



ASSOCIAZIONE
CENTRO DEL
MOVIMENTO

Incontro informativo INTRODUZIONE

29 marzo 2018

Damiano Zemp, MSc e Cand. PhD
Specialista di scienze motorie

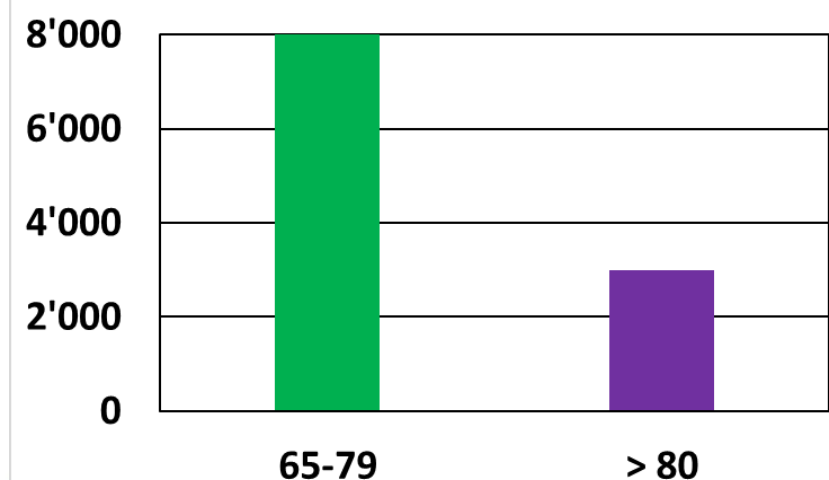
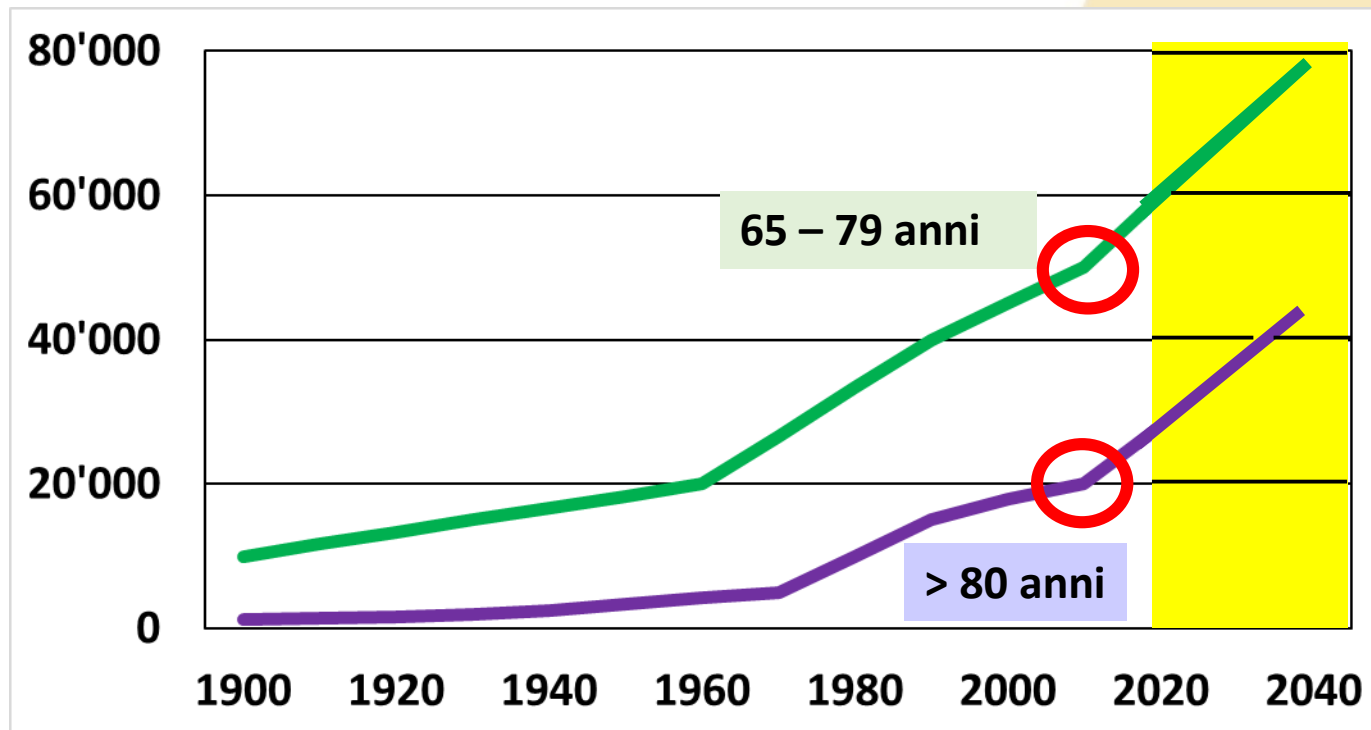
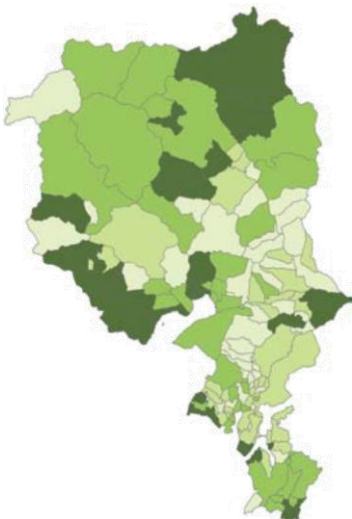
Dividat.



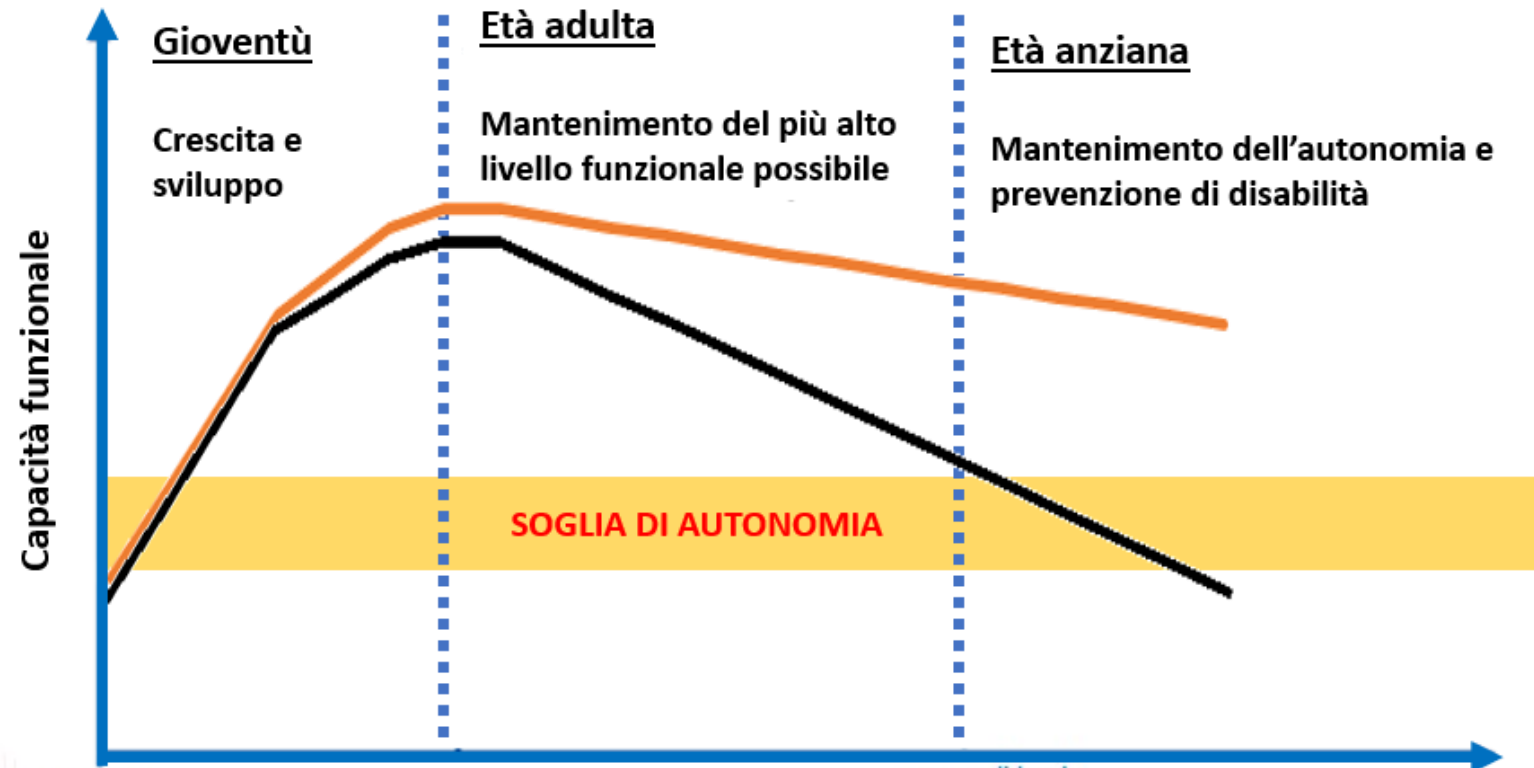
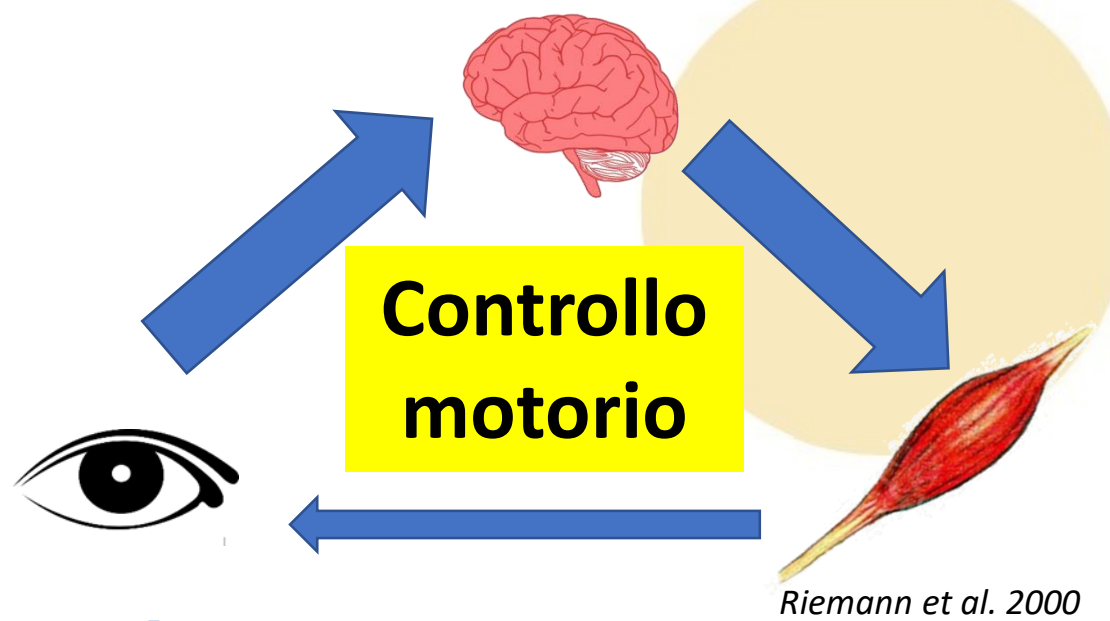
ETH zürich

