Walking four times weekly for at least 15 min is associated with longevity in a Cohort of very elderly people

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ABSTRACT

Objectives: This study investigated the role of walking outdoors on longevity, controlling for individual and other life-style factors as possible confounders.

Methods: A 10-year cohort study was conducted with 152 self-caring and mobile, mean age 80 years, were enrolled in the study. Information on socio-demographic characteristics, clinical and biochemical data, diet, physical activity, smoking, depression status, cognitive status and anthropometrics measurements, were obtained for all participants. Cox proportional-hazards models were used to determine independent predictors of longevity.

Results: During the 10-years of follow-up, 96 (63%) died. Old age, chronic diseases, smoking, depression, CD4/CD8 ratio and coffee consumption were significantly predictors of mortality. Over-all survival was highest for subjects walking at open air for 4 times weekly for at least 15 min in comparison to subjects walking less than 4 times weekly (40% versus 22%). After adjusting for sex, age, education, chronic diseases, smoking, Body Mass Index and CD4/CD8 ratio, elderly people walking at open air for four times weekly had 40% decreased risk of mortality that individuals who walked less than four times weekly [relative risk (RR) = 0.53; 95% confidence interval (CI) = 0.32–0.88, p = 0.01].

Conclusions: Findings suggest an independent and protective effect of walking on mortality and supports the encouragement of physical activity in advanced age for increasing longevity.

1. Introduction

Aging is associated with a dysregulation of the immune system [1] high formation of free radicals, accumulation of free-radical damage and decrease antioxidant capacity [2]. A decline of the absolute number of T-cells (CD3+), involving both CD4+ and CD8 subsets and an increase of NK cells and a reduction of B-cells has been suggested to be associated with aging [1]. These dysregulations of the immune system and increased lipid peroxidation are, in turn, associated with an increase in incidence of infections, chronic diseases [1] and mortality [3]. In some instances, however, persons 70 years of age and older maintain an immunologic vigor at levels seen among the young [1]. Age-related decline of immune function and longevity may be partially due to extrinsic factors such as life-style behavior. Diet, including alcohol consumption, smoking and physical activity [4–7] have been suggested to influence immune response. A diet rich in antioxidants may play a role in maintaining the immunologic vigor by preventing free-radical damage [7]. Because adults decrease their consumption of foods they may also reduce their consumption of antioxidants [8,9]. Moderate physical activity has been also shown to enhance the immune function mainly in less fit subjects or sedentary population [6]. On the other hand, cigarette smoking has been long known to influence immune response and increase mortality [10]. This study investigated the role of walking outdoors on longevity, controlling for individual and other life-style factors as possible confounders.

2. Methods

2.1. Study population

Between March and May 1993, 209 elderly people 65 years of age and older who were residing in a home for older people in Rome, Italy (Casa di Riposo Roma III) were contacted. On the basis of an

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Table 1
Socio-demographics, anthropometric and clinical characteristics of the subjects: 10-year survival and crude relative risks (RR) and 95% confidence intervals.

| | Subjects | Survivors | Survival | | | |
	N. (%) [a]	N.	%	p-Value[b]	RR (95%CI)[c]	p-Value
Sex						
Males	51 (33.6)	16	30.1		1	
Females	101 (66.4)	40	37.8	0.13	0.73 (0.48–1.10)	0.13
Age, years						
≤79	63 (41.4)	35	55.1		1	
80–84	50 (32.9)	16	27.3		1.86 (1.12–3.07)	0.02
≥85	39 (25.7)	5	12.3	<0.0001	3.39 (2.05–5.63)	<0.0001
Education, years						
0–8	102 (82.3)	35	34.2		1	
>8	22 (17.7)	7	31.8	0.75	1.09 (0.62–1.91)	0.76
Marital status						
Single	52 (35.1)	21	39.8		1	
Married	21 (14.2)	10	47.6		0.90 (0.45–1.80)	0.78
Windowed/divorced	75 (50.7)	24	29.3	0.42	1.27 (0.81–1.99)	0.29
Body mass index (kg/m^2)						
High (≥25)	95 (66.0)	37	37.2		1	
Low (<25)	49 (34.0)	15	30.5	0.05	1.51 (0.98–2.30)	0.06
Arm muscle area (cm^2)						
Low (<39)	87 (65.49)	28	31.5		1	
High (≥39)	46 (34.6)	18	38.4	0.35	0.81 (0.52–1.27)	0.37
Chronic disease[d]						
No	81 (57.4)	37	43.8		1	
Yes	60 (42.6)	15	24.6	0.001	1.96 (1.29–2.98)	0.002
Cognitive function (score)						
Normal	123 (83.7)	49	38.2		1	
Abnormal[e]	24 (16.3)	6	24.3	0.18	1.42 (0.85–2.38)	0.18
Depressive symptoms						
No	85 (57.89)	37	42.2		1	
Yes[f]	62 (42.2)	18	27.0	0.03	1.57 (1.04–2.37)	0.03
Ever smoking						
Yes	62 (42.8)	17	27.0		1	
No	83 (57.2)	37	42.2	0.03	0.64 (0.43–0.97)	0.04

