Insufficienza respiratoria e demenza

Dott. Simone Scarlata
Area di Geriatria - Servizio di fisiopatologia respiratoria
Policlinico Universitario Campus Bio Medico di Roma

Outline

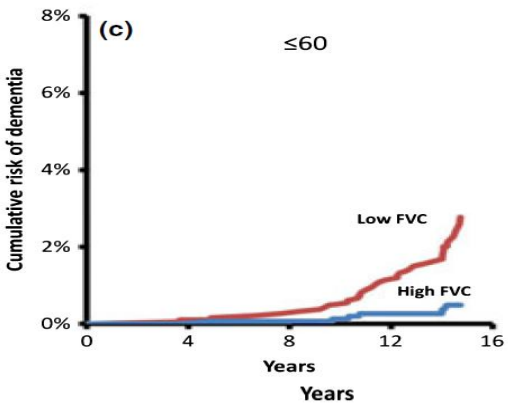
1. Associazione tra insufficienza respiratoria, poor lung function e deterioramento cognitivo
2. Impatto del deterioramento cognitivo sull'aderenza terapeutica e sugli outcomes pneumologici
3. Modelli clinici per lo studio dei meccanismi fisiopatologici del deterioramento cognitivo indotto dall'insufficienza respiratoria:

- Ipossiemia acuta: ARDS
- Ipossiemia cronica: BPCO
- Ipercapnia cronica: BPCO
- Ipossiemia intermittente: OSAS

Association of lung function with cognitive decline and dementia: the Atherosclerosis Risk in Communities (ARIC) Study

S. S. Pathan[a], R. F. Gottesman[b], T. H. Mosley[c], D. S. Knopman[d], A. R. Sharrett[e] and A. Alonso[a]

European Journal of Neurology 2011, **18:** 888–898



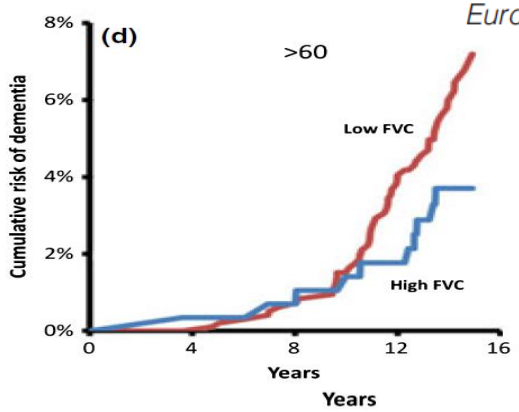


Table 3 Difference in cognitive score by gender-specific quartiles of forced expiratory volume in 1 s (FEV1), forced vital capacity (FVC), and FEV1/FVC at visit 2, Atherosclerosis Risk in Communities Study, 1990–1992

FEV1/FVC					
DWR					
Model 1	−0.02 (−0.10, 0.06)	0.06 (−0.01, 0.14)	0.06 (−0.01, 0.14)	Ref	0.19
Model 2	0.03 (−0.05, 0.11)	0.06 (−0.02, 0.14)	0.07 (−0.01, 0.14)	Ref	0.68
Model 3	0.06 (−0.07, 0.19)	0.01 (−0.10, 0.12)	0.08 (−0.03, 0.18)	Ref	0.54
DSS					
Model 1	−1.22 (−1.82, −0.61)	0.31 (−0.29, 0.90)	0.18 (−0.41, 0.76)	Ref	< 0.0001
Model 2	−0.42 (−0.96, 0.12)	0.14 (−0.36, 0.65)	0.13 (−0.37, 0.62)	Ref	0.03
Model 3	0.03 (−0.86, 0.93)	0.26 (−0.50, 1.01)	0.83 (0.12, 1.54)	Ref	0.69
WF					
Model 1	−0.17 (−0.83, 0.49)	0.63 (−0.02, 1.29)	−0.09 (−0.73, 0.55)	Ref	0.25
Model 2	−0.03 (−0.65, 0.59)	0.29 (−0.29, 0.87)	−0.14 (−0.71, 0.42)	Ref	0.85
Model 3	−0.21 (−1.19, 0.78)	0.12 (−0.71, 0.96)	0.00 (−0.78, 0.79)	Ref	0.71

DWR, delayed word recall test; DSS, digit symbol substitution test; WF, word fluency test.

Poor lung function and associated patterns of cognitive decline

S. Scarlata[a] and R. Antonelli-Incalzi[a,b]

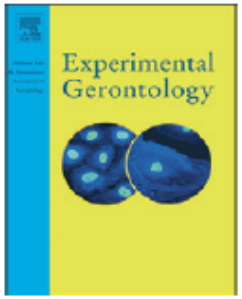
European Journal of Neurology 2011, **18:** 799–800

	Normal pattern	Obstructive pattern	Restrictive pattern	Mixed pattern
N	7969	1912	642	452
DWR				
Model 1	Ref	−0.06 (−0.14, 0.01)	−0.27 (−0.39, −0.16)	−0.22 (−0.36, −0.09)
Model 2	Ref	−0.02 (−0.09, 0.06)	−0.17 (−0.28, −0.06)	−0.07 (−0.21, 0.07)
Model 3	Ref	0.05 (−0.09, 0.20)	−0.19 (−0.37, −0.01)	−0.19 (−0.54, 0.17)
DSS				
Model 1	Ref	−1.30 (−1.86, −0.74)	−2.58 (−3.47, −1.69)	−4.58 (−5.63, −3.54)
Model 2	Ref	−0.53 (−1.03, −0.04)	−0.71 (−1.47, 0.05)	−1.63 (−2.55, −0.72)
Model 3	Ref	−0.27 (−1.22, 0.68)	−1.82 (−3.04, −0.61)	−1.64 (−4.01, 0.73)
WF				
Model 1	Ref	−0.14 (−0.76, 0.47)	−2.48 (−3.46, −1.50)	−2.76 (−3.91, −1.60)
Model 2	Ref	0.08 (−0.48, 0.64)	−1.16 (−2.02, −0.29)	−1.00 (−2.04, 0.05)
Model 3	Ref	0.74 (−0.31, 1.78)	−1.47 (−2.81, −0.13)	−2.91 (−5.52, −0.30)

DWR, delayed word recall test; DSS, digit symbol substitution test; WF, word fluency test.

Diagnosis and prognostic value of restrictive ventilatory disorders in the elderly: A systematic review of the literature

Simone Scarlata [a,b,*], Luisa Costanzo [a], Renato Giua [a], Claudio Pedone [a,b], Raffaele Antonelli Incalzi [a,c]



Experimental Gerontology 47 (2012) 281–289

Classification of the main systemic diseases causing restrictive ventilatory pattern in the elderly.

