NEW SCIENTIFIC ADVANCES IN EXERCISE PHYSIOLOGY

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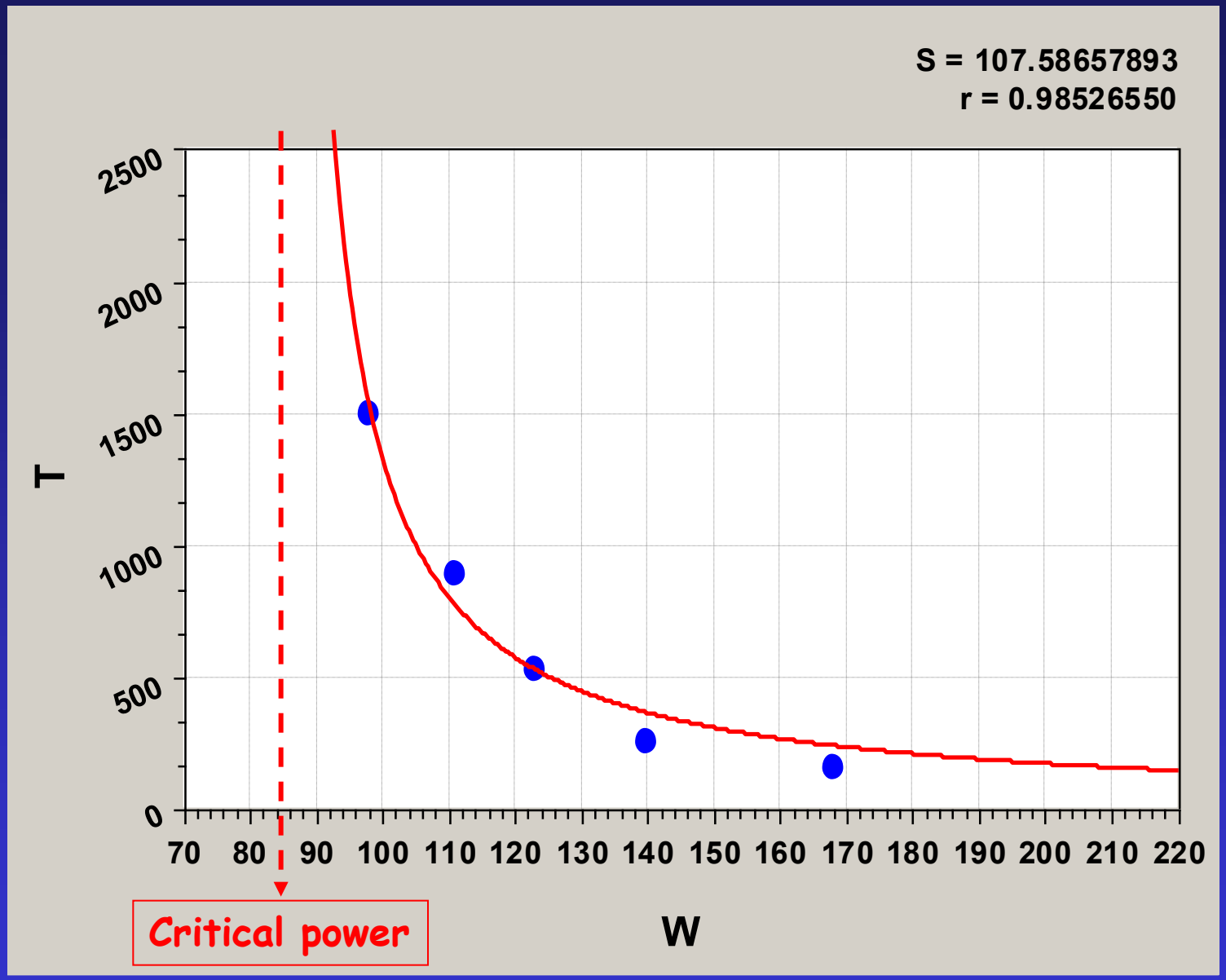
'Critical power' as the upper limit for prolonged aerobic exercise or, in other words, as the maximum prescriptible 