Ente Ospedaliero Cantonale

La popolazione anziana in Ticino



Due modelli

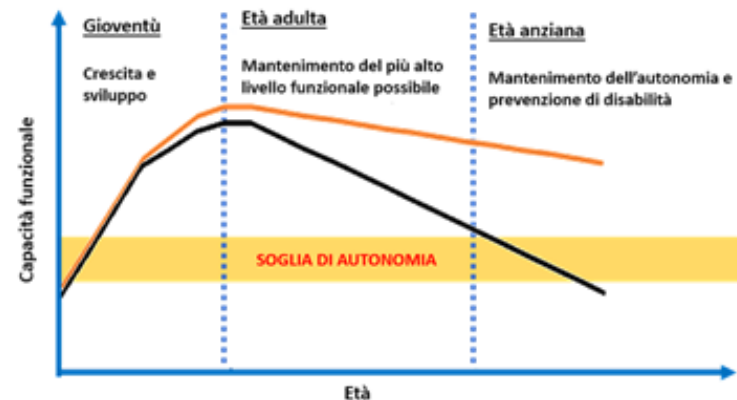
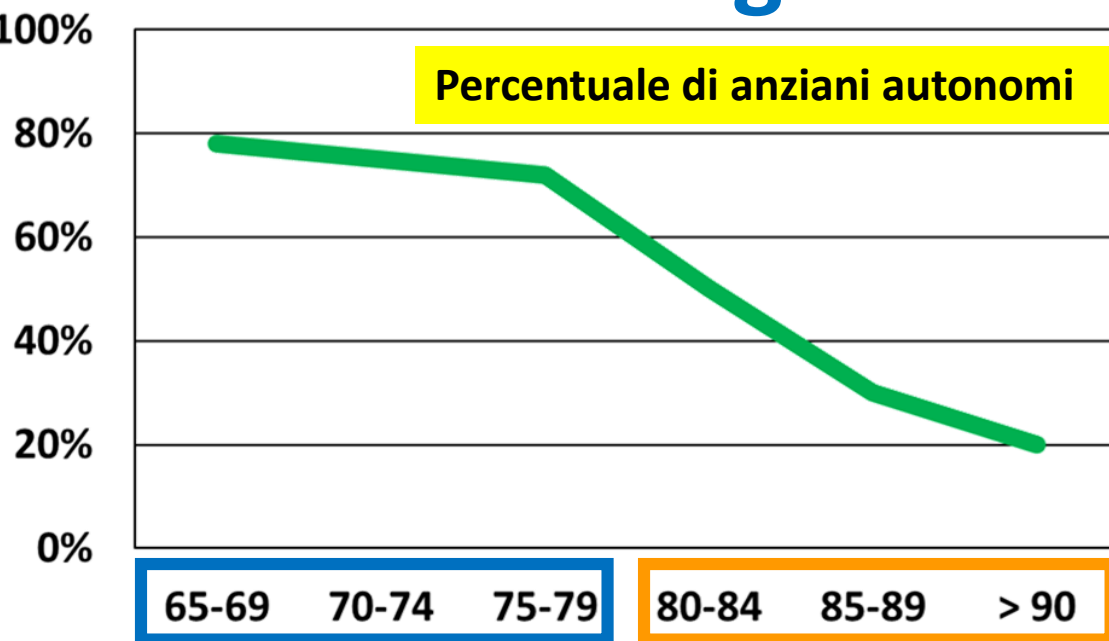


Kalache and Kickbusch, 1997

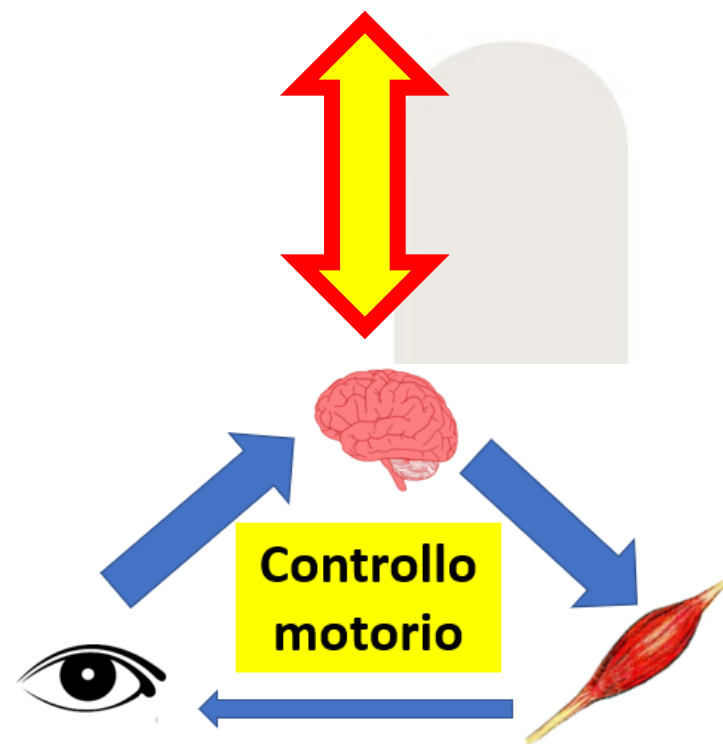
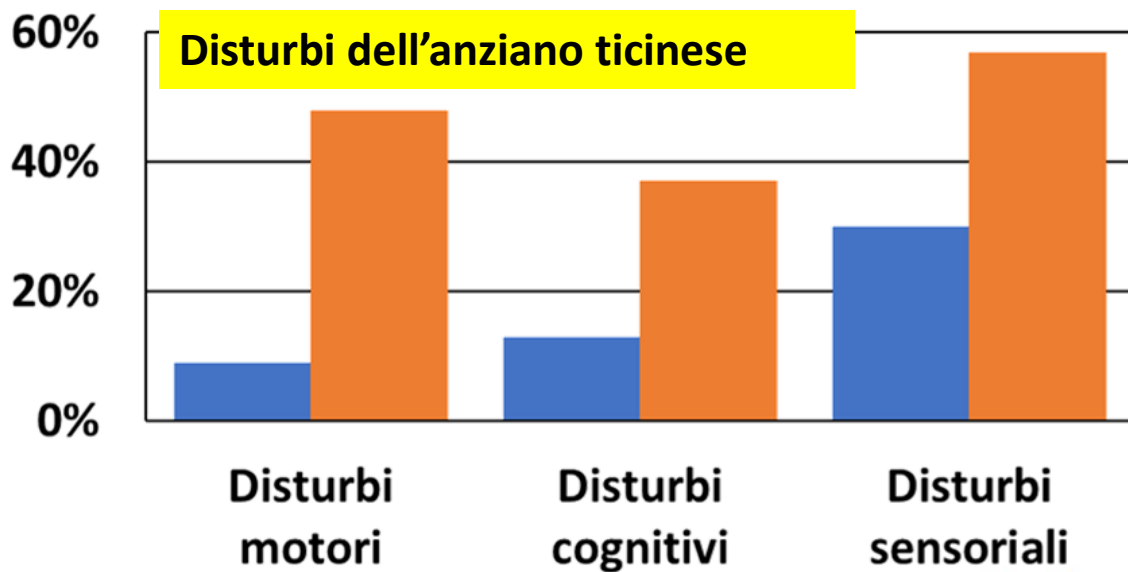
Autonomia degli anziani in Ticino

