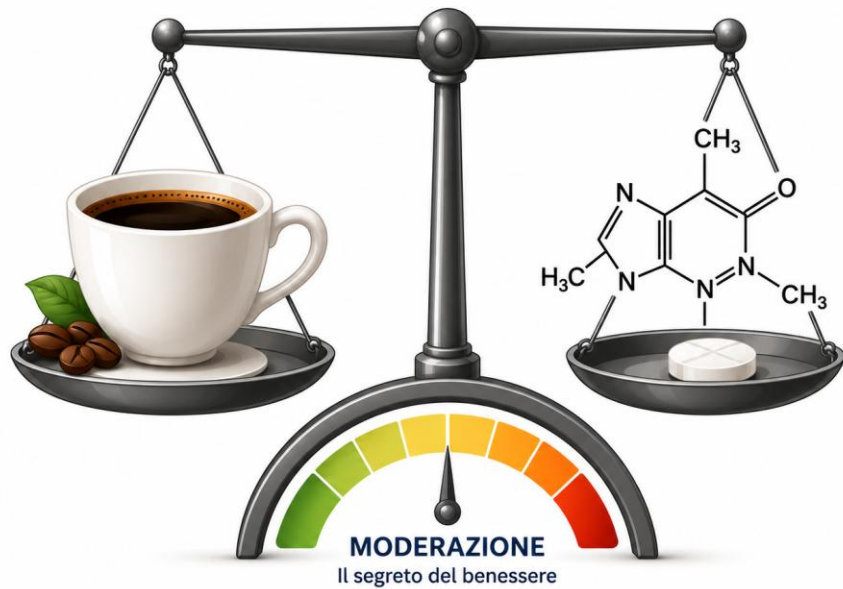


beneficial effect



adverse effect

RR – relative risk; OR – odds ratio; HR – hazard ratio; WMD – weighted mean difference
95% CI – 95% confidence interval; BP – blood pressure



Caffè e ipertensione arteriosa

Caffè e controllo della pressione arteriosa

Caffè e ritmo cardiaco

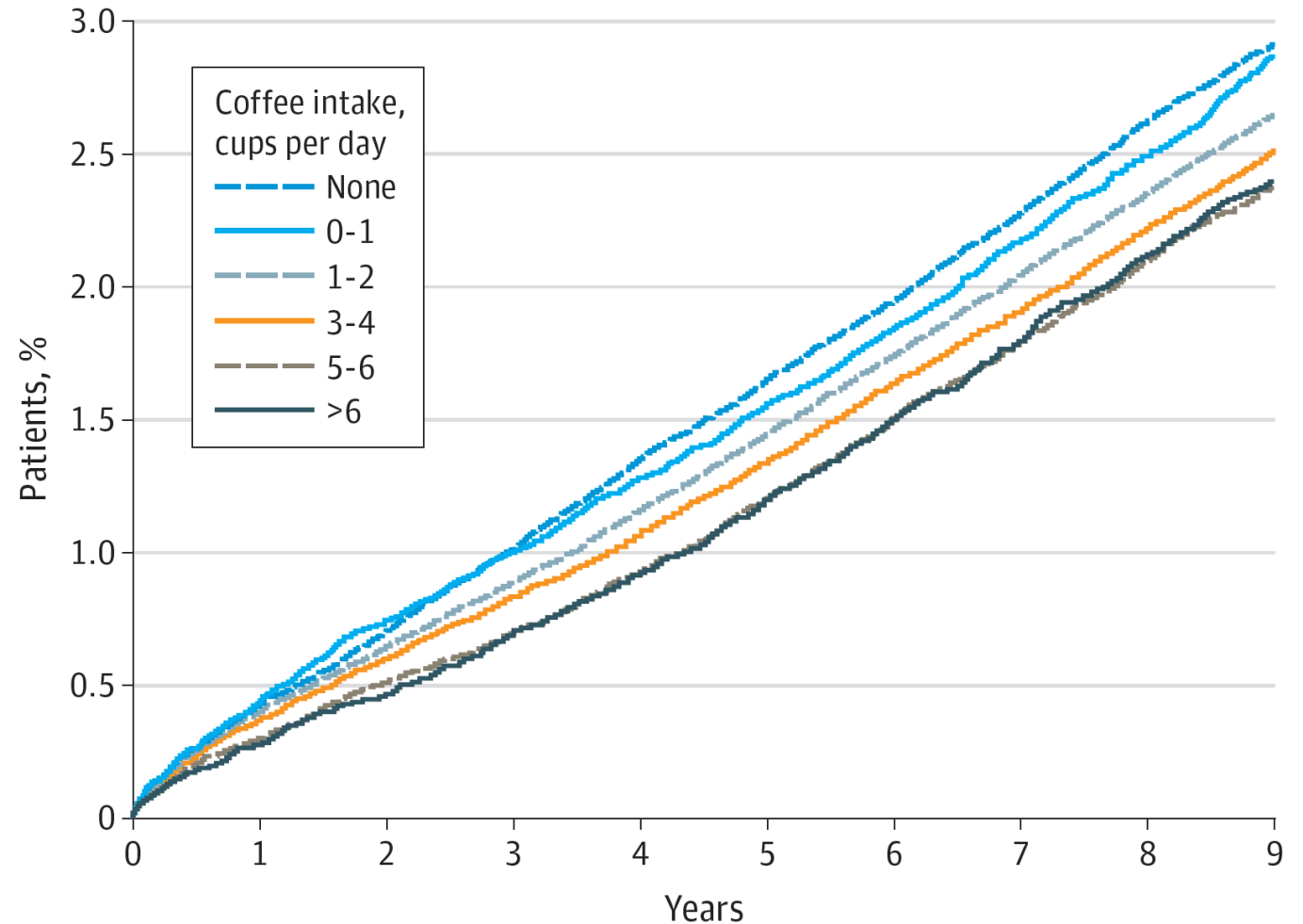
Coffee Consumption and Incident Tachyarrhythmias

Reported Behavior, Mendelian Randomization, and Their Interactions

Eun-jeong Kim, MD; Thomas J. Hoffmann, PhD; Gregory Nah, MA; Eric Vittinghoff, PhD; Francesca Delling, MD; Gregory M. Marcus, MD, MAS

JAMA Intern Med. doi:10.1001/jamainternmed.2021.3616
Published online July 19, 2021.

Figure 1. Cumulative Incidence of Any Arrhythmia by Coffee Consumption



Caffeinated Coffee Consumption or Abstinence to Reduce Atrial Fibrillation

This study investigated whether consuming caffeinated coffee affects the risk of recurrent atrial fibrillation episodes compared with abstaining from coffee and caffeine after successful cardioversion.

Why Does This Clinical Trial Matter?

Atrial fibrillation is a common heart rhythm disorder, affecting more than 10 million people in the US. Coffee is widely consumed, yet its impact on atrial fibrillation has long been debated. Clear evidence is needed to guide recommendations for patients with this condition.



Coffee consumption
100 Patients

Coffee abstinence
100 Patients

Who Was Involved?