- Central neurological diseases
  - Multisystemic atrophy
  - Progressive supranuclear palsy
  - Ischemic encephalopathy
  - Parkinson's disease
  - Multiple sclerosis
  - Post-polio syndrome
  - Demyelinating diseases
  - Amyotrophic lateral sclerosis
  - Syringomyelia
- Neuromuscular disorders
  - Spinal muscular atrophy
  - Amyotrophic lateral sclerosis
- Phrenic nerve injuries (trauma, neoplasm, compression by discal protrusion, abdominal aorta aneurysms, thyroid goiter, subphrenic or hepatic abscess, infections)
  - Guillain–Barrè syndrome
  - Vasculitis
- Extraparenchymal diseases (endocrine disorders, porphyria, uremic syndrome, chronic heart disease)
- Paraneoplastic syndromes (Lambert–Eaton, Myasthenia Gravis, lymphomas)
- Drugs (CCS, quinidine, antibiotics, lithium, antirheumatic drugs)
- Polymyositis/dermatomyositis
- Musculoskeletal disorders
  - Kyphoscoliosis
  - Fibrothorax
  - Thoracoplasty
  - Ankylosing spondylitis
  - Osteoporosis
- Metabolic and endocrine disorders
- Thyroid diseases (hypothyroidism, hyperthyroidism)
- Pituitary gland diseases (acromegaly, hypopituitarism)
- Parathyroid dysfunctions
- Adrenal gland diseases (Addison's disease, Cushing's disease)
  - Diabetes Mellitus (insulin resistance)
- Lung parenchyma diseases (intrinsic lung diseases)
  - Interstitial lung diseases (see Table 3)
  - Connective tissue diseases
    - Rheumatoid arthritis
    - Systemic lupus erythematosus
    - Progressive systemic sclerosis
    - Sjogren's syndrome
    - Polymyiositis/dermatomyositis
    - Mixed connective tissue disease
    - Ankylosing spondylitis
  - Vasculitis, granulomatous diseases, hypersensitivity pneumonias
    - Wegener's granulomatosis
    - Microscopic polyangiitis
    - Churg–Strauss syndrome
    - Polyarteritis nodosa
    - Sarcoidosis
    - Syndrome X
  - Drugs associated to pulmonary fibrosis
    - NSAIDs (acetylsalicylic acid, penicillamine, gold salts)
    - Antiarrhythmics (amiodarone, procainamide)
    - Antineoplastics (cyclophosphamide, vinblastine, nitrosourea, methotrexate)
    - Antibiotics (isoniazid, nitrofurantoin, sulfonamide)
  - Oxygen-related fibrosis
  - Radiation therapy
  - Chemical agents

Chronic Obstructive Pulmonary Disease in the elderly

Raffaele Antonelli Incalzi [a,b,*], Simone Scarlata [a], Giorgio Pennazza [c], Claudio Pedone [a]

Eur J Intern Med. 2014 ; 25(4):320-8

Main conditions potentially affecting the quality of spirometry and, consequently, the achievement of a state of art COPD diagnosis in the elderly.

Patient related conditions
• Motor and sensory deficits, e.g. pyramidal or e tra-pyramidal disorders – Lack of de terity and poor control of ventilation during spirometry; – Difficulty in coordination and properly sequencing the flow volume maneuver and the breath holding. • Dementia or cognitive impairment: deteriorated constructive functions, verbal attainment and, mainly, secondary verbal memory – Difficulty in learning and recall instruction to perform spirometry – Poor ability to interact with the technician or physician • Mood depression and psychological factors – Poor motivation, early discouragement for unsuccessful trials. • Educational level – Ability to understand technical instructions • Malnutrition/undernutrition, deconditioning: respiratory muscles weakness – Difficulty in providing acceptable and reproducible tests
Environment and technician related conditions
• Poor geriatric e pertise of the physician or technician – She/he is unable to teach the patient through a variety of non-verbal tools, like visual e amples or touch-guided respiratory maneuver. – She/he does not motivate the proband by stressing any, even minimal, improvement, and does not tailor the teaching process to the individual learning potential. • Unpleasant or stressful environment – The diagnostic test does not fit the age-related slowing of learning process and, then, the need for gently repeated or even fractioned maneuvers.

Ability to learn inhaler technique in relation to cognitive scores and tests of praxis in old age

S C Allen, S Ragab

Postgrad Med J 2002;**78**:37–39

Learning points

- Elderly patients are often unable to learn to use a metered dose inhaler despite apparently normal cognitive function and no obvious dyspraxia.
- Unrecognised cognitive impairment and subclinical dyspraxia are important reasons for that difficulty.
- Patients with a minimental test score of less than 23/30 are unlikely to master a metered dose inhaler.
- Patients with an ideomotor dyspraxia score of less than 14/20 are also unlikely to learn to use a metered dose inhaler.
- Clinicians should take these factors into account when prescribing inhaler therapy for elderly patients.

Causes of Mortality in Older People With Intellectual Disability: Results From the HA-ID Study

Alyt Oppewal, Josje D. Schoufour, Hanne J.K. van der Maarl, Heleen M. Evenhuis, Thessa I.M. Hilgenkamp, and Dederieke A. Festen

Table 5
Percentages of Primary Causes of Death per 5-year Age Category for Older Adults With ID and the General Population

	50–54 yrs		55–59 yrs		60–64 yrs		65–69 yrs	
Cause of death (category)	ID	Gen	ID	Gen	ID	Gen	ID	Gen
	n =	*n* =	*N* =	*n* =	*n* =	*n* =	*n* =	*n* =
%	2	3728	34	5558	35	18180	23	11839
Diseases of the respiratory system	100	3.3	26.5	4.7	51.4	6.0	30.4	6.7
Neoplasms	—	50.7	17.6	52.4	8.6	53.7	8.7	51.5
Diseases of the circulatory system	—	16.9	5.9	16.6	8.6	18.0	8.7	21.0
Mental & behavioral disease (incl. dementia)	—	1.9	17.6	2.2	11.4	1.7	4.3	1.9
Diseases of the nervous system	—	3.0	5.9	3.2	11.4	3.2	8.7	3.2
Other	—	11.4	8.7	10.8	—	10.0	8.6	9.9
External cause	—	9.3	2.9	6.6	2.9	3.8	4.3	2.5
Diseases of the digestive system	—	3.6	5.9	3.5	—	3.5	4.3	3.3

Note. ID = Intellectual disability; Gen = General population.