'dose' of continuous aerobic training intensity in both normal subjects and cardiac patients.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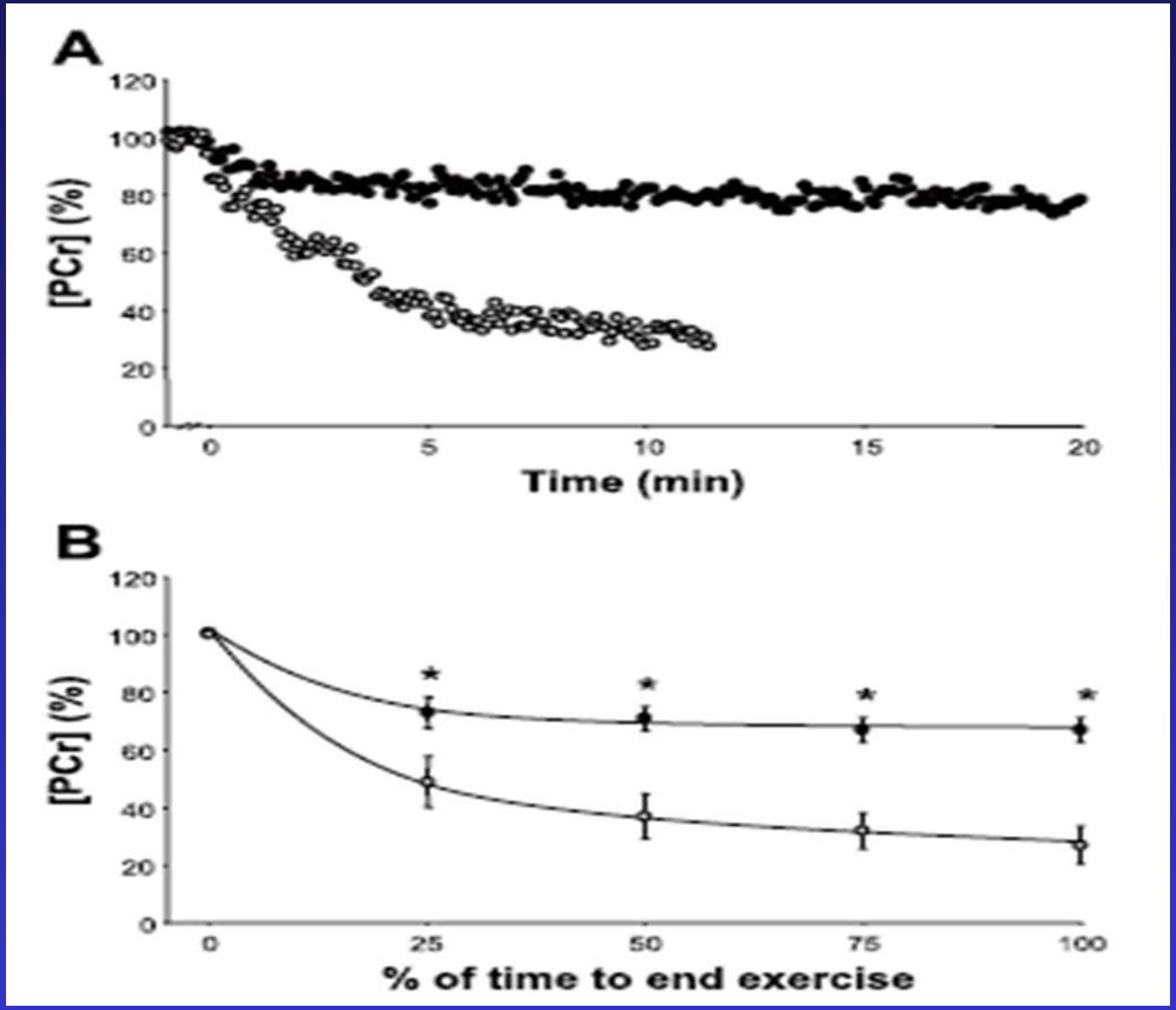
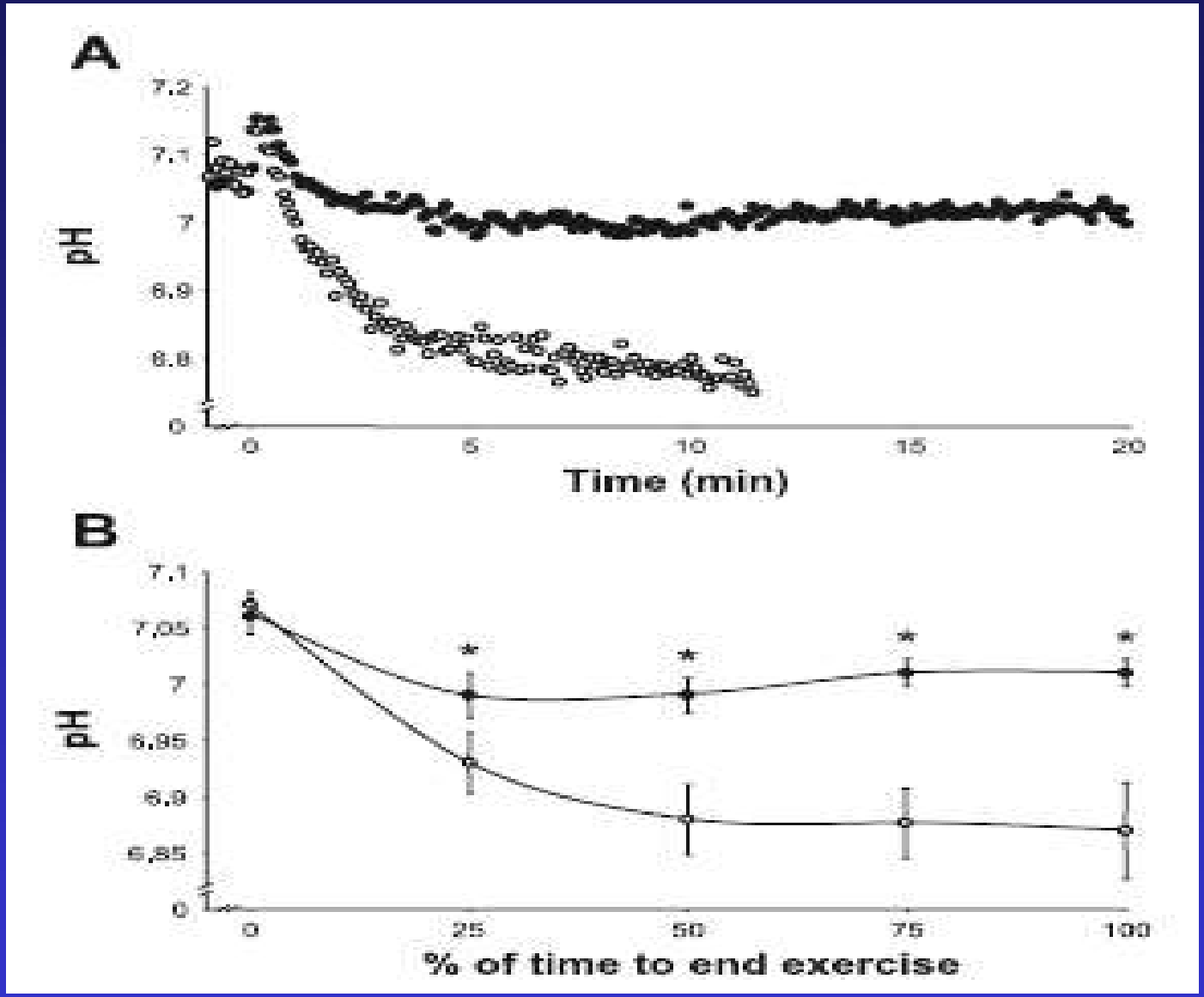
Critical power