- **Participants Analyzed:** 200 randomized and included in the analysis
- **Type:** Adults with a history of coffee drinking and persistent atrial fibrillation (or atrial flutter with a history of atrial fibrillation) after successful cardioversion
- **Age (mean):** 69 years
- **Sex:** 71% male and 29% female
- **Locations:** 5 Hospitals in the US, Canada, and Australia
- **Eligibility:** Age ≥ 21 years, history of regular coffee drinking, planned electrical cardioversion, and able and willing to follow assigned coffee/caffeine intake

How Was the Trial Done?

- **Trial Type:** Open-label, randomized clinical trial
- **Randomization Details:** Individual patients assigned to daily coffee consumption or abstinence
- **Interventions**
 - At least 1 cup of caffeinated coffee daily vs abstaining from coffee and all caffeine
- **Intervention Details:** Coffee consumption group drank regular caffeinated coffee; coffee abstinence group avoided coffee and caffeine-containing products
- **Mode of Delivery:** Oral (beverage)
- **Timing of Outcome Assessment:** At 6 months

What Was Found?

Primary Outcomes

- Recurrence of atrial fibrillation or flutter occurred in 47 of 100 (47%) in the coffee consumption group vs 64 of 100 (64%) in the coffee abstinence group over 6 months
- Statistically significant lower risk with coffee consumption

Secondary Outcomes

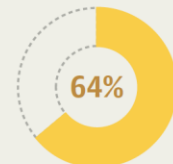
- Isolated atrial fibrillation recurrence: lower in the coffee consumption group
- Adverse events, such as hospitalization, heart failure, or stroke, were similar between groups

Rate of recurrence of AF or atrial flutter over 6 months

Coffee consumption
(47 of 100 patients)



Coffee abstinence
(64 of 100 patients)

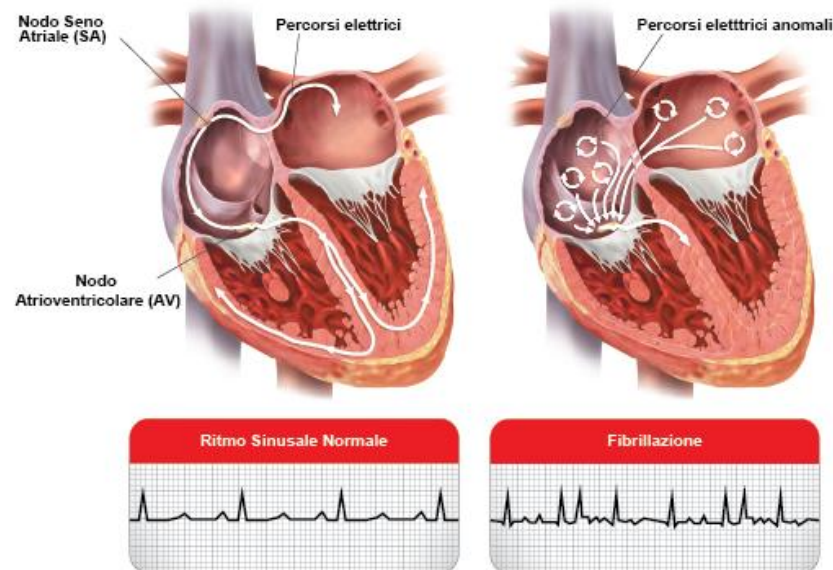


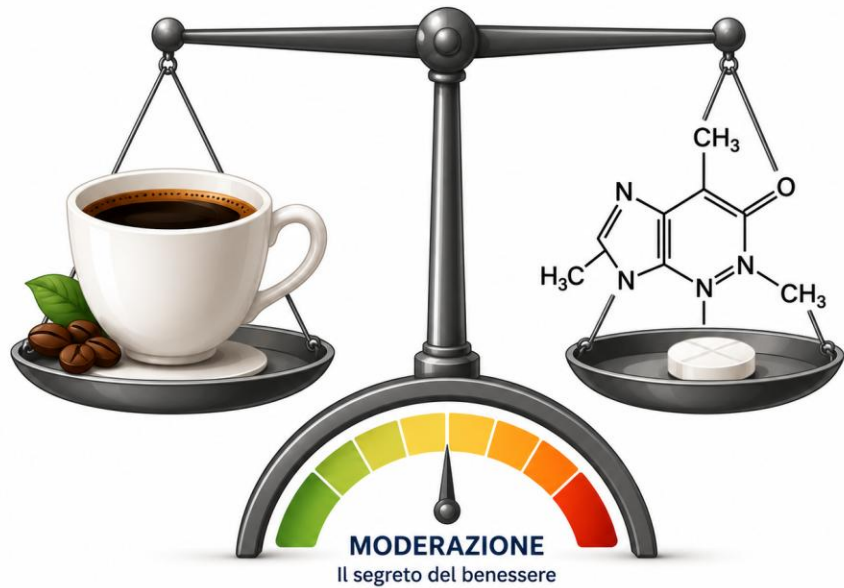
What This Means

The study suggests that daily caffeinated coffee consumption may reduce the risk of recurrent atrial fibrillation compared with abstinence. Recommendations to avoid coffee in patients with atrial fibrillation may be reconsidered, but individualized advice is still important.

Limitations and Knowledge Gaps

The study was open label and had a modest sample size. No protocol-mandated arrhythmia detection was used. Adherence was incomplete in the coffee abstinence group. Results may not apply to high-dose caffeine or synthetic products. Additional research is warranted.





Caffè e ipertensione arteriosa

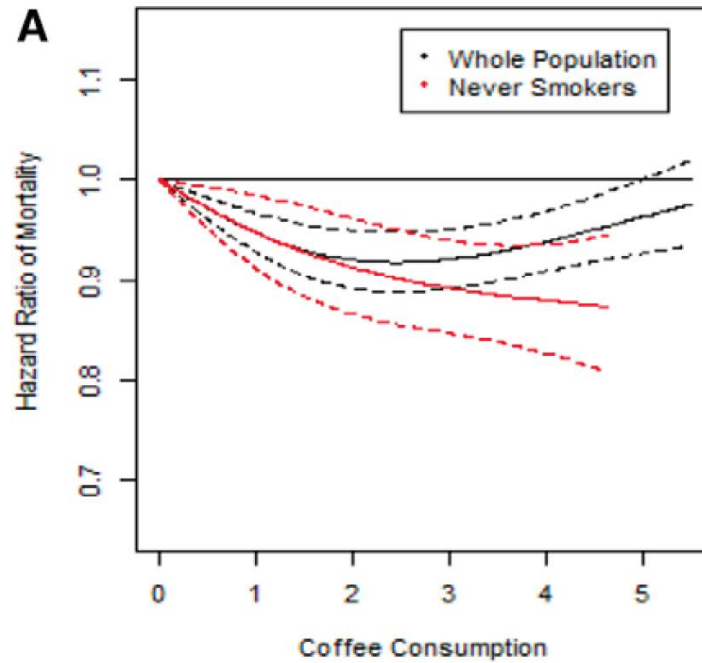
Caffè e controllo della pressione arteriosa