Mortality patterns and risk among older men and women with intellectual disability: a Swedish national retrospective cohort study

Nawi Ng[1,2], Eva Flygare Wallén[3] and Gerd Ahlström[4*]

BMC Geriatrics (2017) 17:269

	All individuals with intellectual disability vs. their control population (15,289 vs. 76,445 individuals)
	Hazard Ratio (95% CI)
All deaths	4.14 (3.98–4.31)
Circulatory diseases-related deaths	4.20 (3.92–4.50)
Neoplasm-related deaths	1.78 (1.63–1.94)
Respiratory diseases-related deaths	12.5 (10.9–14.2)
Nervous diseases-related deaths	6.68 (5.58–7.99)

Table 6 Hazard risk for mortality among individuals with intellectual disability; models run separately for all deaths and cause-specific deaths

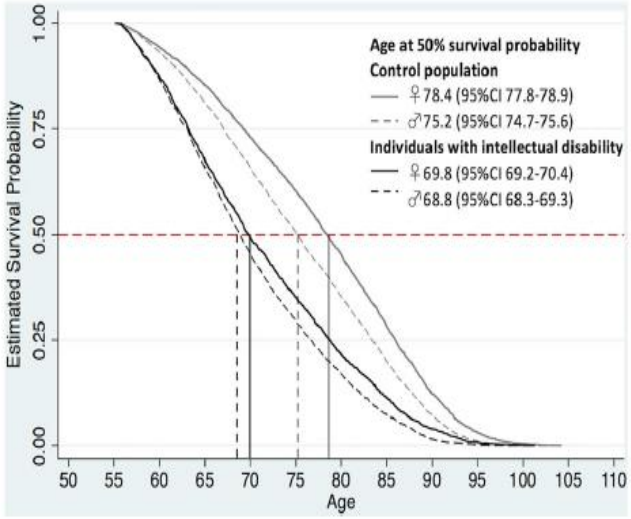
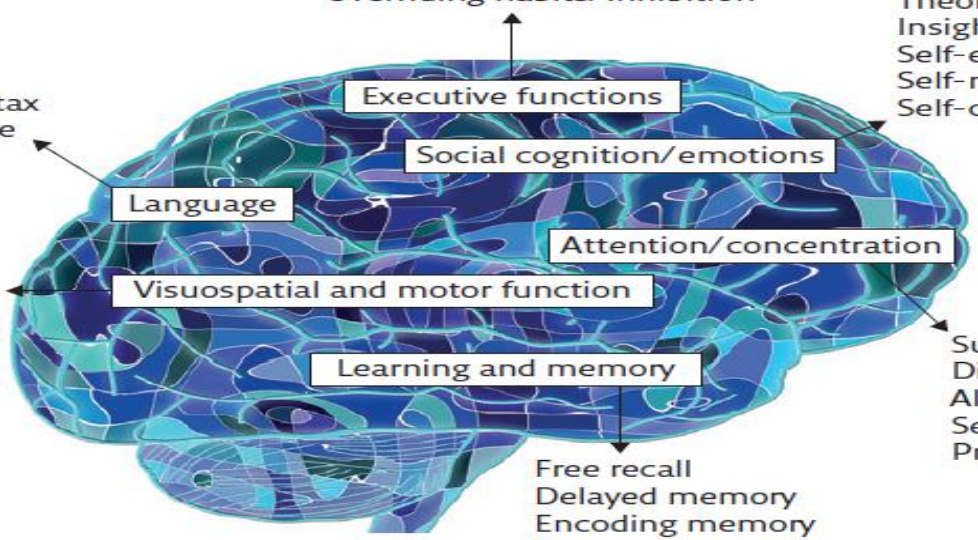


Fig. 2 Survival curve for men and women with intellectual disability and the control population

Determinants of cognitive impairment with potential independent and overlapping impact on cognitive function.



Planning
Integrated perception
Decision making
Working memory
Reasoning
Mental flexibility
Flexible problem solving
Metacognition
Responding to feedback
Overriding habits/inhibition

Recognition of emotions
Theory of mind
Insight
Self-evaluation
Self-monitoring
Self-control

Object naming
Word finding
Fluency
Grammar and syntax
Receptive language

Visual perception
Visuoconstruction
Perceptual-motor coordination

Sustained attention
Divided attention
Alternating attention
Selective attention
Processing speed

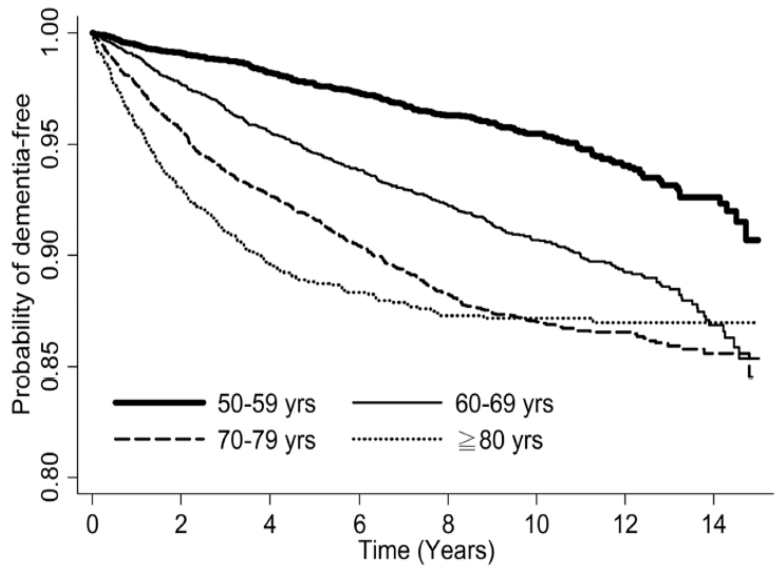
Free recall
Delayed memory
Encoding memory
Long-term memory
Short-term memory
Prospective memory
Reasoning memory
Verbal memory
Information processing
Implicit learning

Breathe 2017; 13: e1–e9.