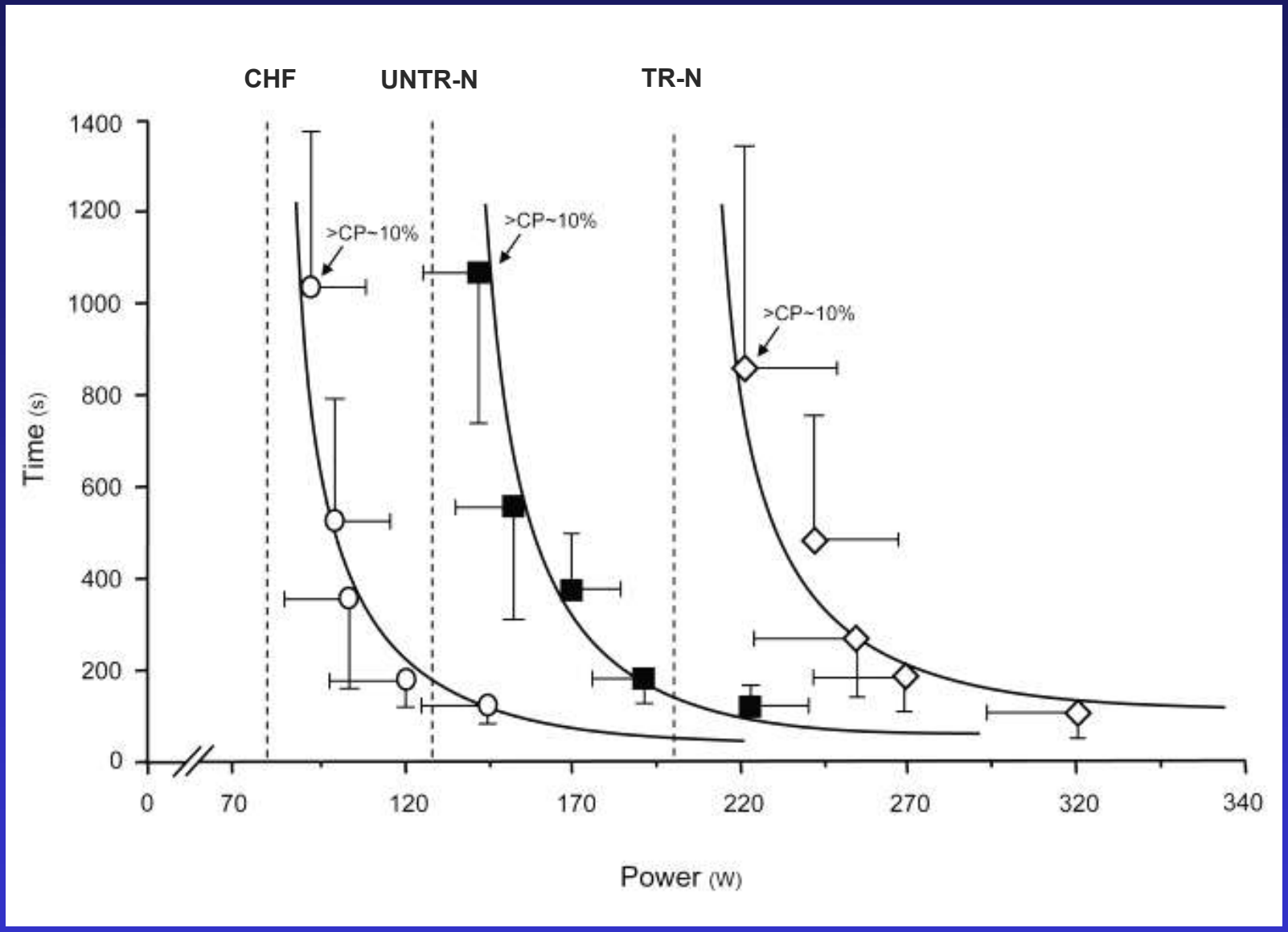
Jones AM, J Appl Physiol 2008



Jones AM, J Appl Physiol 2008

Specifically, the CP appears to demarcate a range of work rates within which muscle [PCr], [Pi], and pH can be rapidly stabilized and sustained close to resting values from those (…) that might predispose the muscle to the development of fatigue. The CP concept therefore has theoretical and practical utility in exercise physiology as a model for exploring the mechanistic bases of muscular fatigue and the determinants of human exercise tolerance.

Jones AM, J Appl Physiol 2008



Mezzani A, Med Sci Sports Exerc *in press*

	CHF	UNTR-N	TR-N
Exercise time (min)	29.9±0.6	30±0	30±0
CP (W)	80±21 *	129±17 †	199±35