UFSTA 2015

Percentuale di anziani autonomi



Disturbi dell'anziano ticinese





Esercizio Geriatrico: *MOBILITY*



“L’interazione tra outcome motori ed il cervello”

Eling D. de Bruin

*Department of Neurobiology, Care Sciences and Society / Karolinska Institutet
& Laboratory of Motor Control and Learning / Institute of Human Movement
Sciences and Sport / ETH Zurich*



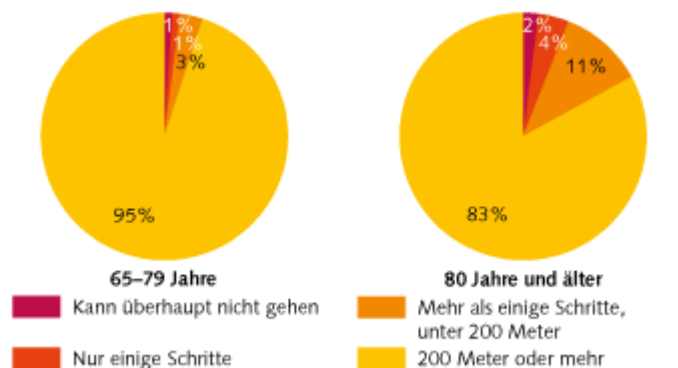
Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Statistik Schweiz

<http://www.bfs.admin.ch/bfs/portal/de/index/themen/14/02/01/key/07/05.html>

Beeinträchtigung des Gehvermögens, 2012

Bevölkerung ab 65 Jahren in Privathaushalten

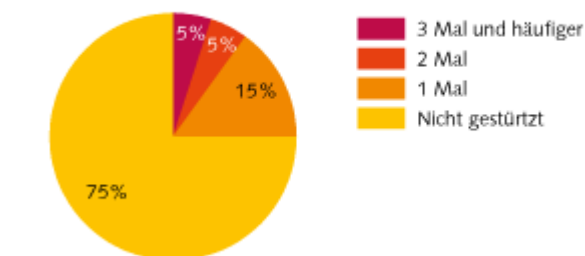


Quelle: BFS – SGB

© BFS, Neuchâtel 2014

Stürze im Laufe eines Jahres, 2012

Bevölkerung ab 65 Jahren in Privathaushalten



Quelle: BFS – SGB

© BFS, Neuchâtel 2014



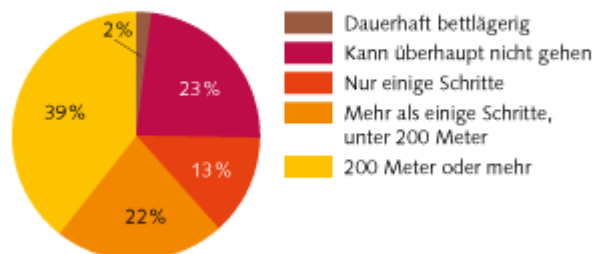
Schweizerische Eidgenossenschaft
Confédération suisse
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Confederaziun svizra

Statistik Schweiz

<http://www.bfs.admin.ch/bfs/portal/de/index/themen/14/02/01/key/07/05.html>

Beeinträchtigungen des Gehvermögens in Alters- und Pflegeheimen, 2008/09

Bevölkerung ab 65 Jahren in Alters- und Pflegeheimen

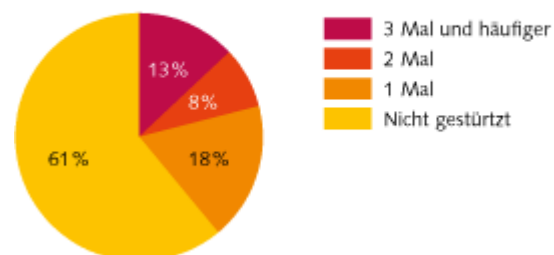


Quelle: BFS – EGBI2008/09

© BFS, Neuchâtel 2014

Stürze im Laufe eines Jahres in Alters- und Pflegeheimen, 2008/09

Bevölkerung ab 65 Jahren in Alters- und Pflegeheimen



Quelle: BFS – EGBI2008/09

© BFS, Neuchâtel 2014



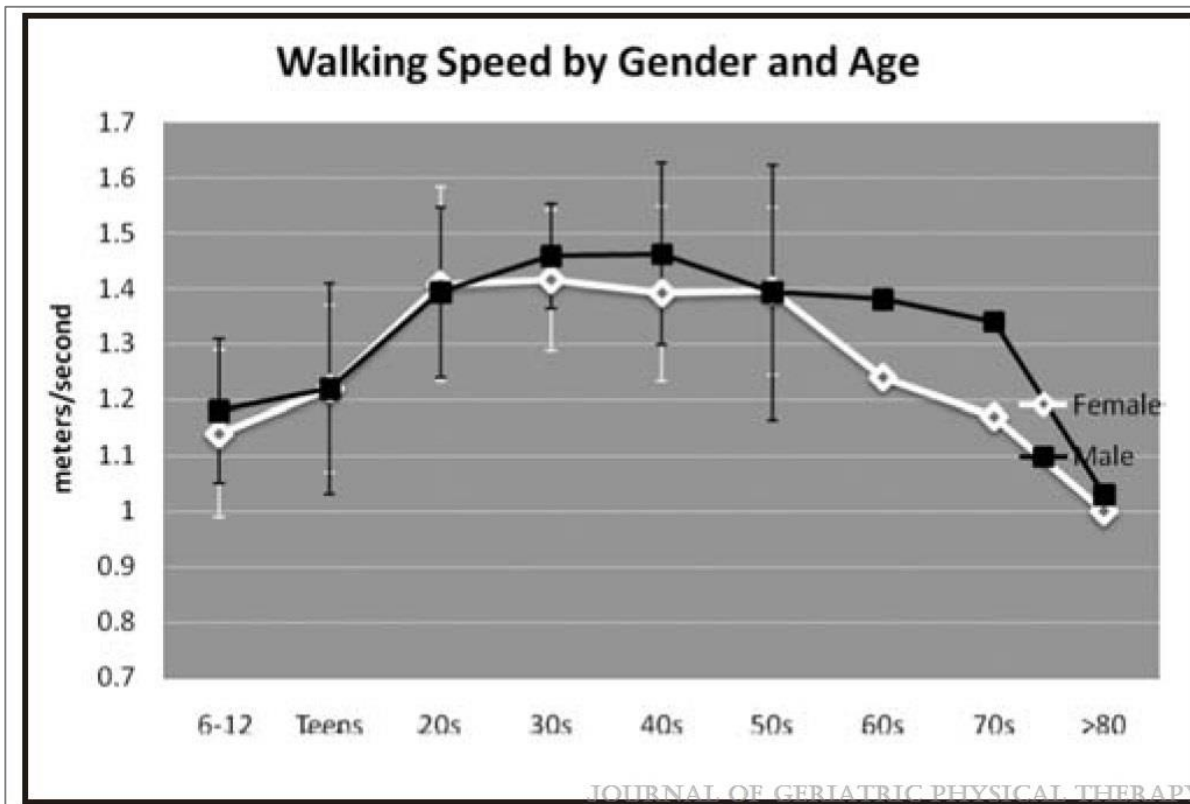
[White Paper: "Walking Speed: the Sixth Vital Sign"](#)

Fritz, Stacy; Lusardi, Michelle

Journal of Geriatric Physical Therapy.
32(2):2-5, 2009.

doi:

**Velocità del cammino individuale,
categorizzata per sesso ed età**



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How fast does the Grim Reaper walk? Receiver operating characteristics curve analysis in healthy men aged 70 and over

BMJ 2011;343:d7679 doi: 10.1136/bmj.d7679

Quanto corre veloce il
«Cupo Mietitore»?