PLOS | ONE

Long-term risk of dementia after acute respiratory failure requiring intensive care unit admission

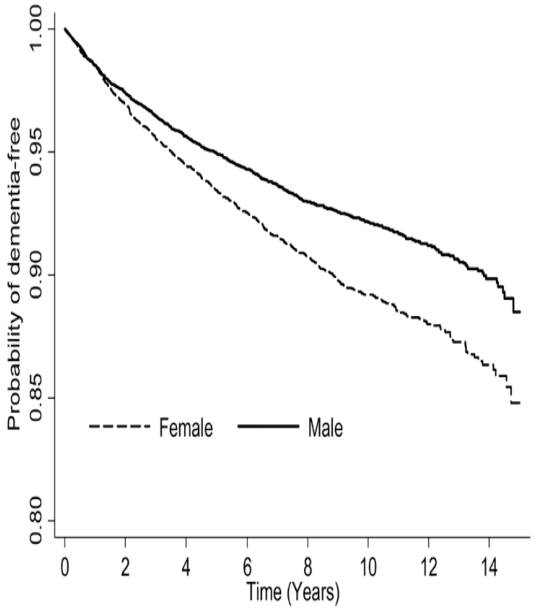
Chih-Cheng Lai[1], Chung-Han Ho[2,3], Chin-Ming Chen[4,5], Shyh-Ren Chiang[5,6], Chien-Ming Chao[1], Wei-Lun Liu[1], Yu-Chieh Lin[7], Jhi-Joung Wang[8], Kuo-Chen Cheng[6,9]*



Number at risk

50-59 yrs	6237	5488	4570	3804	2933	2021	1187	384
60-69 yrs	5425	4911	4256	3665	2902	2076	1200	385
70-79 yrs	4808	4214	3625	3137	2475	1748	1039	338
≧80 yrs	1563	1339	1170	1035	813	590	325	103

Fig 2. Kaplan-Meier curve shows the probability of being dementia-free after hospital discharge for patients admitted to the intensive care unit and mechanically ventilated.



Number at risk

Female	7320	6474	5501	4708	3675	2577	1495	466
Male	10713	9478	8120	6933	5448	3858	2256	744

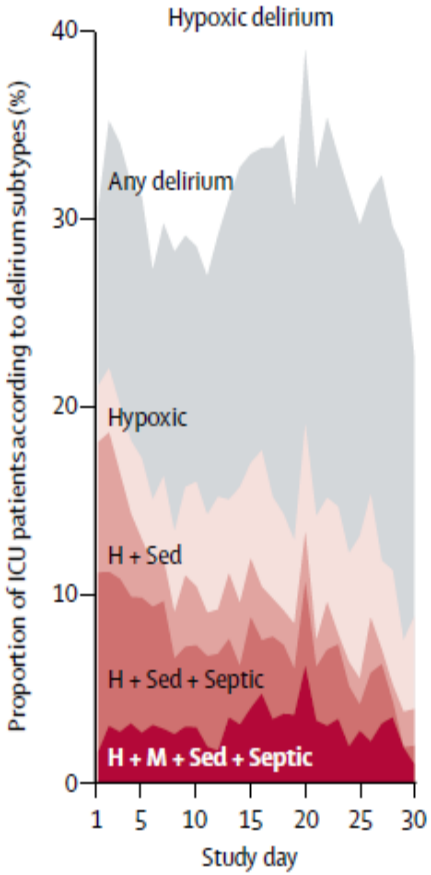
Fig 3. Kaplan-Meier curves show the probability of being dementia-free after hospital discharge for patients admitted to the intensive care unit and mechanically ventilated by age group (A), and by gender group(B) ($p < 0.0001$, log-rank test).

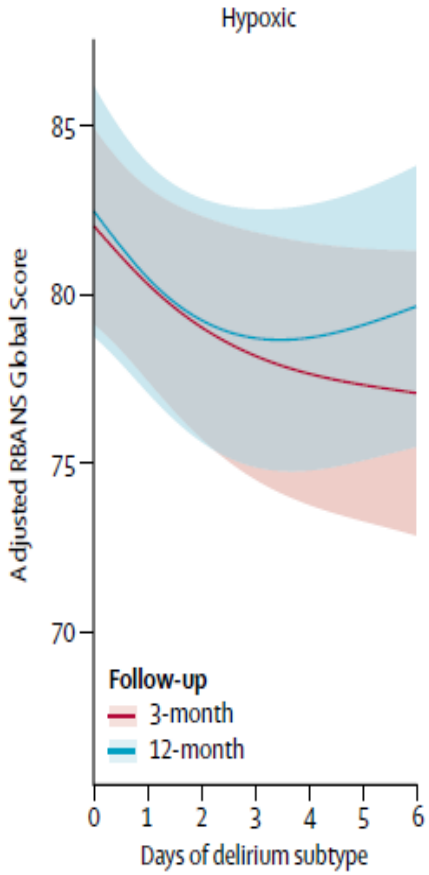
PLOS ONE | https://doi.org/10.1371/journal.pone.0180914 July 24, 2017

Clinical phenotypes of delirium during critical illness and severity of subsequent long-term cognitive impairment: a prospective cohort study

Timothy D Girard, Jennifer L Thompson, Pratik P Pandharipande, Nathan E Brummel, James C Jackson, Mayur B Patel, Christopher G Hughes, Rameela Chandrasekhar, Brenda T Pun, Leanne M Boehm, Mark R Elstad, Richard B Goodman, Gordon R Bernard, Robert S Dittus, E W Ely

Lancet Respir Med 2018; 6: 213–22





	Comparison	RBANS global cognition at 3 months	RBANS global cognition at 12 months
Hypoxic	3 vs 0 days	-3·85 (-7·07 to -0·64)	-3·76 (-7·16 to -0·37)
Septic	3 vs 0 days	-2·65 (-6·05 to 0·75)	-3·67 (-7·13 to -0·22)
Sedative-associated	3 vs 0 days	-6·52 (-9·66 to -3·37)	-4·03 (-7·80 to -0·26)
Metabolic	3 vs 0 days	0·15 (-1·52 to 1·81)	1·44 (-0·12 to 3·01)
Unclassified	3 vs 0 days	-4·72 (-6·93 to -2·51)	-4·70 (-7·16 to -2·25)

Chronic Obstructive Pulmonary Disease

An Original Model of Cognitive Decline

RAFFAELE ANTONELLI INCALZI, ANTONELLA GEMMA, CAMILLO MARRA, RODOLFO MUZZOLON, OLIVIERO CAPPARELLA, and PIERUGO CARBONIN

Am Rev Respir Dis 1993; 148:418–24.