%peak power	66±6	66±6	74±3 ‡
SS VO_2 (ml/kg/min)	17.5±3.7 *	23.8±4.0 †	36.0±4.5
%peak VO_2	96±5	83±6 §	93±10
SS [Lactate] (mmol/l)	5.6±0.6	6.2±0.5	4.8±0.6

Mezzani A, Med Sci Sports Exerc *in press*

Aerobic exercise as a neuro-protective intervention, based on demonstrable biological effects and determining improvements in cognitive function.

EuroPRevent 2009
Exercise Physiology Poster Prize

PHYSICAL ACTIVITY AND 5-YEAR COGNITIVE DECLINE IN MIDDLE-AGED MEN AND WOMEN

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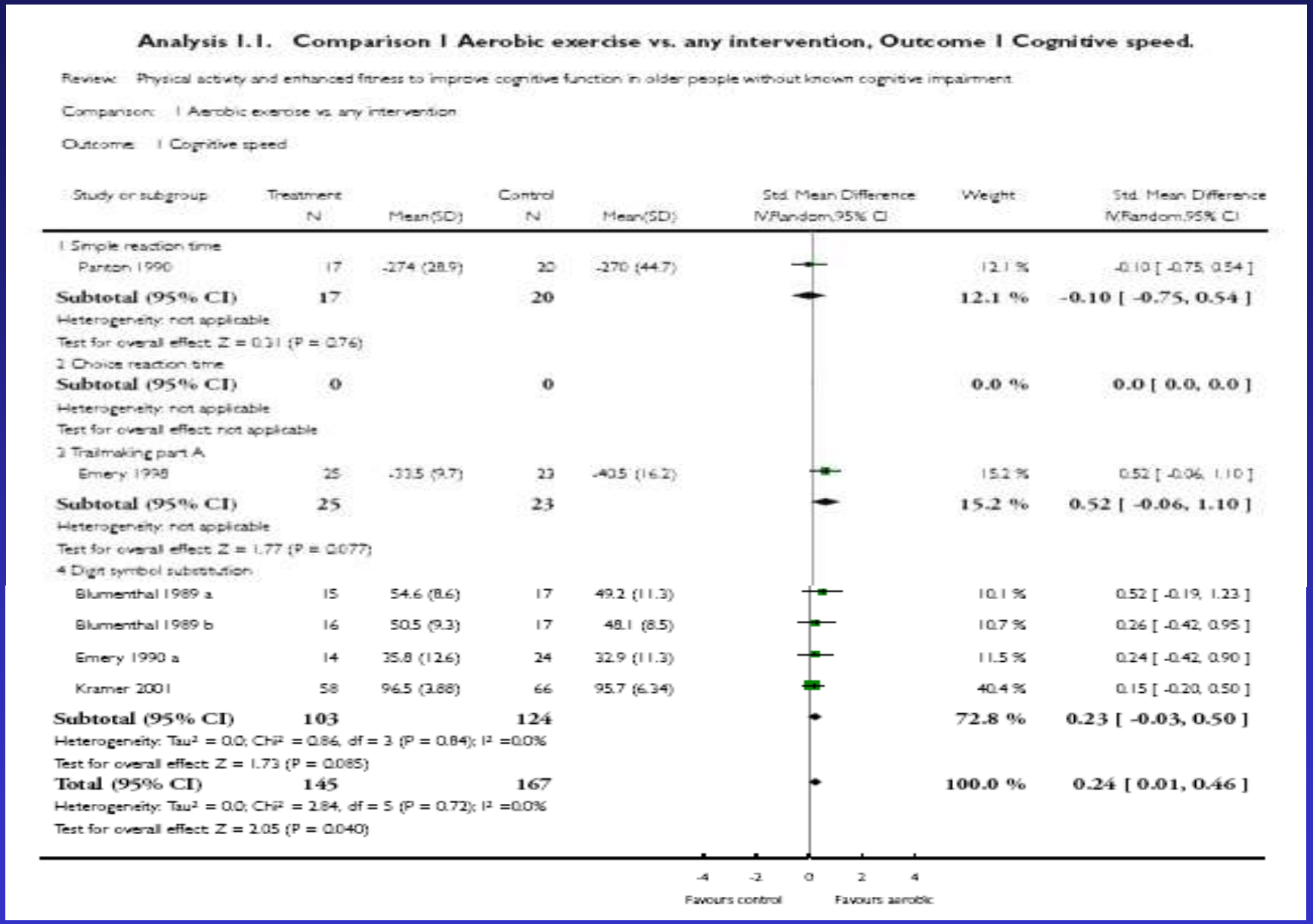
Aim of the study: to test a possible relationship between changes in the time spent on or the average intensity of weekly physical activities and changes in cognitive function.

