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Physical activity and blood pressure in a Mediterranean population of not hypertensive adults

The importance of blood pressure (BP) control for the prevention of the main cardiovascular diseases emerges in the general population. Anthropometric characteristics and lifestyle habits have been widely recognized to influence BP values. A relevant role has been attributed to physical activity (PA) habits. It is well documented that regular moderate to vigorous PA may be beneficial for both prevention and treatment of hypertension while low levels of PA may precede hypertension onset.

Studies assessing the relationship between PA and BP values in not hypertensive subjects are spare and often not adjusted for anthropometric measurements and other individual characteristics related to lifestyle.

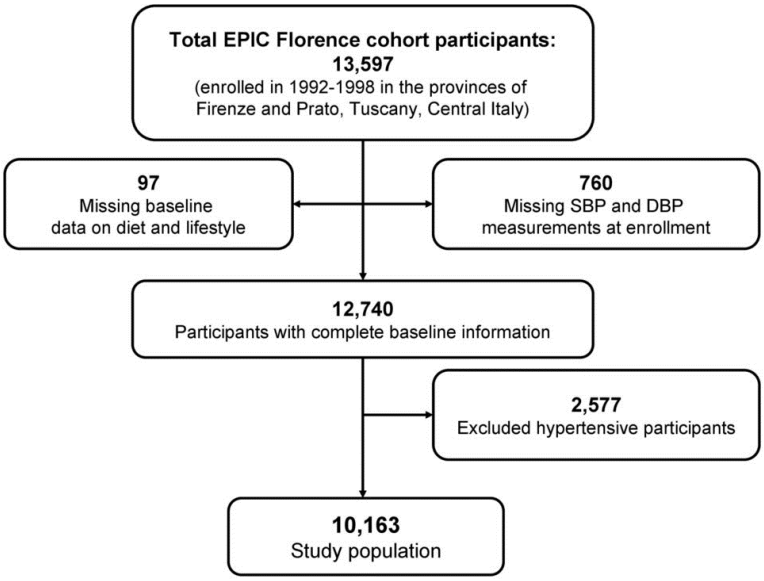

Fig. 1. Flowchart of the study population. EPIC, European Prospective Investigation into Cancer and Nutrition; SBP, systolic blood pressure; DBP, diastolic blood pressure.

We evaluated, in a large population of not hypertensive adults residing in Tuscany, central Italy, the influence of total PA and its various components (occupational, household and recreational activities) on systolic (SBP) and diastolic blood pressure (DBP) values. Individual characteristics related to lifestyle, socioeconomic status and anthropometric measurements were considered.

Overall, 13,597 individuals of both sexes, residing in Florence and Prato (Tuscany), aged 35-64 years, were enrolled between 1993 and 1998 in the local cohort of the EPIC study *. Information on occupational and leisure-time PA and BP were collected at recruitment, together with data on lifestyle and dietary habits, health status and anthropometry.

To assess PA habits subjects were asked to classify their current occupation into sedentary, standing, manual or heavy manual work. Subjects were also requested to indicate the number of hours they spent weekly in recreational activities (walking, cycling, fitness) and household activities (do-it-yourself, housework, gardening, stairs climbing). Based on the combination of occupational, recreational and household PA, each individual was assigned to one of the four categories (inactive, moderately inactive, moderately active and active) of a total PA index. Similarly, based on the combination of occupational PA with weekly hours of cycling and sports, each subject was classified according to the four categories of a second PA score named the Cambridge index.

SBP and DBP were measured at enrolment by specifically trained operators with the use of a mercury sphygmomanometer.

Overall, 857 subjects were excluded due to missing SBP and DBP measurements or missing data on dietary and lifestyle variables. Moreover 2,577 individuals reporting at recruitment a previous diagnosis of hypertension were excluded (Fig. 1). The effect PA on SBP and DBP values were evaluated on the remaining 10,163 individuals, with a cross-sectional design, by multivariate regression models adjusted for gender, age, BMI, smoking history, educational level, total daily calories intake.

	DBP		SBP	
	Beta [5]	**p**	**Beta** [5]	**p**
Total physical activity index (ref. inactive) [1]				
Moderately inactive	-0.14	0.57	-0.56	0.16
Moderately active	-0.30	0.21	-0.09	0,82
Active	**-0,87**	**0.02**	-0.67	0.25
p for trend		**0.02**		0,88
Cambridge index (ref. inactive) [2]				
Moderately inactive	-0.22	0.33	**-1.04**	**0.005**
Moderately active	-0.45	0.10	**-1.36**	**0.002**
Active	**-0.84**	**0.003**	**-1.14**	**0.01**
p for trend		**0.002**		**0.006**
Occupational activities (ref. sedentary-standing occupation)				
Manual-heavy manual occupation	**-0.70**	**0.02**	0.06	0,9
Unemployed	0.22	0.31	0.33	0.35
Recreational activities (MET-hours/week) [3]				
(ref. I tertile: men 0-15.8, women 0-12.8)				
II tertile (men 16.5-36.8, women 13.5-29.3)	-0.06	0,79	0.34	0.32
III tertile (men 37.5-210.0, women 30.0-219.0)	-0.19	0.38	-0.02	0,96
p for trend		0.37		0,93
Household activities (MET-hours/week) [4]				
(ref. I tertile: men 0-7.1, women 0-71.9)				
II tertile (men 7.1-19.4, women 72.1-109.3)	-0.14	0.51	-0.08	0,82
III tertile (men 19.7-131.7, women 109.6-273.1)	-0.35	0.13	0.38	0.32
p for trend		0.13		0.33

Fig. 2. Multivariate regression coefficients of physical activity variables on diastolic blood pressure (DBP) and systolic blood pressure (SBP) in the 10,163 not hypertensive study participants. Multivariate regression models are adjusted for

gender, age, body mass index, smoking history, educational level, and total daily calories intake.
(1) Four categories (inactive, moderately inactive, moderately active and active) obtained through a cross-classification of occupational physical activity and the sex specific quartiles of the total weekly energy expenditure (MET-hours/week) for recreational and household activities.
(2) Four categories (inactive, moderately inactive, moderately active and active) obtained through a cross-classification of occupational physical activity and the four categories of cycling and sport activities weekly duration (hours/week).
(3) Amount of energy expended during an average week (MET-hours/week) for walking, cycling and fitness activities.
(4) Amount of energy expended during an average week (MET-hours/week) for do-it-yourself, housework, gardening and stair climbing activities.
(5) Regression coefficient. It represents the adjusted difference in DBP or SBP values (mmHg) between each physical activity category and the specific reference category.

Mean values of SBP and DBP in the study subjects were 124.4 (SD 15.6) and 79.7 mmHg (SD 9.4), respectively. Total PA index and Cambridge index were both inversely associated with DBP values overall and among females. SBP values were inversely associated with the Cambridge index overall and among females. An overall inverse association between manual occupations and DBP values as compared to sedentary-standing occupations also emerged (Fig. 2). A modest but significant inverse association was evident between cycling and DBP.

This study carried out in a large Mediterranean population of not hypertensive individuals confirms the previously reported beneficial effects of overall PA on BP values, thus contributing to support the preventive role of PA against hypertension onset.

* *European Prospective Investigation into Cancer and Nutrition (EPIC) is a large study conducted in 10 European countries aimed to examine the role of dietary, biological, lifestyle, and environmental factors in the aetiology of cancer and other chronic diseases.*

Bendinelli Benedetta, Giovanna Masala
Cancer Risk Factors and Lifestyle Epidemiology Unit, Institute for cancer research, Prevention and Clinical Network – ISPRO, Florence, Italy

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