The Grim Reaper prefers to walk at 0.82 m/s (2 miles (about 3 km) per hour), with a maximum estimated speed of 1.36 m/s (3 miles (about 5 km) per hour)

Older men wishing to outrun the Grim Reaper should maintain walking speeds above these levels

Gli anziani in strutture sanitarie per lungodegenza hanno una velocità del cammino di circa 0.475 m/s; pazienti ospedalizzati (non solo anziani) mostrano di avere una velocità del cammino usualmente pari a circa 0.58 m/s ...

Kuys et al. J Am Med Dir Assoc 15(3), 2014 & Peel et al. J Gerontol A Biol Sci Med Sci. 68(1), 2013.



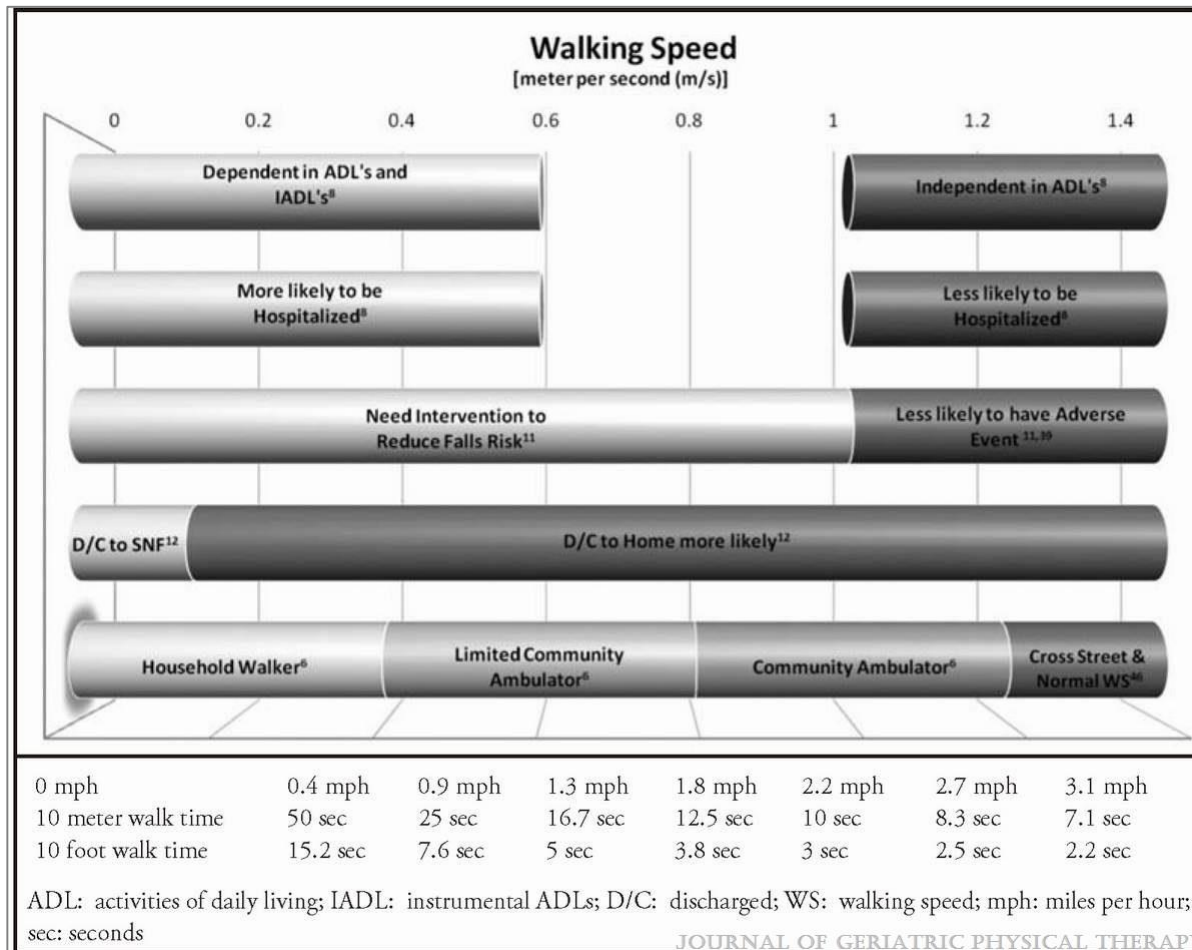
[White Paper: "Walking Speed: the Sixth Vital Sign"](#)

Fritz, Stacy; Lusardi, Michelle

Journal of Geriatric Physical Therapy.
32(2):2-5, 2009.

doi:

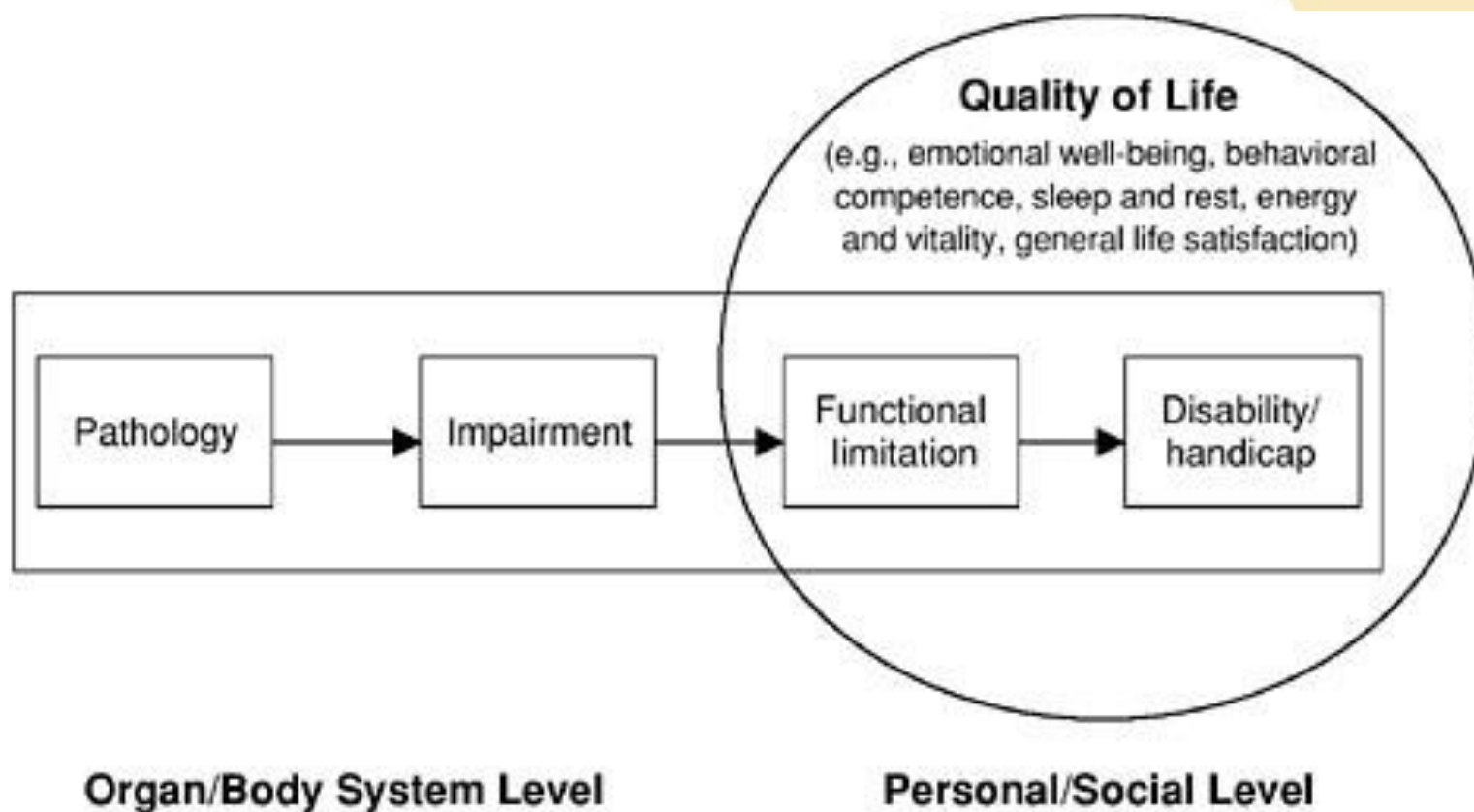
Insieme di differenti tempi di velocità del cammino collegati a non-autosufficienza, ospedalizzazione, necessità riabilitativa, strutture sanitarie post-ospedaliere, capacità di deambulazione.