Methods: 1904 healthy, middle-aged men and women. Physical activity habits and cognitive function assessed twice with an interval of 5 years.

Results: changes in the time spent on physical activities were not related to changes in cognitive function. On the contrary, changes in average intensity of weekly activities were significantly related to processing speed (b 0.063, $p < 0.05$).

Conclusions: in this longitudinal cohort study, an increase in the average intensity of weekly physical activities was related to a smaller age-related decline in processing speed.



Angevaren M, Cochrane Database Syst Rev 2008

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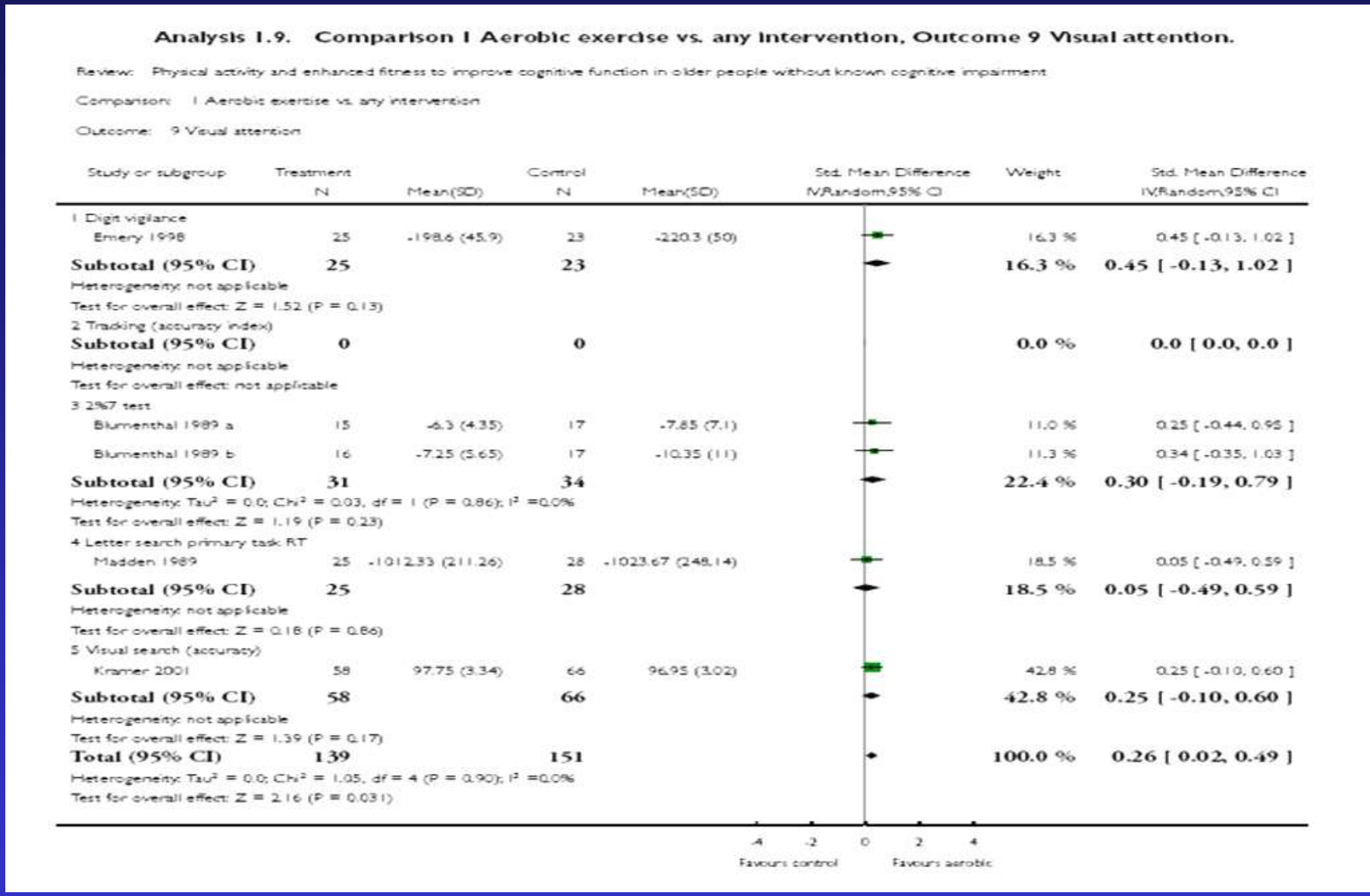