Caffè e ritmo cardiaco

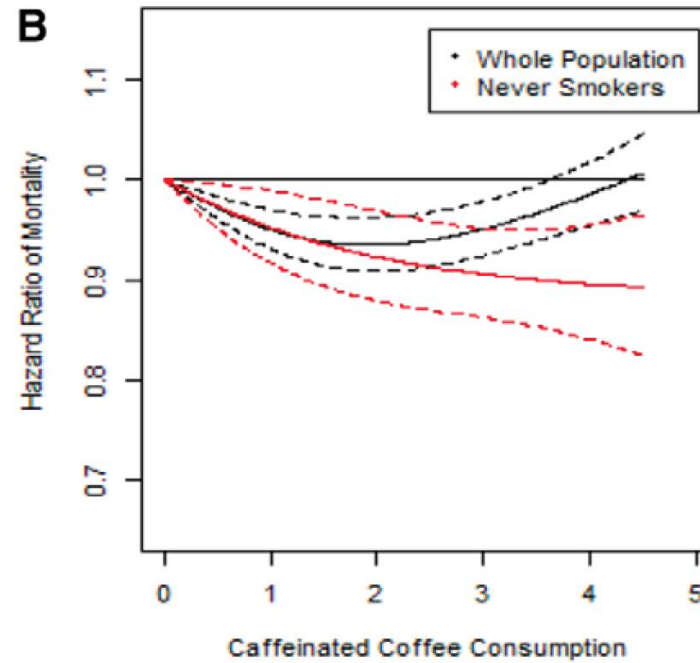
Caffè e malattie cardiovascolari

Baseline coffee consumption and risk of mortality in the overall population and among never smokers

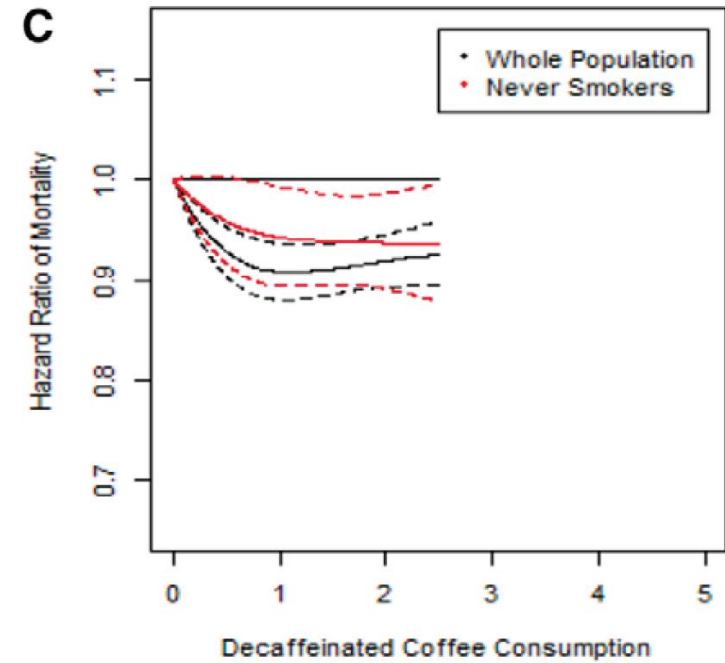
Coffee consumption and mortality



Caffeinated coffee consumption and mortality



Decaffeinated coffee consumption and mortality



2021 ESC Guidelines on cardiovascular disease prevention in clinical practice

4.3.2.4.7. Coffee. Non-filtered coffee contains LDL-C-raising cafestol and kahweol, and may be associated with an up to 25% increased risk of ASCVD mortality by consumption of nine or more drinks a day.⁴⁴⁶ Non-filtered coffee includes boiled, Greek, and Turkish coffee and some espresso coffees. Moderate coffee consumption (3–4 cups per day) is probably not harmful, perhaps even moderately beneficial.⁴⁴⁷

2024 ESC Guidelines for the management of elevated blood pressure and hypertension

Coffee intake is not associated with a higher risk of hypertension in the general population; in fact, higher coffee consumption may be associated with a lower risk for incident hypertension.⁴²⁰

Caffeine

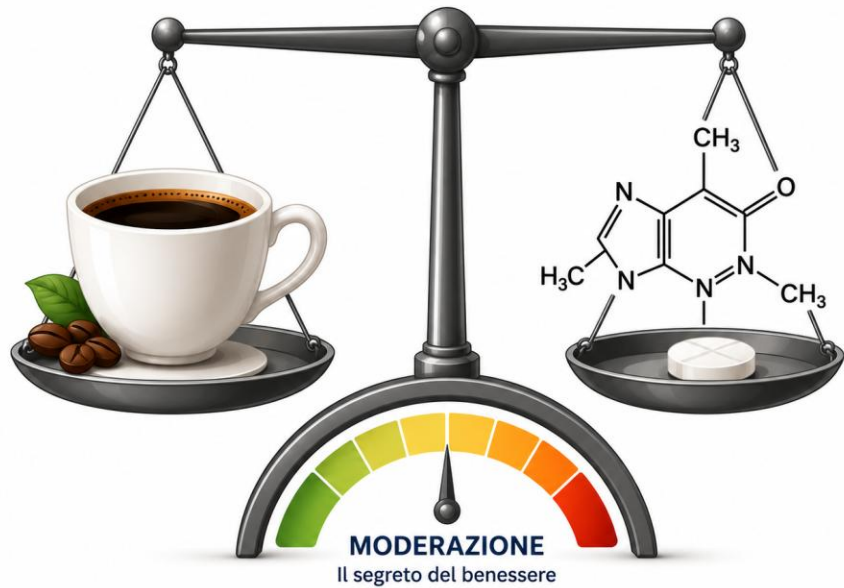
- Generally limit caffeine intake to <300 mg/d
- Avoid use in patients with uncontrolled hypertension
- Coffee use in patients with hypertension is associated with acute increases in BP; long-term use is not associated with increased BP or CVD (S5.4.1-12)



2019 ESC Guidelines on diabetes, pre-diabetes, and cardiovascular diseases developed in collaboration with the EASD

6.1.1.6 Coffee and tea

Consumption of more than four cups of coffee per day was associated with a lower risk of CVD in Finnish patients with DM.¹⁰⁶ An exception should be made for coffee brewed by boiling ground coffee, which increases cholesterol levels.¹⁰⁷ In a meta-analysis of 18 observational studies, increasing coffee or tea consumption appeared to reduce the risk of DM.¹⁰⁸



