High levels of participation in physical leisure activities protects MCI subjects against the risk of dementia

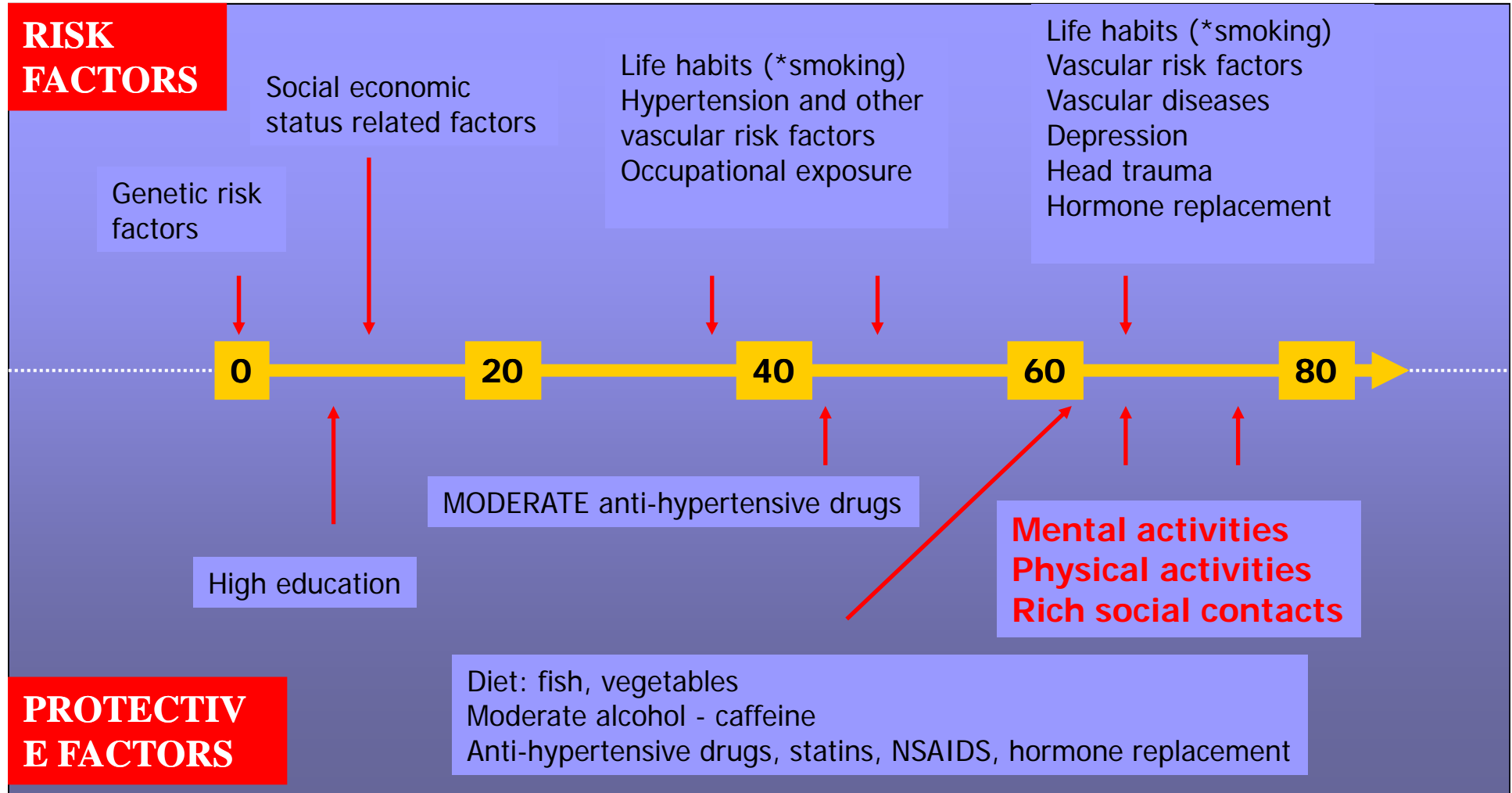**Grande G. [1], Cova I.[1] , Maggiore L. [1], Pomati S. [1], Cucumo V. [1], Ghiretti R. [1], Forcella M.[1], Galimberti D.[3], Scarpini E.[3], Vanacore N[2], Mariani C[1], Clerici F.[1]**

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Background

RISK FACTORS

Genetic risk factors

Social economic status related factors

Life habits (*smoking)
Hypertension and other vascular risk factors
Occupational exposure

Life habits (*smoking)
Vascular risk factors
Vascular diseases
Depression
Head trauma
Hormone replacement

0   20   40   60   80

High education

MODERATE anti-hypertensive drugs

Mental activities
Physical activities
Rich social contacts

PROTECTIVE FACTORS

Diet: fish, vegetables
Moderate alcohol - caffeine
Anti-hypertensive drugs, statins, NSAIDS, hormone replacement

Modified from Fratiglioni L. et al. 2004

Aim

To study the influence of life style on the risk

of progression of Mild Cognitive Impairment (MCI)

to dementia.