	Groups				
	A	B	C	D	E
Mental deterioration battery	3.9 ± 2.3	6.6 ± 1.2‖	5.6 ± 1.4†	3.2 ± 1.7	2.1 ± 1.4§
Word fluency	24.2 ± 9.7	31 ± 8§	26 ± 10	19 ± 10	21 ± 7‡
Phrase construction	11.8 ± 5.9	19 ± 4‖	15 ± 5	12.5 ± 6	10.6 ± 4‡
Rey's word memory					
Short-term	33 ± 7.3	41 ± 7‖	37 ± 7	31 ± 9‡	27 ± 6‖
Long-term	5.4 ± 2.5	8.7 ± 3§	7.4 ± 2‡	5.7 ± 2.4	3.1 ± 2‖
Immediate visual memory	16.9 ± 2.9	20 ± 2.4‖	17 ± 3	17 ± 2.6	14.6 ± 2.6§
Raven's colored progressive matrices	23 ± 4.8	27 ± 4.5§	24 ± 3.8	22 ± 4.8	20 ± 4‖
Copying design					
Simple copy	6.9 ± 2.3	8.8 ± 2‖	7.6 ± 2	7.5 ± 2.1	6.1 ± 2.1
Copy with landmarks	61 ± 6	65 ± 4§	64 ± 6.3	63 ± 4.7	56 ± 13
Barrage	132 ± 71	145 ± 78	95 ± 56	108 ± 74	87.5 ± 42‡
Visual discrimination	94 ± 7	97 ± 4‡	94 ± 7	97 ± 4‡	92 ± 9‡
Temporal rules induction	25 ± 10.5	31 ± 4	30 ± 8	24 ± 11	20 ± 10†
Simple analogies test	15.1 ± 2.8	17.7 ± 2.7§	15.5 ± 2.2	13.8 ± 4	13.1 ± 5.9§
Verbal span forward	5.1 ± 0.9	5.7 ± 0.9	5.4 ± 1	5.2 ± 0.9	5.2 ± 0.9
Verbal span reverse	3.3 ± 0.9	4.1 ± 0.8‡	3.6 ± 0.8	3.8 ± 0.9	3.7 ± 0.9
Spatial span forward	4.5 ± 0.7	5.3 ± 0.8	4.6 ± 0.6	4.4 ± 0.7	4.1 ± 0.8‖
Spatial span reverse	3.8 ± 0.6	4.4 ± 0.7§	4.0 ± 0.6	4.4 ± 0.9	3.9 ± 0.9§
Verbal memory					
Recognition	10.9 ± 3	12.8 ± 2.3†	12.3 ± 2	10.4 ± 3.7	9.6 ± 3.8
Intrusions	3.3 ± 3.8	1.6 ± 2.1‡	3.5 ± 4.3	1.4 ± 2.6‡	6.5 ± 6.3‡
Semantic word fluency	19.8 ± 5	24 ± 7	19 ± 6	18 ± 7‡	16 ± 6‖

A: patients with chronic respiratory failure; B: adult normal subjects; C: elderly normal subjects; D: patients with multiinfarctual dementia; E: patients with Alzheimer-type dementia.

Predicting cognitive decline in patients with hypoxaemic COPD

R. ANTONELLI INCALZI*, F. CHIAPPINI+, L. FUSO+, M. P. TORRICE+, A. GEMMA‡ AND R. PISTELLI+

RESPIRATORY MEDICINE (1998) **92**, 527–533

	Baseline	1 yr	2 yr	*P* value
Completed 2 yr follow-up				
MMS	27 ± 2·9	25·8 ± 4·1	25·4 ± 4	0·003†
ADLs	5·75 ± 0·74	5·65 ± 0·95	5·6 ± 1	0·31†
GDS	13·3 ± 7·2	13·5 ± 6·8	13·8 ± 7·3	0·64†
Dead or lost to follow-up after 1 yr				
MMS	27·6 ± 3	26·2 ± 3·6		0·05‡
ADLs	5·5 ± 1·3	4·9 ± 1·6		0·04‡
GDS	11·9 ± 8·8	14·5 ± 7·6		0·002‡

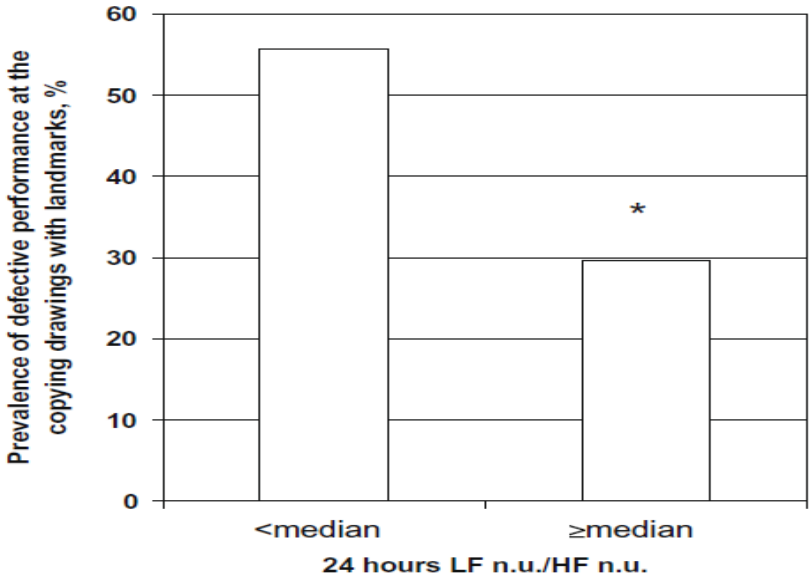
Cognitive decline is faster in the presence of severe bronchial obstruction and parallels the worsening of the affective status in COPD patients on oxygen therapy. The onset of depression rather than baseline depressive symptoms seems to be a risk factor for cognitive decline.

Heart rate variability and drawing impairment in hypoxemic COPD

Raffaele Antonelli Incalzi [a,e], Andrea Corsonello [b,*], Luigi Trojano [c], Claudio Pedone [a], Domenico Acanfora [d], Aldo Spada [e], Gianni D'Addio [d], Roberto Maestri [f], Franco Rengo [d,g], Giuseppe Rengo [d]

Brain and Cognition 70 (2009) 163–170

	LF n.u./HF n.u.
24 h period	
Raven's progressive matrices	0.041
Verbal fluency	0.002
Visual span	0.033
Verbal span	0.118
Verbal memory – short term	0.048
Verbal memory – long term	0.092
Copying drawings	0.178
Copying drawings with landmarks	0.268*
Immediate visual memory	0.018
Sentence construction	−0.079
Daytime period	
Raven's progressive matrices	0.108
Verbal fluency	0.051
Visual span	0.033
Verbal span	0.143
Verbal memory – short term	0.071
Verbal memory – long term	0.165
Copying drawings	0.205
Copying drawings with landmarks	0.330*
Immediate visual memory	0.053
Sentence construction	−0.059
Nighttime period	
Raven's progressive matrices	0.021
Verbal fluency	−0.126
Visual span	−0.066
Verbal span	0.160
Verbal memory – short term	−0.050
Verbal memory – long term	−0.086
Copying drawings	0.134
Copying drawings with landmarks	0.185
Immediate visual memory	−0.026
Sentence construction	−0.124



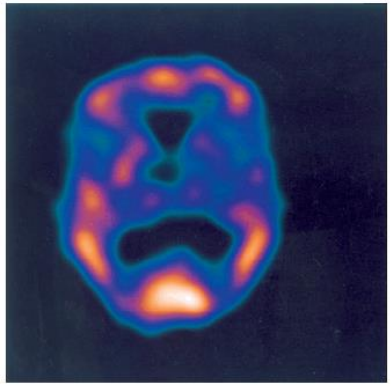
In conclusion, we observed a correlation between drawing impairment and depressed sympathetic modulation of the neuro-autonomic tone. Such a relationship seems worthy of reassessment in a larger and more heterogeneous COPD population in the framework of properly designed studies including also a well balanced set of executive and copying tests. Confirming or denying present