Caffè e ipertensione arteriosa

Caffè e controllo della pressione arteriosa

Caffè e ritmo cardiaco

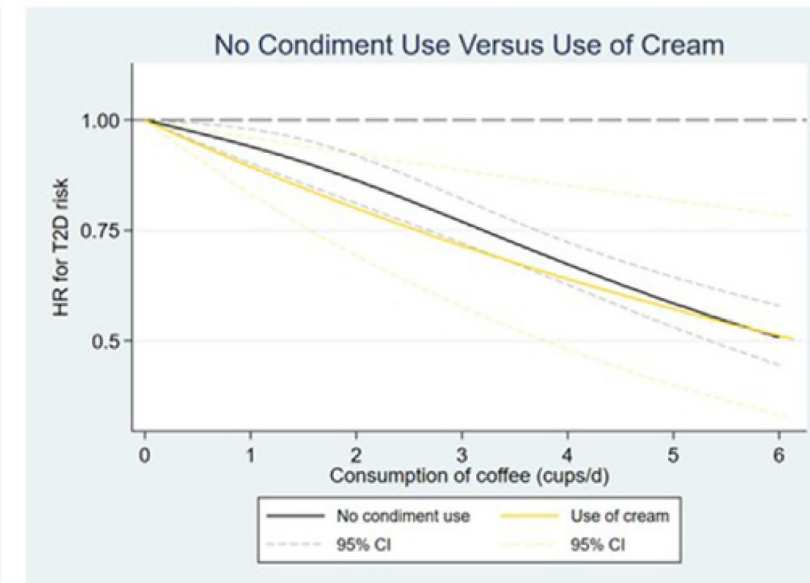
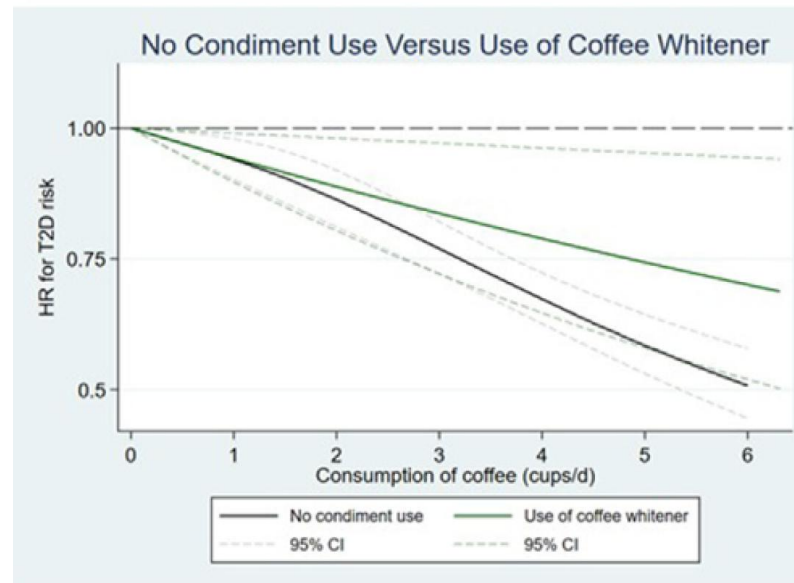
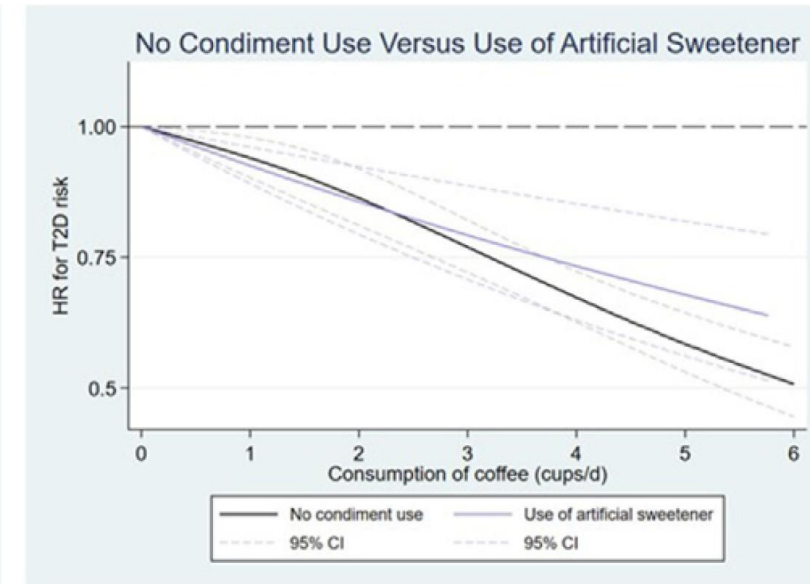
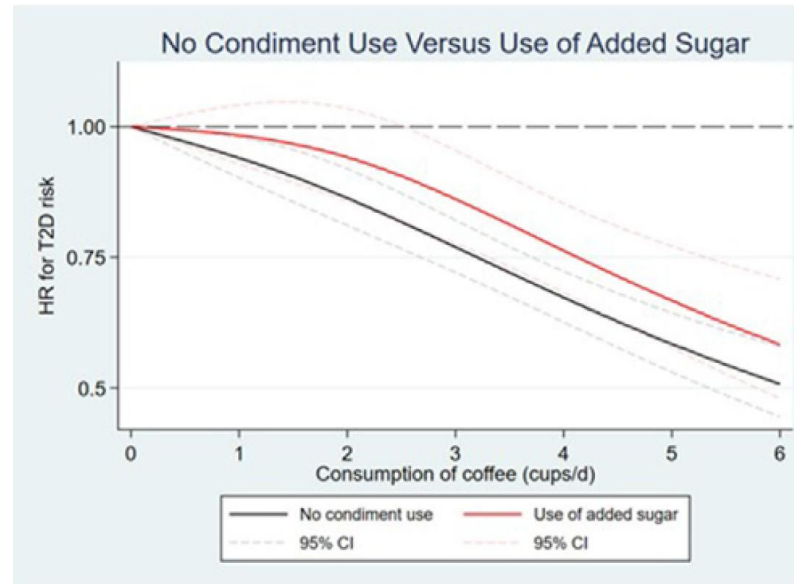
Caffè e malattie cardiovascolari

Caffè e malattie non-cardiovascolari

Original Research Article

Coffee Consumption, Additive Use, and Risk of Type 2 Diabetes—Results from 3 Large Prospective United States Cohort Studies

Matthias Henn^{1,2}, Andrea J Glenn^{1,3,4}, Walter C Willett^{1,5}, Miguel A Martínez-González^{1,2,6}, Qi Sun^{1,5,7}, Frank B Hu^{1,5,7,*}



A diverse group of people, including a doctor, a patient, and a caregiver, standing in front of a large screen displaying a brain scan. The group consists of individuals of various ages, ethnicities, and genders, representing a multicultural and multi-generational population. The doctor is wearing a white coat and a stethoscope, and the patient is holding a cane. The caregiver is holding a smartphone. The background screen shows a brain scan, suggesting a focus on healthcare and medical research.

Standards of Care in Diabetes 2025



Whereas overall healthy low-calorie eating patterns should be encouraged, there is also some evidence that particular dietary components impact diabetes risk. Higher intakes of nuts (13), berries (14), yogurt (15), coffee, and tea (16) are associated with reduced diabetes risk. Conversely, red meats and sugar-sweetened beverages are associated with an increased risk of type 2 diabetes (8).