MCI: definition

- **Memory complaint**, preferably corroborated by an informant and **objective memory impairment** (defects ≥1,5 SD below age and education- corrected norms)

- **Intact activities of daily living** (ADL- IADL)

- **Not demented**

Winblad, 2004

Methods

- **Design**: Cohort study

- **Setting**: Memory Clinic

- **Enrolment**: January 2001-May 2011

- **Inclusion criterion**: MCI *(Winblad 2004)* with at least 12 months of follow-up

- **Baseline Assessment:** clinical evaluation, neuropsychological examination, blood chemistry, CT/MRI, Geriatric Depression Scale, APOE genotype

Follow-up: annual clinical and neuropsychological controls

- **Outcome:** progression to dementia *(DSM IV)*
    - Dementia subtypes were diagnosed according to current established criteria
    - In few cases (8%) cognitive status was ascertained from an informant using CDR scale[1]

[1] Waite 1999

Baseline assessment of leisure activities:

- Physical activities
4 items

	1/dì	1/sett	1/mese	1/anno	+ raro	mai
Fare sport						
Camminare						
Viaggiare						
Fare giardinaggio						

- Cognitive activities
16 items

	1/dì	1/sett	1/mese	1/anno	+ raro	mai
Leggere						
Puzzles						
Cultura						
Borsa						
Radio						
Pitturare et al.						
Francobolli						
Scrivere						
Carte						
Corsi						
TV						
Amici						
Chiesa						
Bingo						
Strumento						
Solitari						

- Social activities
11 items

	1/dì	1/sett	1/mese	1/anno	+ raro	mai
Villeggiatura						
Concerti						
Musei						
Cantare						

	1/dì	+ vv/sett	1/sett	1/mese	+ raro	mai	Non c'è
Figli							
Nuore/generi							
Nipoti							
Germani							
Vicini							
Amici							
Caregiver							
Altro							

According to literature [1] we coded self- reported frequency of participation to generate a scale: for each activity, subjects received:

7 points for **daily** participation,

4 points for **weekly** participation,

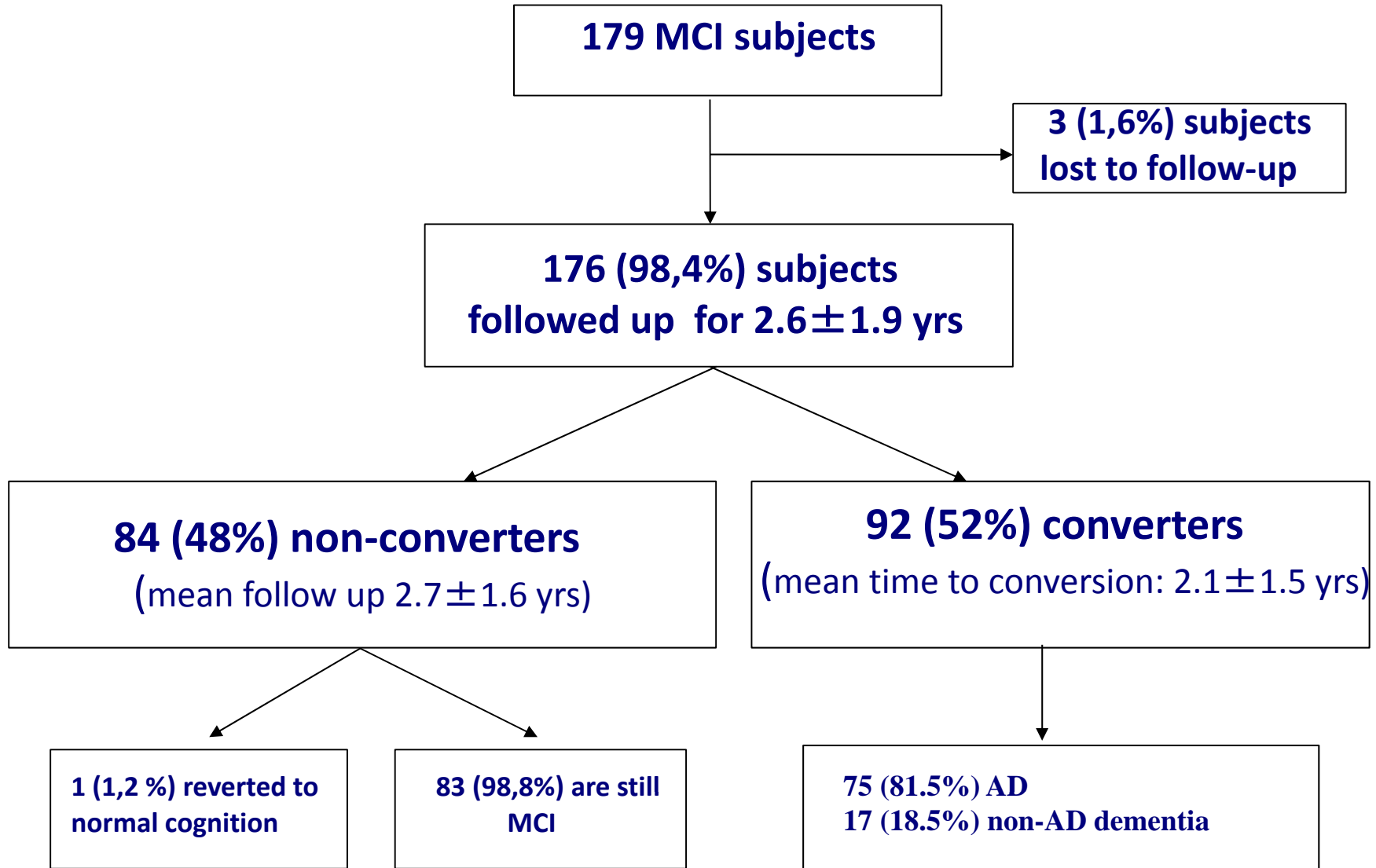1 points **for monthly or once a year** participation and

0 point for participating **occasionally or never.**

We summed these encodings to generate:

- Physical Activity Scale
- Cognitive Activity Scale
- Social Activity Scale

[1] *Verghese J. et al. Leisure activities and the risk of amnestic mild cognitive impairment in the elderly Neurology 2006*

Flow diagram of the study

Tab. 1

Baseline characteristics the whole MCI sample and by outcome at follow- up

Subject characteristics	MCI N= 176	MCI at follow-up N= 84	Dementia at follow- up N= 92	P
Age yrs, mean (sd)	74.0 (7.4)	72.2 (8.2)	75.7 (6.1)	0.001
Female, n (%)	102 (58)	48 (47.1)	54 (52.9)	n.s.
Education yrs, mean (sd)	7.8 (8.2)	7.1 (3.6)	8.5 (4.6)	0.03
MMSE score, mean (sd)	25.4 (2.6)	26.0 (2.5)	24.0 (2.6)	0.002
GDS score, mean (sd)	9.5 (6.2)	10.6 (6.3)	8.4 (5.9)	0.02
APOE ε4* $\geq$ 1 allele, n (%)	50 (37)	18 (36)	32 (64)	0.045
MCI subtypes, n (%)				0.006
Amnestic single domain	39 (22.2)	18 (46.2)	21 (53.8)	
Non-amnestic single domain	28 (15.9)	21 (75.0)	7 (25.0)	
Amnestic multiple domains	109 (62.9)	45 (41.3)	64 (58.7)	

* APOE genotype was determined in a subgroup of 135 subjects (76.7%)

Tab. 2

Baseline Cognitive, Social and Physical activities scores in MCI subjects by outcome at follow-up and Hazard ratios (HR) of dementia in relation to baseline Cognitive, Social and Physical activities scores

Subjects characteristics	MCI at follow-up N=84	Dementia at follow-up N=92	HR* (95% CI)
Physical activity score§, n (%)			
0-2 points	29 (35.8)	43 (47.2)	1.00
3-5 points	32 (39.5)	28 (30.8)	0.68 (0.37-1.22)
6-12 points	20 (24.7)	20 (22)	0.44 (0.23-0.85)
Cognitive activity score§, n (%)			
0-7	39 (48.2)	37 (40.6)	1.00
8-10	21 (25.9)	19 (20.9)	0.66 (0.32-1.66)
1-25	21 (25.9)	35 (38.5)	0.97 (0.50-1.85)
Social activity score, n (%)			
0-11	36 (42.9)	26 (28.3)	1.00
12-19	26 (30.9)	35 (38.0)	1.21(0.61-2.38)
20-37	22 (26.2)	31 (33.7)	1.02 (0.54-1.94)