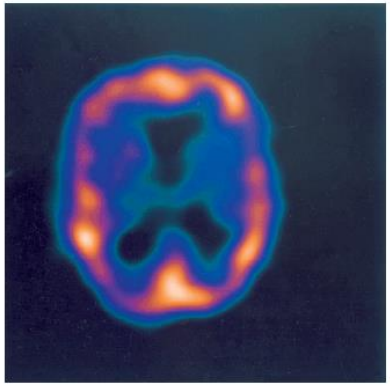
Raffaele Antonelli Incalzi
Camillo Marra
Alessandro Giordano
Maria Lucia Calcagni
Antonella Cappa
Salvatore Basso
Gabriella Pagliari
Leonello Fuso

Cognitive impairment in chronic obstructive pulmonary disease

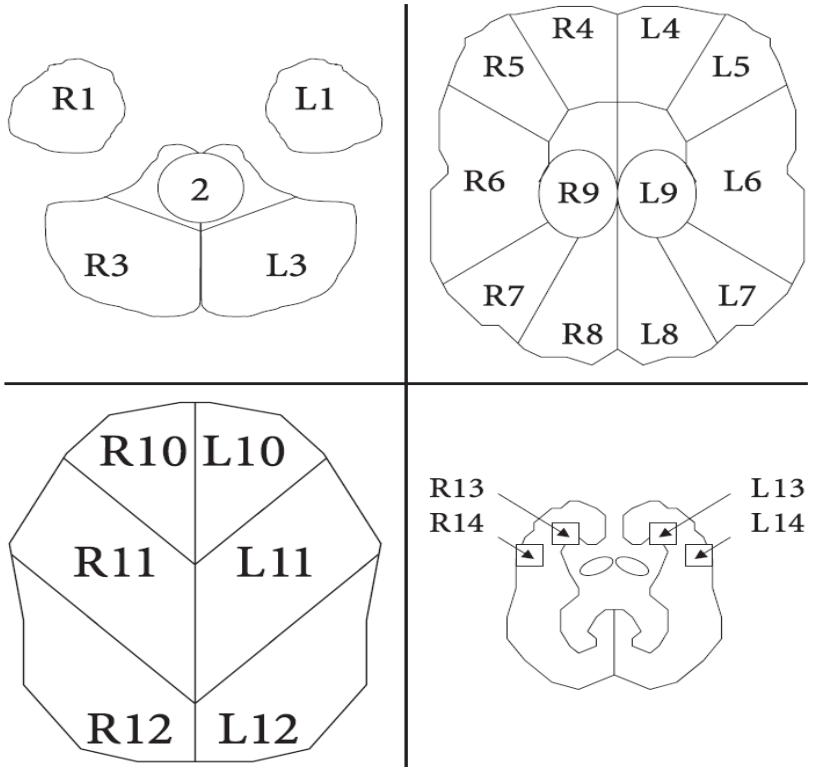
A neuropsychological and spect study

J Neurol (2003) 250:325–332





Large-ROI	Normal subjects (N)	Non hypoxemic COPD (NH)	Hypoxemic COPD (H)	Alzheimer's disease (AD)	p[a]
Right anterior	0.71 (0.02)	0.70 (0.06)	0.67 (006)	0.64 (0.07)	0.05*
Left anterior	0.71 (0.03)	0.67 (0.06)	0.64 (0.09)	0.60 (0.09)	0.001*
Right posterior	0.76 (0.04)	0.76 (0.06)	0.74 (0.05)	0.68 (0.08)	0.005*
Left posterior	0.75 (0.04)	0.74 (0.07)	0.71 (0.05)	0.67 (0.08)	0.005*



BMJ open
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Grey and white matter abnormalities in chronic obstructive pulmonary disease: a case—control study

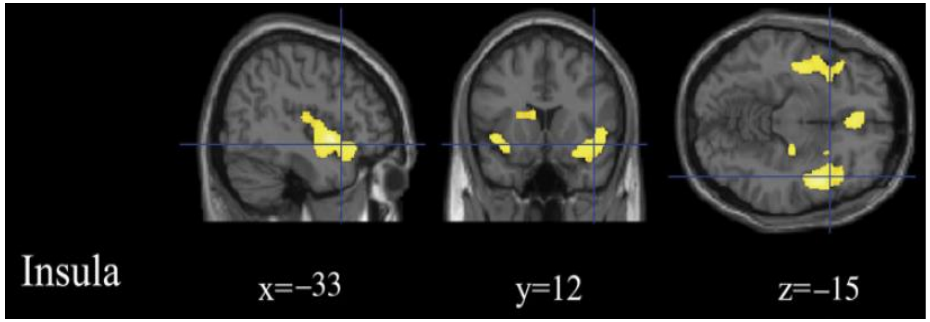
Haiyan Zhang,[1] Xiaochuan Wang,[2] Jianzhong Lin,[3] Yinchuan Sun,[1] Yongxia Huang,[1] Tianhe Yang,[3] Shili Zheng,[4] Ming Fan,[5] Jiaxing Zhang[1]

BMJ Open 2012;2:e000844.

Table 4 Main regions showing FA, λ1 and λ23 values in patients with COPD compared with healthy controls