Effects of coffee consumption on serum uric acid: systematic review and meta-analysis



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Sun Hee Kim, PT, MS^a, Eun Ji Park, MD^a, Shin-Young Yim, MD, PhD^{a,*}, Jae-Bum Jun, MD, PhD^{c,*}

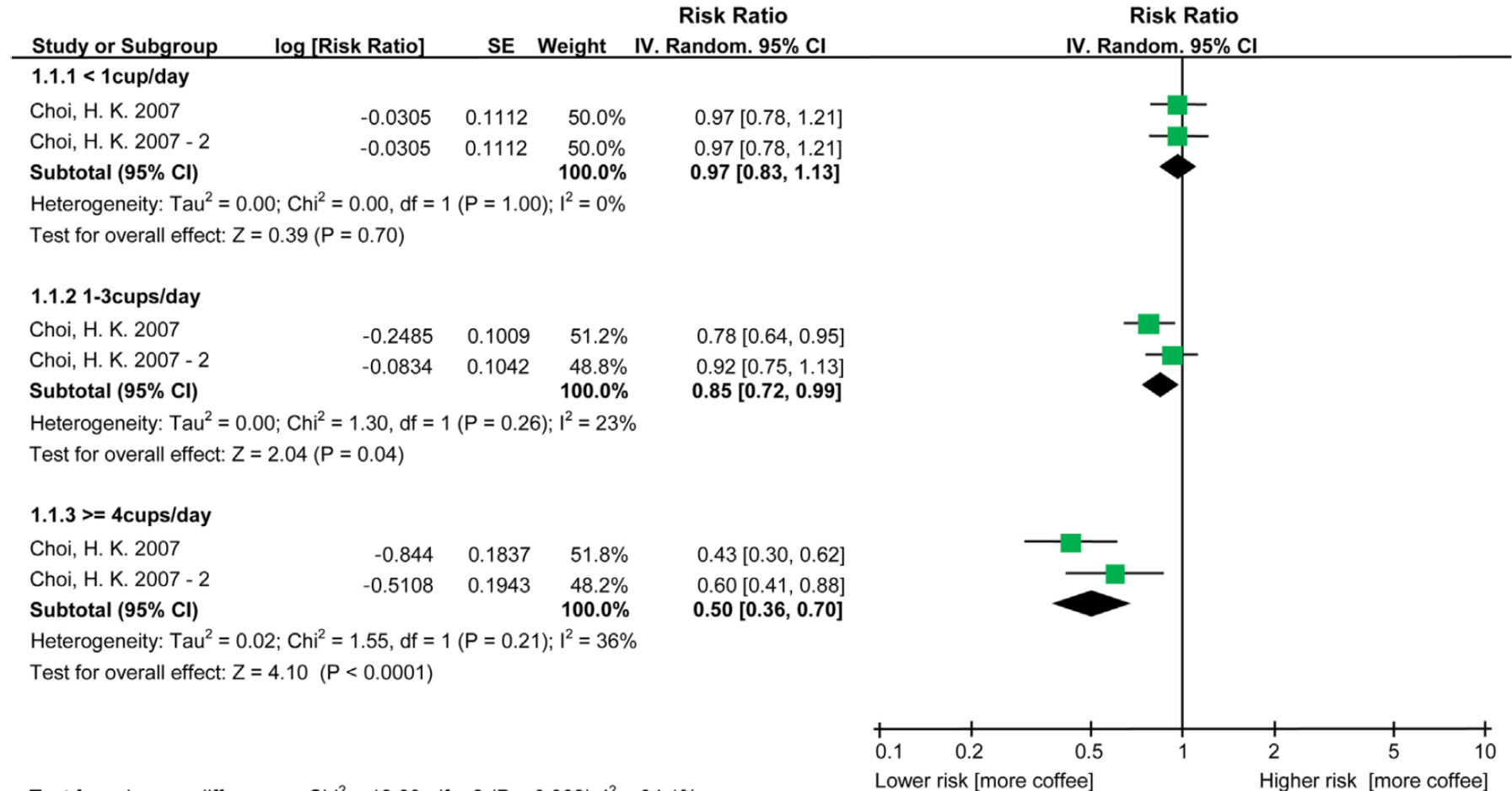
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Meta-analysis of the effect of coffee intake on risk of gout.



Coffee and Tea Intake, Dementia Risk, and Cognitive Function

Yu Zhang, MBBS; Yuxi Liu, PhD; Yanping Li, PhD; Yuhua Li, MS; Xiao Gu, PhD; Jae H. Kang, ScD; A. Heather Eliassen, ScD; Molin Wang, PhD; Eric B. Rimm, ScD; Walter C. Willett, MD, DrPH; Frank B. Hu, MD, PhD; Meir J. Stampfer, MD, DrPH; Dong D. Wang, MD, ScD

IMPORTANCE Evidence linking coffee and tea to cognitive health remains inconclusive, and most studies fail to differentiate caffeinated from decaffeinated coffee.

OBJECTIVE To investigate associations of coffee and tea intake with dementia risk and cognitive function.

DESIGN, SETTING, AND PARTICIPANTS Prospective cohort study that included female participants from the Nurses' Health Study (NHS; n = 86 606 with data from 1980-2023) and male participants from the Health Professionals Follow-up Study (HPFS; n = 45 215 with data from 1986-2023) who did not have cancer, Parkinson disease, or dementia at study entry (baseline) in the US.

EXPOSURES The primary exposures were intakes of caffeinated coffee, decaffeinated coffee, and tea. Dietary intake was collected every 2 to 4 years using validated food frequency questionnaires.

MAIN OUTCOMES AND MEASURES The primary outcome was dementia, which was identified via death records and physician diagnoses. The secondary outcomes included subjective cognitive decline assessed by a questionnaire-based score (range, 0-7; higher scores indicate greater perceived decline; cases defined as those with a score ≥ 3) and objective cognitive function assessed only in the NHS cohort using telephone-based neuropsychological tests such as the Telephone Interview for Cognitive Status (TICS) score (range, 0-41) and a measure of global cognition (a standardized mean z score for all 6 administered cognitive tests).

RESULTS Among 131 821 participants (mean age at baseline, 46.2 [SD, 7.2] years in the NHS cohort and 53.8 [SD, 9.7] years in the HPFS cohort; 65.7% were female) during up to 43 years of follow-up (median, 36.8 years; IQR, 28-42 years), there were 11 033 cases of incident dementia. After adjusting for potential confounders and pooling results across cohorts, higher caffeinated coffee intake was significantly associated with lower dementia risk (141 vs 330 cases per 100 000 person-years comparing the fourth [highest] quartile of consumption with the first [lowest] quartile; hazard ratio, 0.82 [95% CI, 0.76 to 0.89]) and lower prevalence of subjective cognitive decline (7.8% vs 9.5%, respectively; prevalence ratio, 0.85 [95% CI, 0.78 to 0.93]). In the NHS cohort, higher caffeinated coffee intake was also associated with better objective cognitive performance. Compared with participants in the lowest quartile, those in the highest quartile had a higher mean TICS score (mean difference, 0.11 [95% CI, 0.01 to 0.21]) and a higher mean global cognition score (mean difference, 0.02 [95% CI, -0.01 to 0.04]); however, the association with global cognition was not statistically significant ($P = .06$). Higher intake of tea showed similar associations with these cognitive outcomes, whereas decaffeinated coffee intake was not associated with lower dementia risk or better cognitive performance. A dose-response analysis showed nonlinear inverse associations of caffeinated coffee and tea intake levels with dementia risk and subjective cognitive decline. The most pronounced associated differences were observed with intake of approximately 2 to 3 cups per day of caffeinated coffee or 1 to 2 cups per day of tea.

CONCLUSIONS AND RELEVANCE Greater consumption of caffeinated coffee and tea was associated with lower risk of dementia and modestly better cognitive function, with the most pronounced association at moderate intake levels.