Angevaren M, Cochrane Database Syst Rev 2008

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Analysis 2.10. Comparison 2 Aerobic exercise vs. no intervention, Outcome 10 Auditory attention.

Review: Physical activity and enhanced fitness to improve cognitive function in older people without known cognitive impairment

Comparison: 2 Aerobic exercise vs. no intervention

Outcome: 10 Auditory attention

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 Digit span forward							
Blumenthal 1989 a	15	8 (2.3)	18	8.3 (2)		6.9 %	-0.30 [-1.79, 1.19]
Blumenthal 1989 b	16	9.8 (2.6)	16	9.3 (2.4)		4.7 %	0.50 [-1.31, 2.31]
Fabre 2002	8	6.1 (0.7)	8	5.6 (0.3)		54.7 %	0.50 [-0.03, 1.03]
Hassmn 1997 a	10	8 (1.3)	10	7.4 (1.3)		11.7 %	0.60 [-0.54, 1.74]
Hassmn 1997 b	10	7.6 (0.95)	10	6.8 (0.95)		22.0 %	0.80 [-0.03, 1.63]
Total (95% CI)	**59**		**62**			**100.0 %**	**0.52 [0.13, 0.91]**

Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 1.63$, df = 4 (P = 0.80); $I^2 = 0.0\%$

Test for overall effect: Z = 2.62 (P = 0.0087)

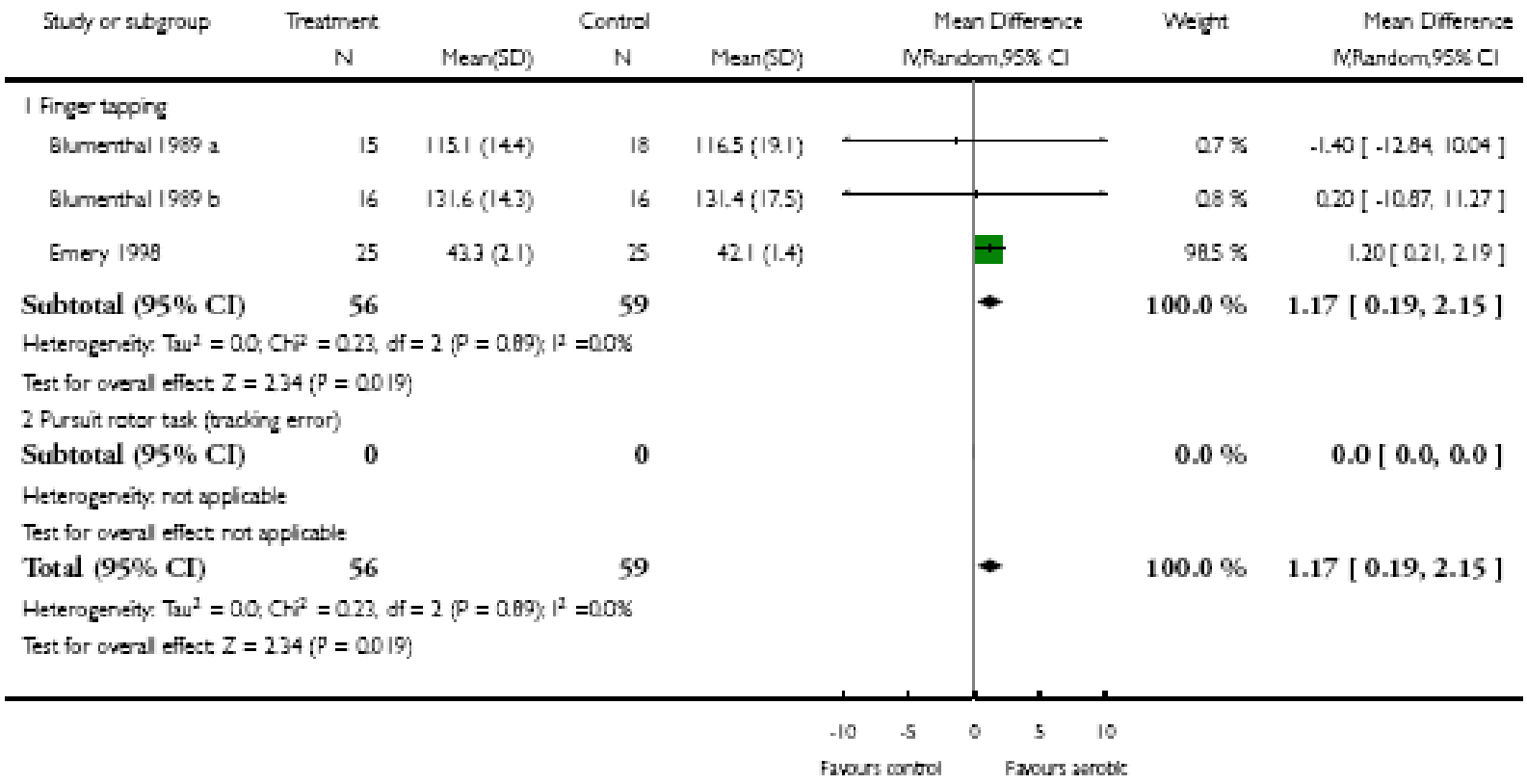
Angevaren M, Cochrane Database Syst Rev 2008