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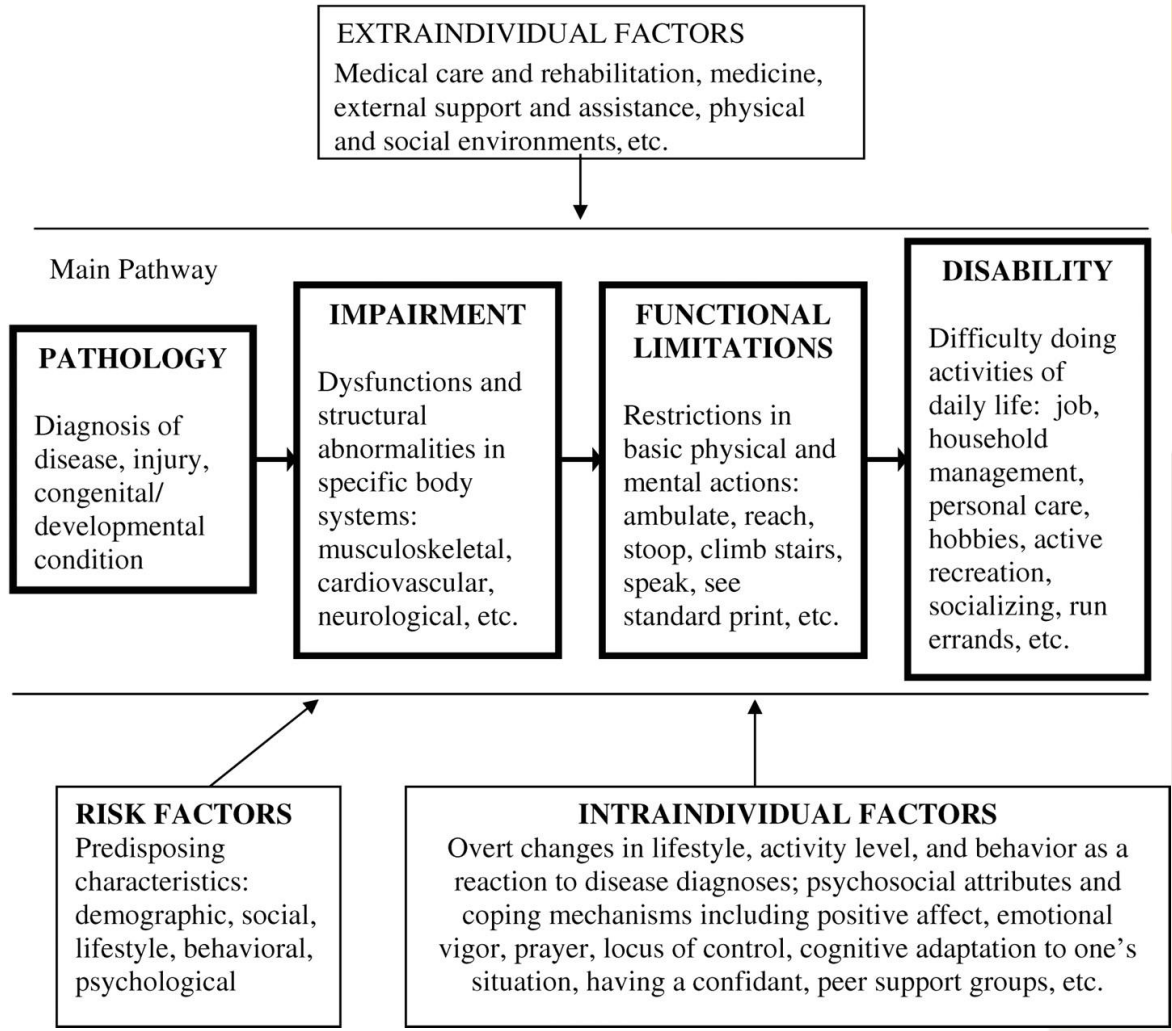
Progressione del declino della mobilità

Modello teoretico: Modello del Processo di Disabilità da Nagi (1976)



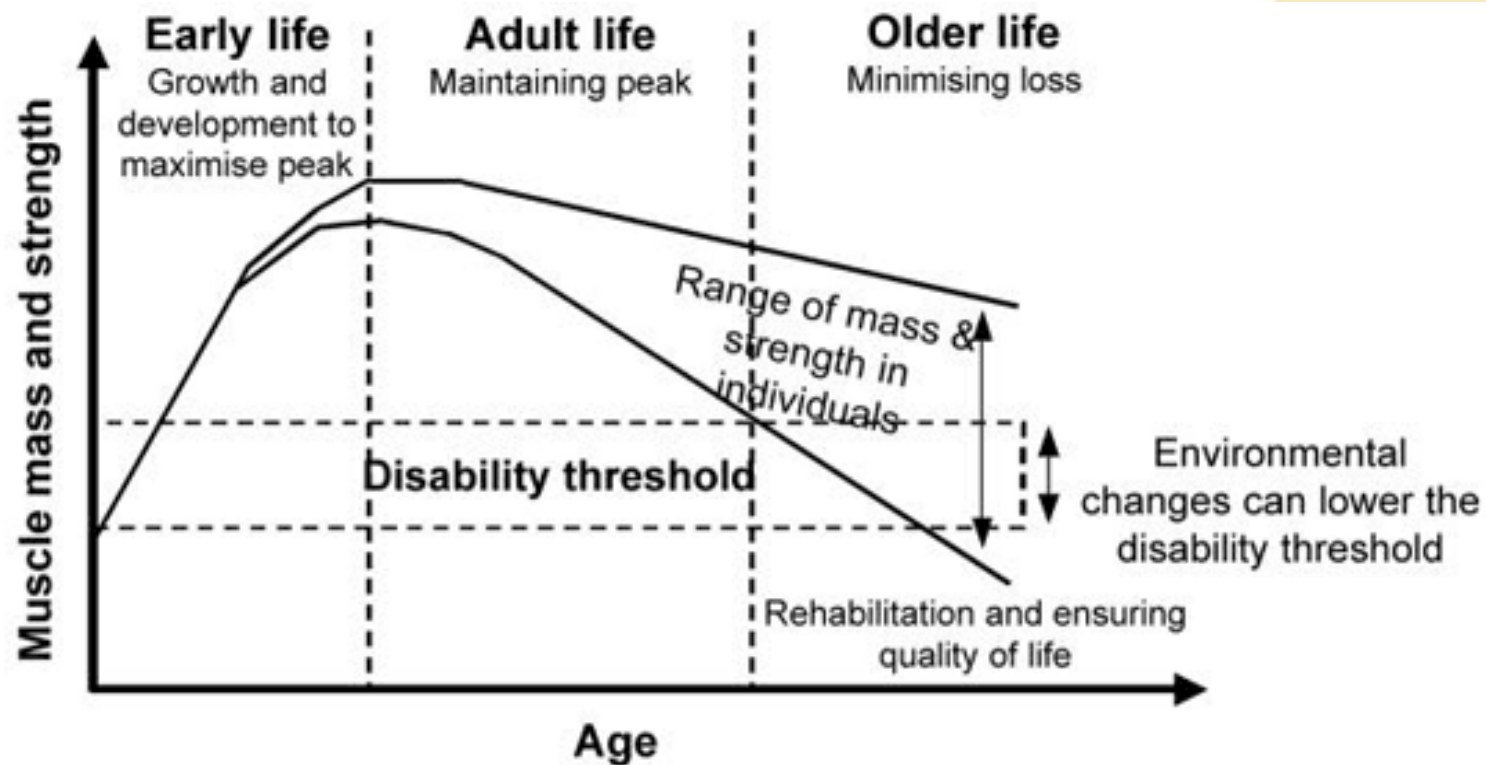
Rappresentazione schematica relativa al Modello del Processo di Disabilità

(adattato da Verbrugge & Jette, 1994).