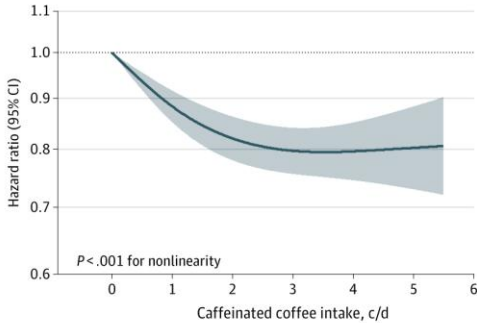
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Published online February 9, 2026.

[Supplemental content](#)

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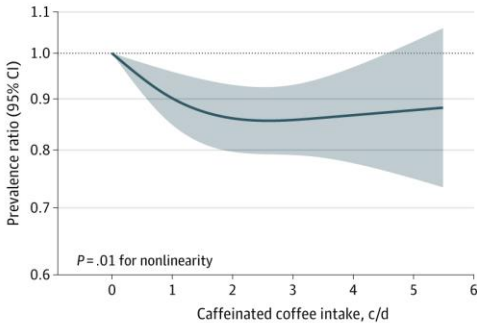
Corresponding Author: Dong D. Wang, MD, ScD, Brigham and Women's Hospital, 181 Longwood Ave, Boston, MA 02115 (dow47@mail.harvard.edu).

A Incident dementia



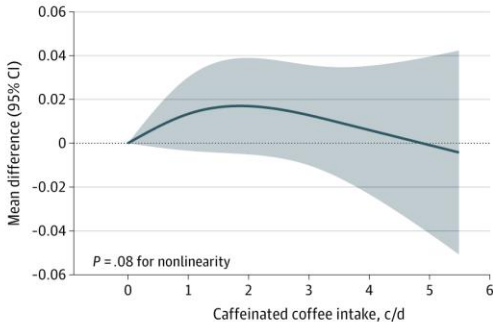
Intake, c/d	0	>0-1	>1-2	>2-3	>3-4	>4-5	>5
No. of cases	4258	2049	1940	2312	217	160	97
No. of person-years	1 287 814	688 673	707 018	1 201 839	179 839	147 466	115 202

B Subjective cognitive decline



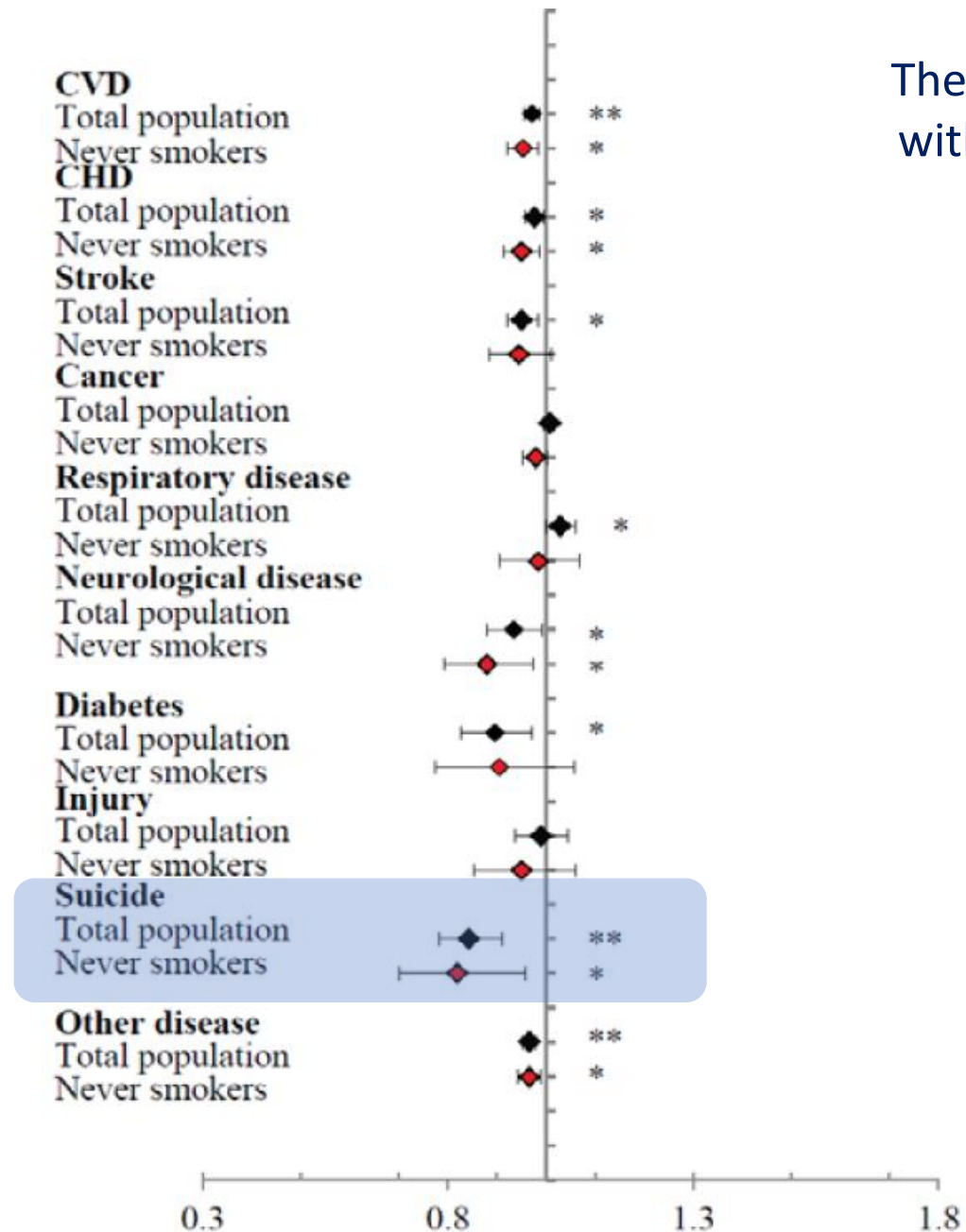
Intake, c/d	0	>0-1	>1-2	>2-3	>3-4	>4-5	>5
No. of cases	1602	1322	1229	906	146	107	42
No. of participants	16 907	13 773	13 886	11 549	1932	1421	512

C Global cognitive z score



Intake, c/d	0	>0-1	>1-2	>2-3	>3-4	>4-5	>5
Mean z score	-0.006	-0.004	0.022	0.037	0.030	0.012	-0.005
No. of participants	4653	3587	4157	3383	670	490	199

The association of 1 cup/day increase in coffee consumption with a risk of cause specific mortality in large cohort studies



Caffeinated Coffee Consumption and Health Outcomes in the US Population: A Dose–Response Meta-Analysis and Estimation of Disease Cases and Deaths Avoided

Matteo Di Maso,¹ Paolo Boffetta,^{2,3} Eva Negri,⁴ Carlo La Vecchia,¹ and Francesca Bravi¹