Analysis 2.11. Comparison 2 Aerobic exercise vs. no intervention, Outcome 11 Motor function.

Review: Physical activity and enhanced fitness to improve cognitive function in older people without known cognitive impairment

Comparison: 2 Aerobic exercise vs. no intervention

Outcome: 11 Motor function



Angevaren M, Cochrane Database Syst Rev 2008

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PHYSICAL ACTIVITY AND NEUROPROTECTION

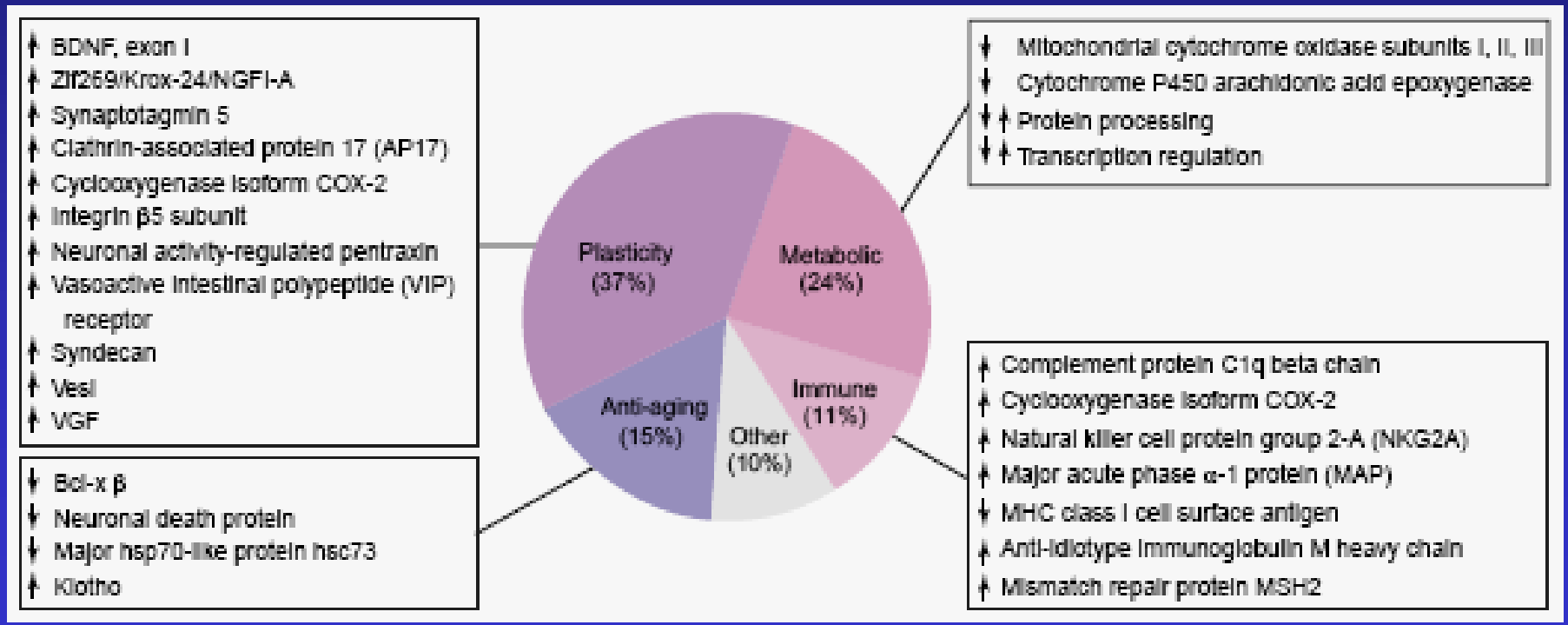
1) Improved axonal transport
2) More efficient neuromuscular synapse communication
3) Heigthened gene expression and protein synthesis
4) Increased astrocyte proliferation
5) Increased angiogenesis
6) Increased circulating and tissue growth factors (VEGF, BDNF, GDNF, CNTF, IGF-1)