Braungart Fauth E et al. The Gerontologist 2007;47:613-624

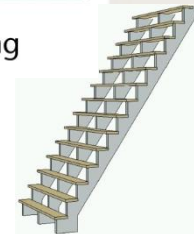
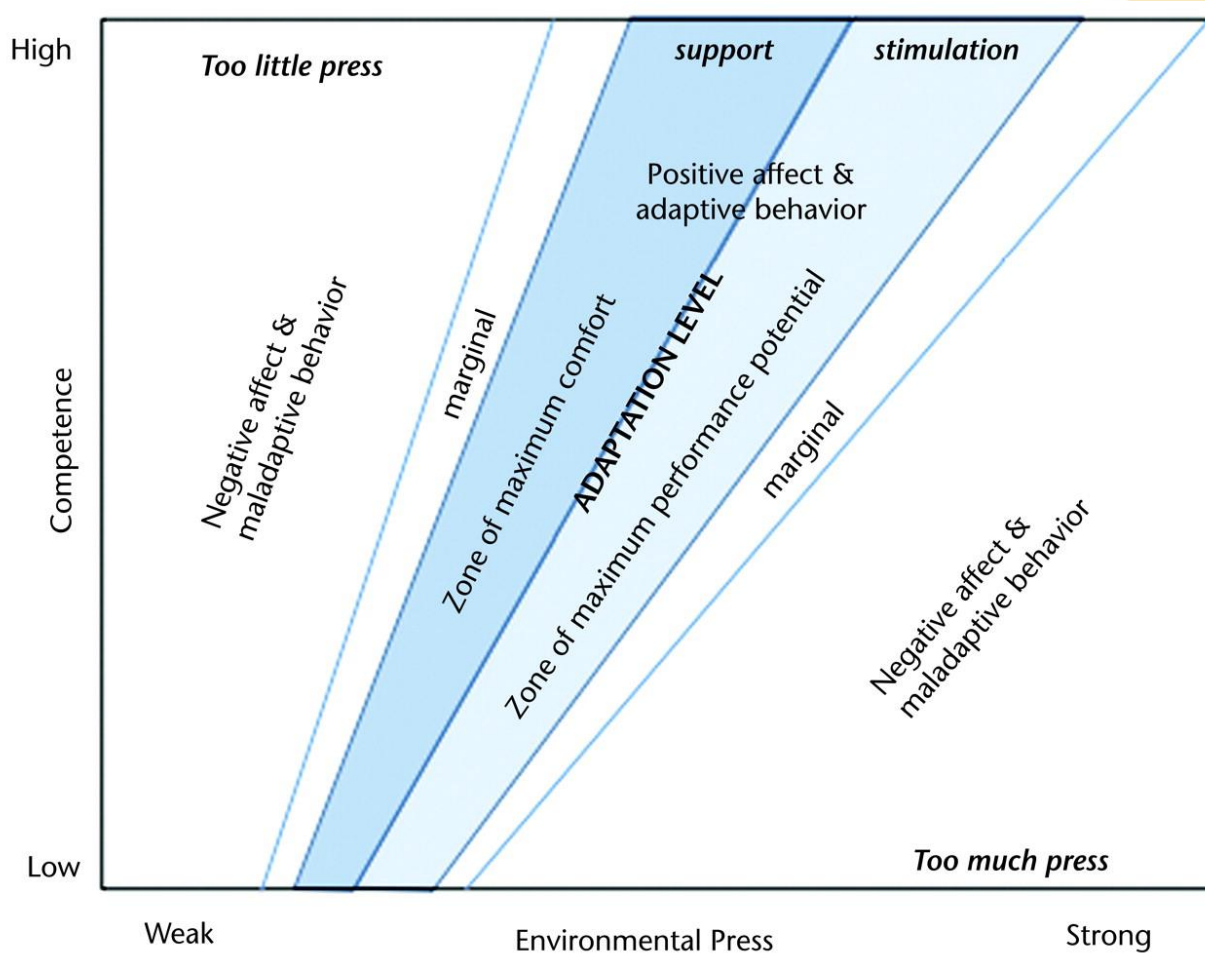
Approccio analitico combinato.....



Modified WHO/HPS, Geneva 2000

Fonte: J Nutr Health Aging. 2008 Aug-Sep

Gerontologia ambientale: il modello della competenza-pressione di Lawton.



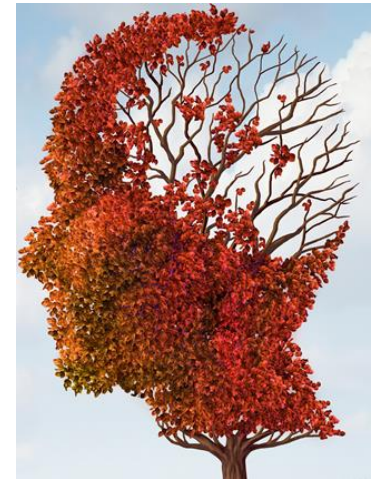
Lawton MP, Nahemow L. Ecology and the aging process. In: Eisdorfer C, Lawton MP, eds. *The Psychology of Adult Development and Aging*. Washington, DC: American Psychological Association; 1973.

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Impoverished environment, cognition, aging and dementia

Karin M. Volkers* and Erik J.A. Scherder

sedentary and lonely people (impoverished environment) have worse cognitive functioning and show a faster cognitive decline than physically and socially active people. Institutionalization further aggravates cognitive decline, probably due to the impoverished environment of nursing homes. In institutions, residents spend an unnecessary and excessive amount of time in bed; out of bed they show mainly sedentary or completely passive behavior. In conclusion, older people, especially those that have been institutionalized, have poor levels of physical and social activity, which in turn has a negative impact on cognitive functioning.



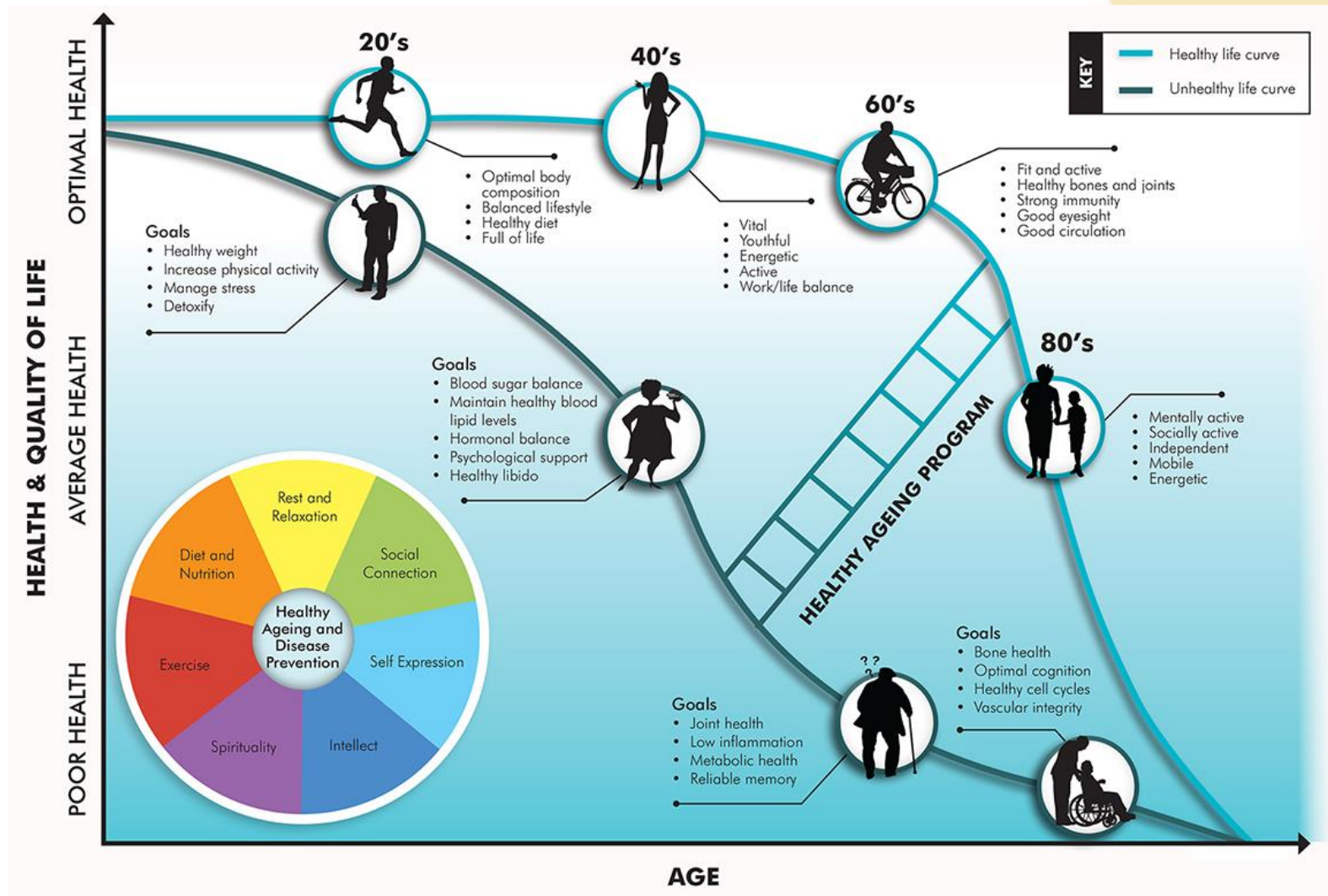
Impoverished environment, cognition, aging and dementia

Karin M. Volkers* and Erik J.A. Scherder

- Sedentary and lonely people have worse cognitive functions and show a faster cognitive decline than physically and socially active people.
- Most community-dwelling older people do not meet the recommended levels of physical activity.
- Cognitive performances are worsened when people move into institutions due to their impoverished environments; residents spend an excessive time in bed, show mainly sedentary behavior, and often have feelings of loneliness.