Adjusted for sex, education, Mini-Mental State Examination score, Depression Geriatric Scale score, MCI subtype and APOE genotype

Fig 1.
Cumulative Hazard curves for the risk of development of dementia in subjects with MCI according to tertiles on baseline Physical Activity Scale scores.
Adjusted for sex, education,, Mini-Mental State Examination score, Depression Geriatric Scale score, MCI subtype and APOE genotype
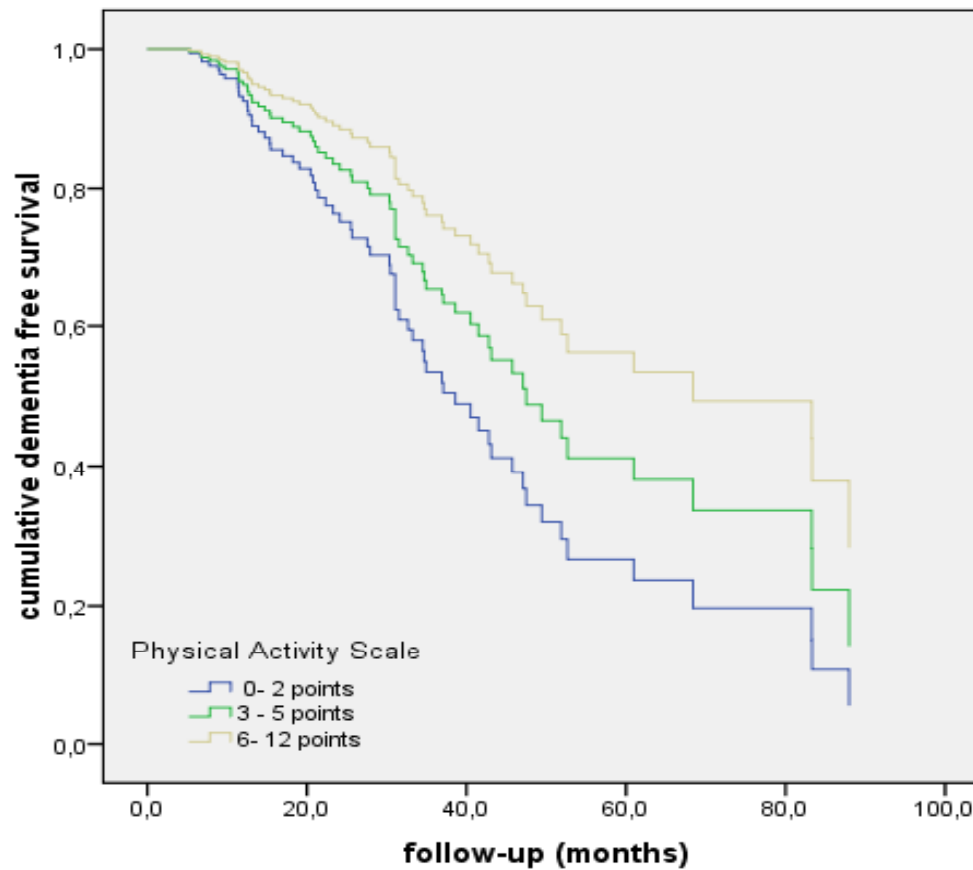
Discussion I

PAR=population attributable risk. *Absolute number.

Table: Alzheimer's disease cases attributable to potentially modifiable risk factors worldwide and in the USA

Barnes et al. The projective effect of risk factor reduction on Alzheimer's disease prevalence, Lancet Neurol 2011

Discussion II

- To our knowledge, this is the first prospective clinical study which demonstrates that high levels of participation in physical leisure activities is associated with reduced risk of dementia in subjects with MCI attending a memory clinic.

- Cognition may benefit from physical activity by several mechanisms believed to provide cognitive reserve against brain damage, including cerebral blood flow improvement, synaptic plasticity stimulation, trophic factors secretion and neurogenesis.

Conclusion:

Clinicians should encourage MCI subjects to perform physical activity.

Aknowledgements