Exercise Enhances and Protects Brain Function

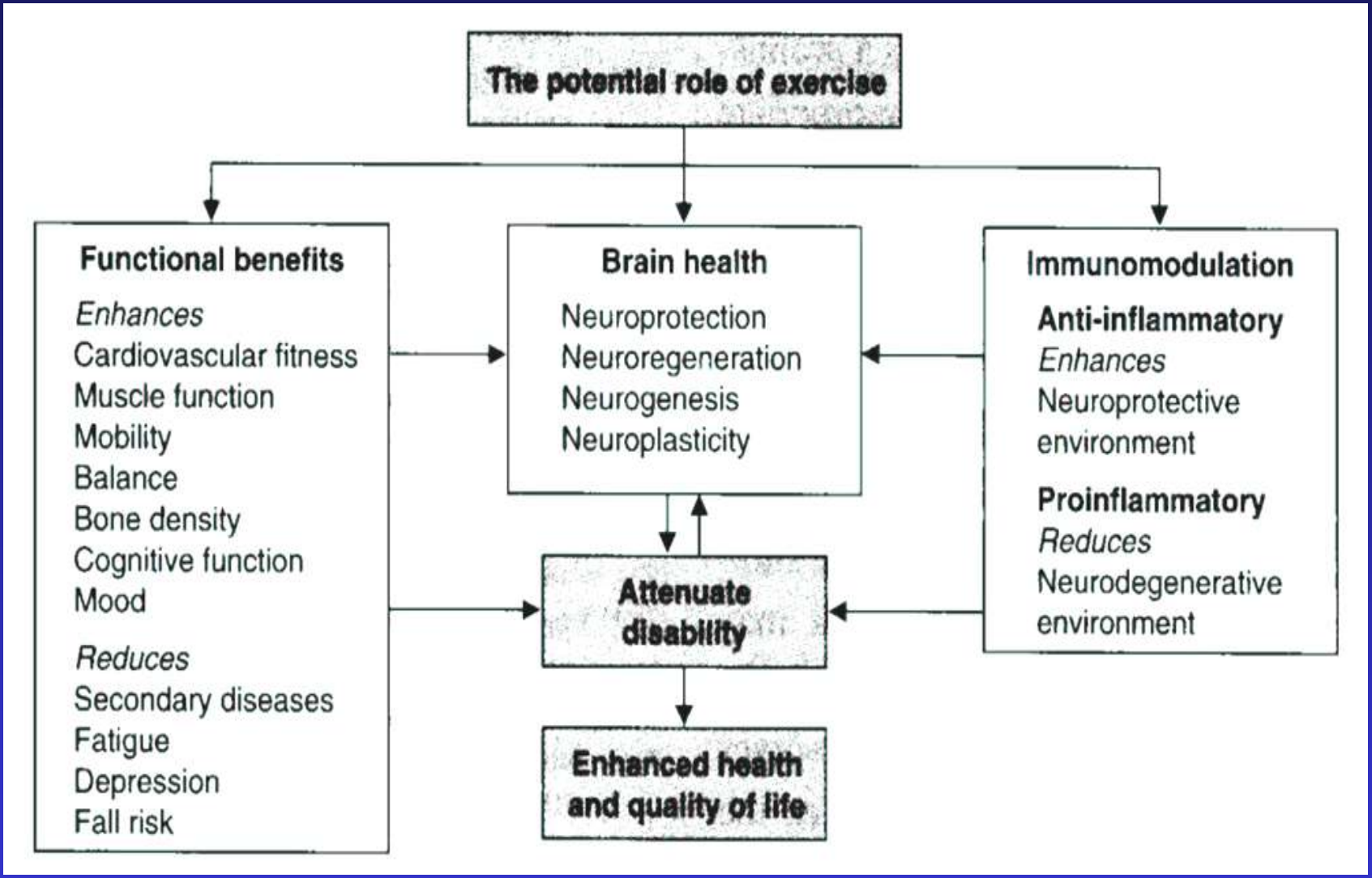
Carl W. Cotman and Christie Engesser-Cesar

Institute for Brain Aging and Dementia, University of California, Irvine

COTMAN, C.W., and C. ENGESSER-CESAR. Exercise enhances and protects brain function. *Exerc. Sport Sci. Rev.*, Vol. 30, No. 2, pp. 75–79, 2002. *Physical activity, in the form of voluntary wheel running, induces gene expression changes in the brain. Animals that exercise show an increase in brain-derived neurotrophic factor, a molecule that increases neuronal survival, enhances learning, and protects against cognitive decline. Microarray analysis of gene expression provides further support that exercise enhances and supports brain function.* **Keywords:** running, BDNF, depression, estrogen, neuroplasticity, neuroprotection



Exerc Sport Sci Rev 2002



White LJ, Sports Med 2008