[a] Totals may vary because of missing values.
[b] Log-rank test.
[c] Evaluated by Cox's proportional model.
[d] At least one of the following physician-reported diagnosis: diabetes mellitus, cardiovascular diseases, stroke, chronic bronchitis, liver and renal disease.
[e] Six or less in mental test score.
[f] Seven or more symptoms of GDS-15 scale.

initial review of clinical records available at the home and interviews with medical staff individuals with mental health problems or suffering from a terminal disease were excluded. Primary activities of daily living were evaluated using the Barthel Index [11]; subjects scoring eight or less of 20 were considered disabled and were excluded from the study. A checklist for the presence of chronic diseases (diabetes, cardiovascular diseases, stroke, chronic bronchitis, liver and renal diseases) was completed by the medical staff. Only residents free of immune system disorders, cancer, recent infection (within 2 weeks of blood collection), and severe renal diseases, and who had not been taking cortisone or other immune modulators for the previous 3 months, were eligible for the study. Of the initial population, 8 elderly subjects were excluded from the analysis because of mental impairment and 11 because they were not eligible for the study because of health problems and 15 because they had a low disability score (Barthel index ≤ 8) and 23 individuals refused to take part in the study. Thus a total of 152 self-caring and mobile elderly subjects donated blood and were included in the analysis.

Prior to data collection, participants were informed about methodology and objectives of the study and were asked to give their consent to participate. The study protocol followed the ethical requirements for conducting experimental studies established by the European Economic Community (EEC document n. 91/507). The study protocol was approved by the local Ethics Committee of the Catholic University of Rome.

A trained researcher interviewed each participant using a standardized health and nutritional questionnaire that included information on cognitive status, depressive symptoms, dietary habits, smoking and physical exercise.

The Abbreviated Mental test was used to assess cognitive function, with a score of less than seven suggesting abnormal cognitive function. The Geriatric Depression Scale was used to detect symptoms of depression [11] using a threshold of seven or more of the 15 items.

A weekly semiquantitative food-frequency questionnaire was used to assess food intake. The 114-item questionnaire was designed and validated by the Italian National Institute of Nutrition [12]. The analysis presented in this paper is part of a broader prospective epidemiological study on diet, immunity and oxidative status in an elderly population [13,14]. The consumption of fruits, vegetables, the use of olive oil, wine, tea and coffee were included as key variables because they are known to be rich in antioxidants [15] and fish rich in n-3 fatty acids because they are known to play a role on immune response [16].

Current smokers were defined as those who smoked at least one cigarette per day or had stopped smoking cigarette during the past 12 months. Former smokers were defined as those who previously smoked, but had not done so for a year or more. Both former and current smokers constituted the group of ever smokers.

The physical activity questionnaire, introduced in 1993 at the baseline evaluation, was adapted from the Voorrips elderly questionnaire [17]. The variable walking was categorized as follows: (1) No walking (2) walking outdoors 1–3 times weekly for more than 15 min (3) walking outdoors 4 times or more weekly for more than 15 min.