MNI (peak)			Voxels	White matter	Corresponding	FA value		λ1 ($\times 10^3$ mm^2/s)		λ23 ($\times 10^3$ mm^2/s)	
x	y	z	(mm^3)	tract	cortical area	COPD	Control	COPD	Control	COPD	Control
1	10	16	240	Fornix	Fornix	0.248 (0.067)	0.289 (0.073)	2.586 (0.314)	2.406 (0.0321)	1.809 (0.295)	1.577 (0.262)*
−26	−69	1	191		Left lingual gyrus	0.259 (0.042)	0.283 (0.046)	1.450 (0.240)	1.370 (0.224)	0.992 (0.185)	0.896 (0.168)*
27	−53	3	147	Lingual gyrus	Right lingual gyrus	0.265 (0.065)	0.290 (0.056)	1.381 (0.239)	1.346 (0.227)	0.955 (0.242)	0.891 (0.215)*
−23	−19	−24	77	Parahippocampus	Left Parahippocampus	0.268 (0.042)	0.319 (0.046)	1.234 (0.057)	1.189 (0.052)	0.869 (0.148)	0.771 (0.125)*
38	−24	−24	77	Fusiform gyrus	Right fusiform gyrus	0.231 (0.037)	0.248 (0.046)	1.053 (0.063)	1.094 (0.073)	0.774 (0.030)	0.723 (0.032)*
−10	−91	17	204	Optic radiation	Left occipital cortex	0.234 (0.043)	0.277 (0.041)	1.037 (0.038)	1.020 (0.031)	0.752 (0.063)	0.693 (0.051)*
25	−86	−5	200	Optic radiation	Right occipital cortex	0.369 (0.099)	0.409 (0.122)	1.171 (0.014)	1.177 (0.171)	0.649 (0.057)	0.601 (0.071)*
−9	−72	45	94	SCR	Left precuneus	0.283 (0.053)	0.317 (0.056)	1.099 (0.032)	1.069 (0.041)	0.726 (0.075)	0.665 (0.065)*
9	−66	37	57	SCR	Right precuneus	0.251 (0.030)	0.280 (0.044)	1.044 (0.032)	1.018 (0.023)	0.868 (0.073)	0.731 (0.084)*
−15	−51	62	57	SCR	Left superior parietal lobule	0.267 (0.043)	0.294 (0.043)	1.130 (0.051)	1.082 (0.025)	0.724 (0.039)	0.671 (0.045)*
16	−45	64	66	SCR	Right superior parietal lobule	0.251 (0.043)	0.294 (0.051)	1.176 (0.117)	1.107 (0.094)	0.805 (0.056)	0.762 (0.056)*
−45	−53	31	44	SLF	Left supramarginal gyrus	0.221 (0.027)	0.239 (0.026)	1.088 (0.020)	1.076 (0.040)	0.935 (0.090)	0.873 (0.071)*
37	−68	21	63	SLF	Right supramarginal gyrus	0.220 (0.025)	0.237 (0.025)	1.116 (0.039)	1.090 (0.052)	0.773 (0.076)	0.715 (0.007)*
−48	0	−16	43	ILF	Left superior temporal gyrus	0.244 (0.013)	0.270 (0.021)	1.060 (0.030)	0.984 (0.015)	0.758 (0.025)	0.714 (0.037)*
53	−46	−6	41	ILF	Right middle temporal gyrus	0.206 (0.016)	0.241 (0.024)	1.025 (0.016)	1.006 (0.021)	1.605 (0.167)	1.340 (0.139)*

Data are presented as means (SD).
*$p<0.05$.
COPD, chronic obstructive pulmonary disease; FA, fractional anisotropy; ILF, inferior longitudinal fasciculus; SCR, superior corona radiata; SLF, superior longitudinal fasciculus.



CONCLUSIONS

In summary, we first demonstrated that COPD extended beyond the lung to the brain, with the decrease of regional GM density accompanied by impairment in the WM microstructural integrity. Our findings suggest significant participation of these structures in responding to hypoxic challenges, which include cardiovascular and air-hunger components. The brain structural changes may also underlie the psychological and mood changes of COPD.

Decreased cerebrovascular response to CO_2 in post-menopausal females with COPD: role of oxidative stress

Sara E. Hartmann*,#, Vincent Pialoux¶, Richard Leigh*,+ and Marc J. Poulin*,#,§,ƒ,**

Eur Respir J 2012; 40: 1354–1361

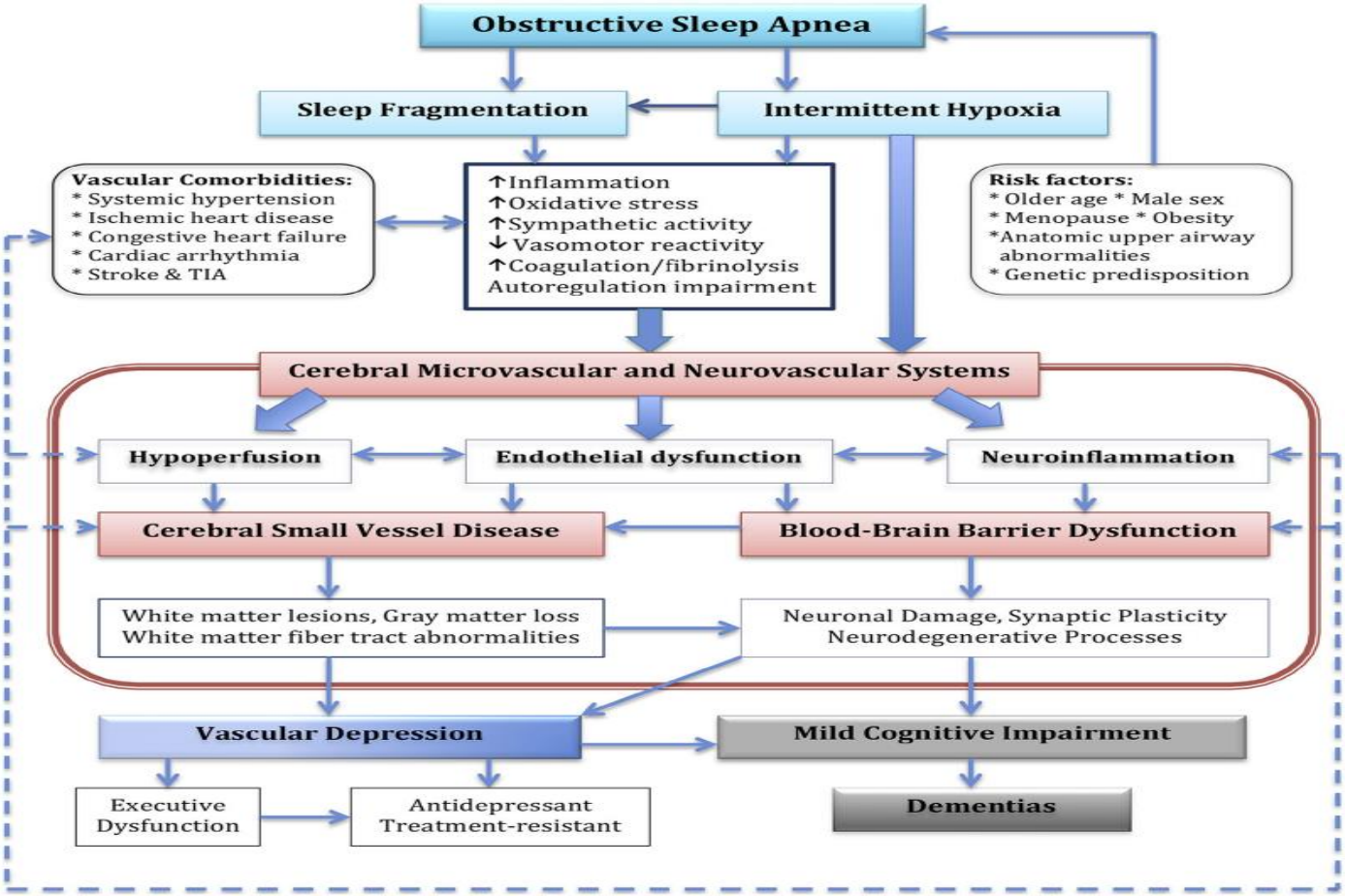
	COPD	Controls
Subjects n	8	10
Oxidative stress markers		
8-OHdG $\mu g \cdot L^{-1}$	$9.6 \pm 0.7^{\#}$	8.5 ± 1.3
MDA $\mu mol \cdot L^{-1}$	$23.4 \pm 4.7^{¶}$	13.1 ± 4.7
AOPP $\mu mol \cdot L^{-1}$	$292.1 \pm 125.1^{¶}$	134.8 ± 70.0
Nitrotyrosine $nmol \cdot L^{-1}$	93.1 ± 102.0	38.7 ± 34.2
Antioxidant enzyme activity		
Catalase $\mu mol \cdot L^{-1} \cdot min^{-1}$	10.5 ± 6.6	9.0 ± 7.1
GPX $\mu mol \cdot L^{-1} \cdot min^{-1}$	$16.9 \pm 4.9^{¶}$	9.5 ± 3.2
NO end-products		
NOx $\mu mol \cdot L^{-1}$	$4.9 \pm 2.2^{\#}$	10.9 ± 6.4