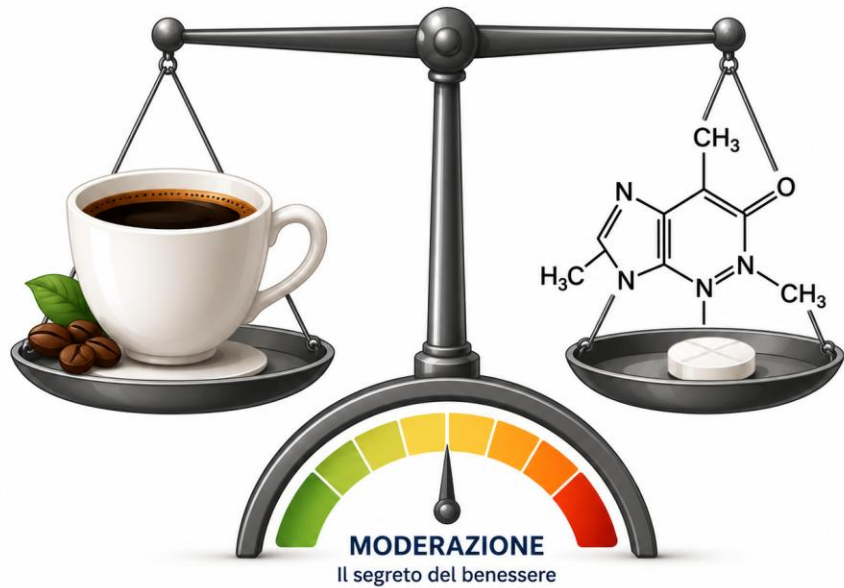
¹Department of Clinical Sciences and Community Health, Branch of Medical Statistics, Biometry and Epidemiology “G.A. Maccacaro,” Università degli Studi di Milano, Milan, Italy; ²Tish Cancer Institute, Ichan School of Medicine at Mount Sinai, New York, NY, USA; ³Department of Medical and Surgical Sciences, University of Bologna, Bologna, Italy; and ⁴Department of Biomedical and Clinical Sciences, Università degli Studi di Milano, Sacco Hospital, Milan, Italy

- We estimated, for each outcome, the fraction and the **number of cases/deaths that would be attributable to lack of coffee consumption**.
- These can be interpreted as the fraction and number of cases/deaths that were avoided based on actual consumption patterns.
- In particular, 2 different counterfactual prevalences of caffeinated coffee consumption were considered:
 - 1) **maximum prevalence reduction scenario** assuming no coffee consumption
 - 2) **shifted prevalence consumption scenario** indicating that all coffee drinkers would reduce their consumption by 1 cup/d.

TABLE 4 Attributable fraction (AF) and number of cases or deaths¹ avoided of selected outcomes according to 2 different counterfactual prevalences of caffeinated coffee consumption. United States, 1987–2017 and NHANES 2003–2004 and 2005–2006

Outcome	Maximum prevalence reduction scenario		Shifted prevalence consumption scenario	
	AF, %	Cases or deaths avoided, <i>n</i>	AF, %	Cases or deaths avoided, <i>n</i>
CVD incidence/mortality	8.1	67,520	4.5	41,145
T2D incidence	8.1	121,500	3.8	57,000
HCC incidence	5.5	2355	4.8	2055
Endometrial cancer incidence	12.4	8137	3.6	2362
Melanoma incidence	9.0	9032	4.0	4014
Nonmelanoma skin cancer incidence	6.4	345,600	2.7	145,800

¹ According to disease incidence/mortality statistics of the American Heart Association, Centers for Disease Control and Prevention, and American Cancer Society. CVD, cardiovascular disease; HCC, hepatocellular carcinoma; T2D, type 2 diabetes.



Caffè e ipertensione arteriosa

Caffè e controllo della pressione arteriosa

Caffè e ritmo cardiaco

Caffè e malattie cardiovascolari

Caffè e malattie non-cardiovascolari

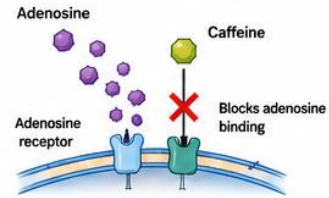
Caffè ed effetti negativi

THE EFFECTS OF CAFFEINE

Mechanisms of Action, Physiological Effects, Benefits, and Potential Adverse Effects

1. PRIMARY MECHANISM OF ACTION

Caffeine is a competitive antagonist of adenosine receptors (A1 and A2A) in the central nervous system and several peripheral tissues.



Result: ↑ Neurotransmitter release
(dopamine, norepinephrine, acetylcholine)
→ ↑ alertness, attention, and mood.

3. EFFECTS ON BRAIN FUNCTION AND MOOD

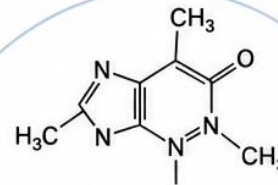


- Increases alertness, vigilance, and wakefulness
- Improves cognitive performance (memory, reaction time)
- Enhances mood and reduces perceived fatigue
- Reduces sleepiness

2. CARDIOVASCULAR EFFECTS



- Acute increase in heart rate and cardiac output
- Mild transient increase in blood pressure
- Vasodilation in skeletal muscle and cerebral circulation
- Habitual consumption is generally not associated with increased cardiovascular risk in healthy individuals



CAFFEINE (1,3,7-trimethylxanthine)

A naturally occurring psychoactive compound found in coffee, tea, cocoa, energy drinks, and some medications and supplements.

4. EFFECTS ON METABOLISM AND PHYSICAL PERFORMANCE



- Increases lipolysis and fat oxidation
- Improves exercise performance (endurance, strength, power)
- May improve insulin sensitivity and glycemic control
- Increases thermogenesis and energy expenditure

5. POTENTIAL ADVERSE EFFECTS



Anxiety, nervousness, irritability



Insomnia and sleep disturbances



Gastrointestinal symptoms (nausea, reflux)



Palpitations and tachycardia



Headache



Tolerance and psychological dependence

⚠️ Adverse effects are more likely with high doses (>400 mg/day), individual sensitivity, or consumption close to bedtime.

6. SPECIAL POPULATIONS



Pregnancy

Limit intake to <200 mg/day
Possible association with low birth weight



Children and Adolescents

Greater sensitivity to caffeine effects
High doses should be avoided



Older Adults

Slower metabolism
Increased susceptibility to adverse effects



Drug Interactions

Caffeine may interact with several medications, including:
• Theophylline
• Fluoroquinolones
• Clozapine

7. DOSAGE AND SAFETY



Generally Safe Intake
Up to 400 mg/day
(~3–5 cups of coffee)



Onset of effects: 15–45 minutes
Peak plasma concentration: 30–120 minutes
Half-life: 3–7 hours
(varies according to genetics, age, pregnancy, smoking, and medications)



KEY MESSAGE

When consumed in moderation, caffeine may improve alertness, physical performance, and mood, and is generally considered safe for most healthy adults. Excessive intake or use in susceptible individuals may lead to adverse effects, highlighting the importance of an individualized approach.

Sources: EFSA, FDA, ACSM, American Heart Association, and contemporary scientific literature.

Coffee drinking timing and mortality in US adults

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See the editorial comment for this article 'Start your day with a morning coffee!' by T. F. Lüscher, <https://doi.org/10.1093/eurheartj/ehae823>.

Abstract

Background and Aims To identify the patterns of coffee drinking timing in the US population and evaluate their associations with all-cause and cause-specific mortality.