Invecchiare in salute: [1] evitare attivamente il rischio di sviluppare malattie e disabilità (p.es. stile di vita salutare), [2] mantenimento di una buona funzionalità fisica e cognitiva, [3] continua partecipazione in attività produttive e sociali

Gerontologist, 1997. 37(4): p. 433-40



ACSM Position Stand (1998)

- Molti anziani in condizioni di fragilità vivono in ambienti e tra operatori assistenziali per i quali l'esercizio fisico è ancora un concetto poco familiare e forse visto con paura.
 - *Sussiste un grande bisogno di cambiare gli ambienti fisici circostanti, le opzioni di programmazione ricreativa, e la formazione del personale al fine di permettere l'istituzione di queste raccomandazioni sia a livello domiciliare sia a livello delle residenze e strutture assistenziali per anziani.*
- *Eliminando le barriere non necessarie per un'ottimale mobilità e benessere fisico negli anziani, potrebbero essere realizzati sostanziali benefici a livello salutare.*

Special Article

Recommendations on Physical Activity and Exercise for Older Adults Living in Long-Term Care Facilities: A Taskforce Report

Current Physical Activity Guidelines for Older Adults^{12,13}

Minimum Recommendations of Physical Activity for Adults 65 Years and Older

*Recommendation from the American College of Sports Medicine
and the American Heart Association (2007)**

Aerobic/endurance (bouts of >10 min). Moderate-intensity aerobic PA, 30 minutes, 5 d/wk or vigorous-intensity aerobic PA, 20 min, 3 d/wk. These moderate or vigorous PAs are in addition to the light-intensity activities performed in daily life (eg, self-care) or moderate-intensity PAs lasting 10 min or less

+

Strength. 8–10 exercises, 10–15 repetitions, for strengthening the major muscles of the body, $\geq$ twice/wk, moderate to high intensity

+

Flexibility. $\geq$ twice/wk, 10 min

+

Balance/coordination. “To reduce risk of injury from falls, community-dwelling older adults with substantial risk of falls should perform exercises that maintain or improve balance.”¹²

Recommendation from the World Health Organization (2010)[†]

Aerobic/endurance (bouts of $\geq$ 10 min). Moderate-intensity aerobic PA, $\geq$ 150 min/wk or vigorous-intensity aerobic PA, $\geq$ 75 min/wk

+

Strength. $\geq$ twice/wk, muscle-strengthening involving major muscle groups

+

Balance/coordination. $\geq$ 3 d/wk, for older adults with poor mobility in order to enhance balance and prevent falls.

PA, physical activity.

*Adapted from: Nelson ME, Rejeski WJ, Blair SN, et al. Physical activity and public health in older adults: recommendation from the American College of Sports Medicine and the American Heart Association. *Med Sci Sports Exerc* 2007;39:1435–1445.

[†]Adapted from: World Health Organization. *Global Recommendations on Physical Activity for Health*. Geneva: WHO Press, 2010.

Special Article

Recommendations on Physical Activity and Exercise for Older Adults Living in Long-Term Care Facilities: A Taskforce Report

Riassunto delle raccomandazioni chiave per quanto concerne attività fisica ed esercizio per persone anziane in strutture sanitarie di lungodegenza.

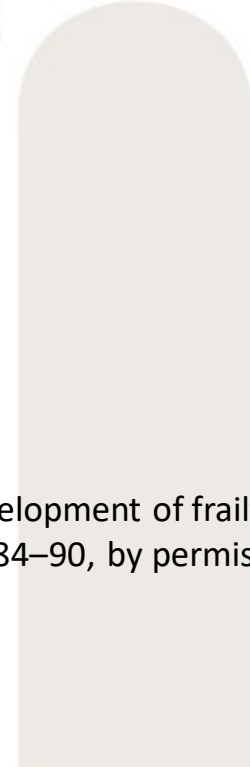
Increasing Overall Physical Activity Levels in Daily Life

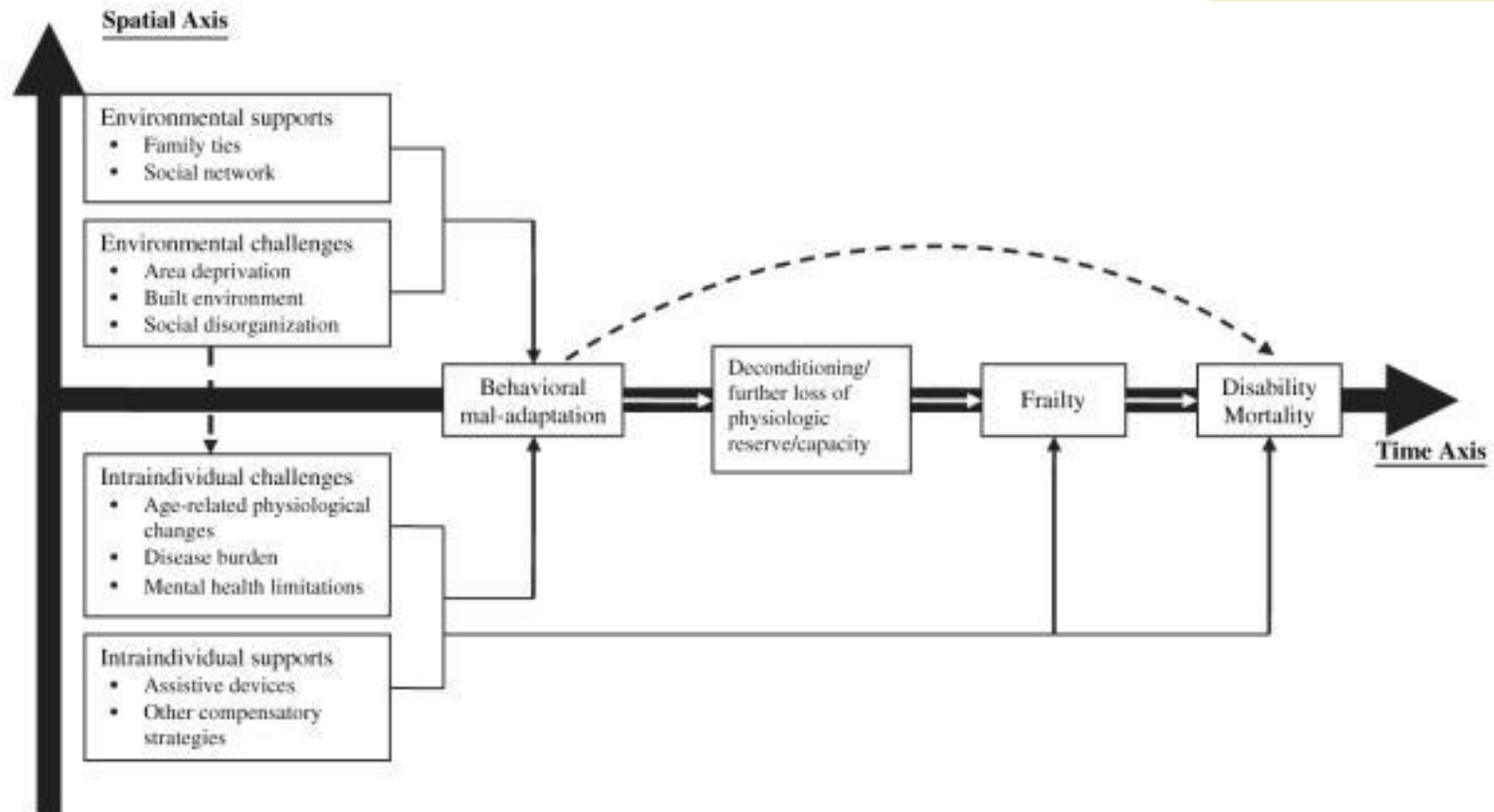
1. Motivation and pleasure are the key aspects to take into account so as to increase overall activity levels among older adults living in long-term care facilities (LTCFs).
2. LTCF staff should adopt strategies for breaking (short breaks of 2–5 minutes) the sedentary time of LTCF residents, twice or 3 times a day.
3. LTCF staff should systematically use simple strategies to stimulate residents to move, such as walking to the lunch/dining hall rather than using wheelchairs for people who are able to ambulate. The risk/benefit of using drugs that reduce patients' activity levels, especially psychotropic drugs, must be systematically evaluated. Physical restraints should be avoided. The use of medical equipment and LTCF architecture should be oriented to optimize residents' mobility.
4. LTCF staff should organize group activities that are motivating and pleasant, such as groups to look after the garden, dance, or walk in green spaces.
5. The use of innovative solutions, such as using animal interventions and new technologies (eg, robots), should be encouraged to increase residents' motivation and pleasure and, then, overall activity levels.