Females with moderate COPD were found to have cerebrovascular dysfunction. Our results suggest that increased levels of systemic oxidative stress may have implications in the cerebrovascular dysfunction observed during hypercapnia in COPD.

Obstructive Sleep Apnea is Linked to Depression and Cognitive Impairment: Evidence and Potential Mechanisms

Nancy A. Kerner, M.D. and **Steven P. Roose, M.D.**

Am J Geriatr Psychiatry. 2016 June ; 24(6): 496–508.



Evidence of Neurodegeneration in Obstructive Sleep Apnea: Relationship Between Obstructive Sleep Apnea and Cognitive Dysfunction in the Elderly

Mak Adam Daulatzai*

Journal of Neuroscience Research 93:1778–1794 (2015)

Obstructive Sleep Apnea

Recurrent Hypoxia

↓

Hypertension/Vasoconstriction

Ischemia/Cerebral Hypoperfusion

Inflammation/Neurotoxic Cytokines

Hypercoagulability

Glucose Hypometabolism

Endothelial Dysfunction

Oxidative Stress

↓

Synergistic Neurotoxic Impact

↓

Abeta deposition &

Tau hyperphosphorylation

↓

Synaptic Dysfunction

Neuronal Calcium Dysregulation

Activation of Caspases

Hippocampal Neuronal Degeneration

Apoptosis

↓

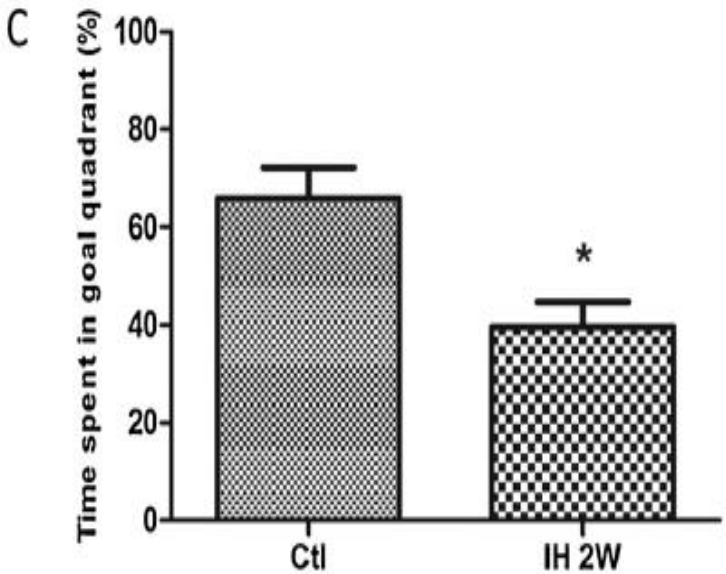
COGNITIVE IMPAIRMENT &

ALZHEIMER'S DISEASE

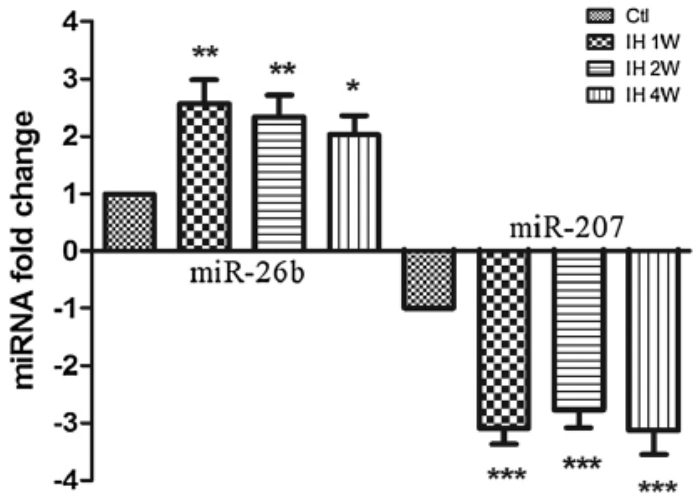
Intermittent hypoxia caused cognitive dysfunction relate to miRNAs dysregulation in hippocampus

Huabin Gao[a,1], Zhaoli Han[b,1], Shan Huang[a], Ruojing Bai[b], Xintong Ge[a], Fanglian Chen[a], Ping Lei[a,b,*]

Behavioural Brain Research 335 (2017) 80–87



Morris water maze detected spatial memory and learning deficits after IH



qRT-PCR detected the expression level of miR-26b and miR-207 post-IH.

methods to verify the microarray results. Our results showed that microarray based analysis of microRNA expression in rat hippocampus after IH has shown that some microRNAs such as miR-26b and miR-207 could be involved in the OSA-induced cognitive impairments.

Conclusioni

- Esiste una forte associazione tra alterata funzione respiratoria, alterazioni degli scambi gassosi e deficit cognitivo.
- Per le sue caratteristiche patogenetiche, il deficit cognitivo associato all'insufficienza respiratoria presenta tratti peculiari
- Patologie respiratorie acute e croniche, ipossiemia continua o intermittente, ipercapnia sono tutti meccanismi in grado di indurre danno cerebrale attraverso molteplici effetti neurotossici.

FINE

Dott. Simone Scarlata
Area di Geriatria - Servizio di fisiopatologia respiratoria
Policlinico Universitario Campus Bio Medico di Roma