Methods This study included 40 725 adults from the National Health and Nutrition Examination Survey 1999–2018 who had complete information on dietary data and 1463 adults from the Women's and Men's Lifestyle Validation Study who had complete data on 7-day dietary record. Clustering analysis was used to identify patterns of coffee drinking timing.

Results In this observational study, two distinct patterns of coffee drinking timing [morning type (36% of participants) and all-day-type patterns (14% of participants)] were identified in the National Health and Nutrition Examination Survey and were validated in the Women's and Men's Lifestyle Validation Study. During a median (interquartile range) follow-up of 9.8 (9.1) years, a total of 4295 all-cause deaths, 1268 cardiovascular disease deaths, and 934 cancer deaths were recorded. After adjustment for caffeinated and decaffeinated coffee intake amounts, sleep hours, and other confounders, the morning-type pattern, rather than the all-day-type pattern, was significantly associated with lower risks of all-cause (hazard ratio: .84; 95% confidential interval: .74–.95) and cardiovascular disease-specific (hazard ratio: .69; 95% confidential interval: .55–.87) mortality as compared with non-coffee drinking. Coffee drinking timing significantly modified the association between coffee intake amounts and all-cause mortality (P -interaction = .031); higher coffee intake amounts were significantly associated with a lower risk of all-cause mortality in participants with morning-type pattern but not in those with all-day-type pattern.

Conclusions Drinking coffee in the morning may be more strongly associated with a lower risk of mortality than drinking coffee later in the day.

Patterns of coffee drinking timing

Morning type
All-day type
NHANES (1999–2018)
Average of twice 24h dietary recall

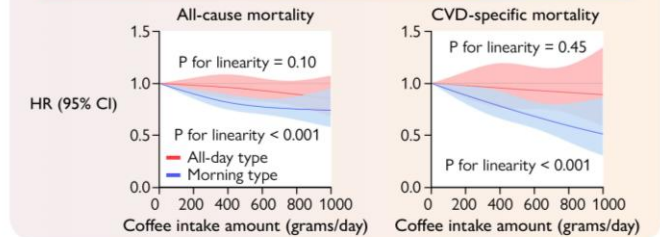
Internal validation (NHANES)
• Day 1 and day 2 dietary data
• Caffeinated and decaffeinated coffee drinking

External validation
Women's and men's lifestyle validation study
Average of twice 7-day dietary record

Outcomes

All-cause mortality
CVD-specific mortality
Cancer-specific mortality

Dose-response relationships between coffee intake amount and the risk of mortality according to patterns of coffee drinking timing



Joint association between coffee drinking timing and coffee intake amount on the risk of all-cause mortality, compared with non-coffee drinkers

Coffee intake amount, cups/day	Morning type	All-day type
> 0 to 1 cup	0.85 (0.71; 1.01)	0.85 (0.61; 1.20)
> 1 to 2 cups	0.84 (0.73; 0.96)	0.93 (0.77; 1.12)
> 2 to 3 cups	0.71 (0.60; 0.86)	0.99 (0.81; 1.22)
> 3 cups	0.79 (0.65; 0.96)	0.85 (0.71; 1.02)

HR (95% CI)

Start your day with a morning coffee!

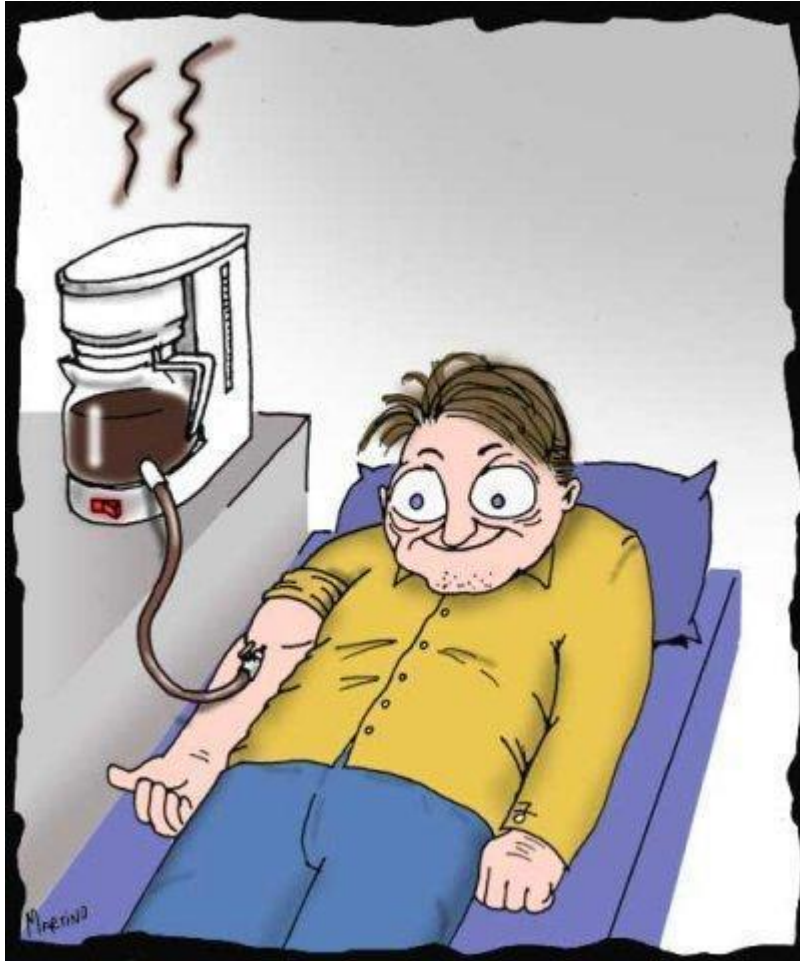
Thomas F. Lüscher ^{1,2,*}

¹Heart Division, Royal Brompton and Harefield Hospitals GSTT, Cardiovascular Academic Group, King's College, Sydney Street, London SW3 6NP, UK; and ²Center for Molecular Cardiology, University of Zurich, Switzerland

This editorial refers to ‘Coffee drinking timing and mortality in US adults’, by X. Wang et al., <https://doi.org/10.1093/eurheartj/ehae871>.

Good
morning
have a good day





I DON'T HAVE
A PROBLEM WITH
CAFFEINE
I HAVE A PROBLEM
WITHOUT IT



Common Symptoms of Caffeine Withdrawal



Dizziness



Nausea



Fatigue



Brain fog



Severe headache



Negative mood

Impact of coffee and caffeine on health and disease

Impact of coffee on cardiometabolic and brain health

Acute effects



Longterm effects



Alertness



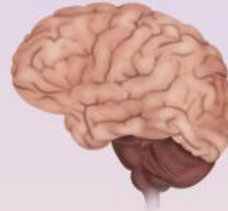
Concentration



Mood



Sleep disturbances



Depression



Parkinson's disease



Alzheimer's



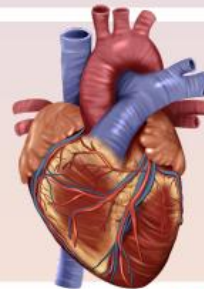
Anti-inflammation



Tachycardia



Palpitations



Total mortality



Cardiovascular mortality



Reduction in diabetes



Blood pressure



Blood pressure



Caffeine

Coffee