Exercise Training for Residents Dependent in Basic Activities of Daily Living, but Capable of Ambulating/Rising From a Chair*

1. Every resident who has no contraindications must have a personalized exercise program as part of his or her health care plan.
2. Exercise type. The best exercise type is a multicomponent training composed of muscle strength and cardiorespiratory endurance exercises as the core components. Other exercise types, particularly flexibility and balance, should be added to the exercise program whenever possible.
3. Exercise intensity. Moderate-intensity exercises are feasible, effective, and safe. Moderate exercises can be achieved by performing the following:
(1) Strength, 1 or 2 sets of exercises, performed at 13–15 repetitions maximum;
(2) Aerobic, exercises that noticeably increase heart and respiratory frequency, without generating breathlessness or undue fatigue (scoring 5 or 6 in a 10-point scale of perceived effort). High-intensity exercises can be executed, but may require closer monitoring.
4. Frequency. Twice a week, with an interval of at least 48 hours between sessions. Higher weekly frequency is safe and may be feasible for fitter residents.
5. Duration: 35–45 minutes per session. Lesser durations may be needed during the first weeks of exercise. Longer sessions are feasible for most people.

*Capable of ambulating/rising from a chair with or without human assistance.





Modello teorico dell'associazione tra spazio ambientale e sindrome clinica della fragilità. Le linee solide e tratteggiate rappresentano effetti diretti ed indiretti, rispettivamente; le frecce rappresentano direzione di causalità.

(Xue QL, Fried LP, Glass TA, et al. Life-space constriction, development of frailty, and the competing risk of mortality: the Women's Health And Aging Study I. Am J Epidemiol 2008;167(2):240–8, by permission of Oxford University Press.)



What type, or combination of exercise can improve preferred gait speed in older adults? A meta-analysis

Van Abbema *et al. BMC Geriatrics* (2015) 15:72
DOI 10.1186/s12877-015-0061-9

Conclusions: Progressive resistance training with high intensities, is the most effective exercise modality for improving preferred gait speed. Sufficient muscle strength seems an important condition for improving preferred gait speed. The addition of balance-, and/or endurance training does not contribute to the significant positive effects of progressive resistance training. A promising component is exercise with a rhythmic component. Keeping time to music or rhythm possibly trains higher cognitive functions that are important for gait.



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Exercise to prevent falls in older adults: an updated meta-analysis and best practice recommendations

Catherine Sherrington^{A,B,E}, Anne Tiedemann^{A,B}, Vol. 22(3–4) 2011 NSW Public Health Bulletin
Nicola Fairhall^{A,C}, Jacqueline C.T. Close^{B,D}
and Stephen R. Lord^B

- **Raccomandazione N° 7. L'allenamento della forza *potrebbe* essere incluso in aggiunta all'allenamento dell'equilibrio.**
- “..., L'inclusione dell'allenamento della forza non sembrerebbe essere cruciale nel comportare un effetto migliorativo nell'allenamento finalizzato a ridurre/prevenire il rischio di caduta,”

Executive Control Deficits as a Prodrome to Falls in Healthy Older Adults: A Prospective Study Linking Thinking, Walking, and Falling

Talia Herman,¹ Anat Mirelman,^{1,2} Nir Giladi,^{1,3} Avraham Schweiger,^{4,5} and Jeffrey M. Hausdorff^{1,2,6}

Conclusions. Among healthy older adults, individuals with poorer EF are more prone to falls. Higher-level cognitive functions such as those regulated by the frontal lobes are apparently needed for safe everyday navigation that demands multi-tasking. Optimal screening, early detection, and treatment of falls should, apparently, also target this cognitive domain.

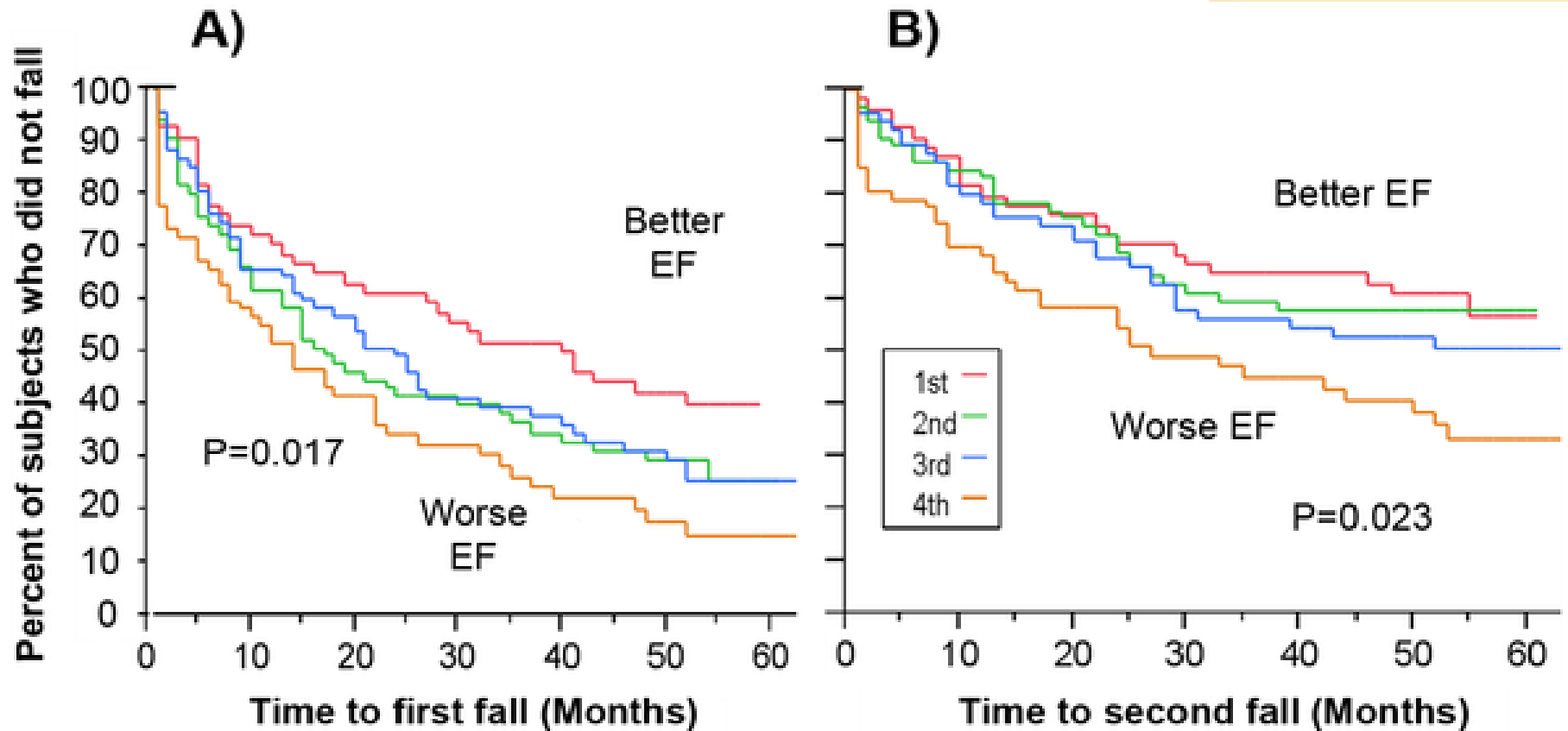
Cognitive and Physical Function in Relation to the Risk of Injurious Falls in Older Adults: A Population-Based Study

Anna-Karin Welmer,^{1,2} Debora Rizzuto,¹ Erika J. Laukka,¹ Kristina Johnell,¹ and Laura Fratiglioni^{1,3}

J Gerontol A Biol Sci Med Sci, 2017, Vol. 72, No. 5, 669–675

Conclusions: Deficits in specific cognitive domains, such as processing speed and executive function, appear to predict injurious falls in the long term. Deficits in physical function predict falls in the short term, especially in people with global cognitive impairment.

Survival curves illustrating the percent of subjects who did not fall as a function of time and executive function (EF).



Mirelman A, Herman T, Brozgol M, Dorfman M, et al. (2012) Executive Function and Falls in Older Adults: New Findings from a Five-Year Prospective Study Link Fall Risk to Cognition. PLoS ONE 7(6): e40297. doi:10.1371/journal.pone.0040297

<http://www.plosone.org/article/info:doi/10.1371/journal.pone.0040297>

Video capture of the circumstances of falls in elderly people residing in long-term care: an observational study

Stephen N Robinovitch*, Fabio Feldman*, Yijian Yang, Rebecca Schonnop, Pet Ming Lueng, Thiago Sarraf, Joanie Sims-Gould, Marie Loughin

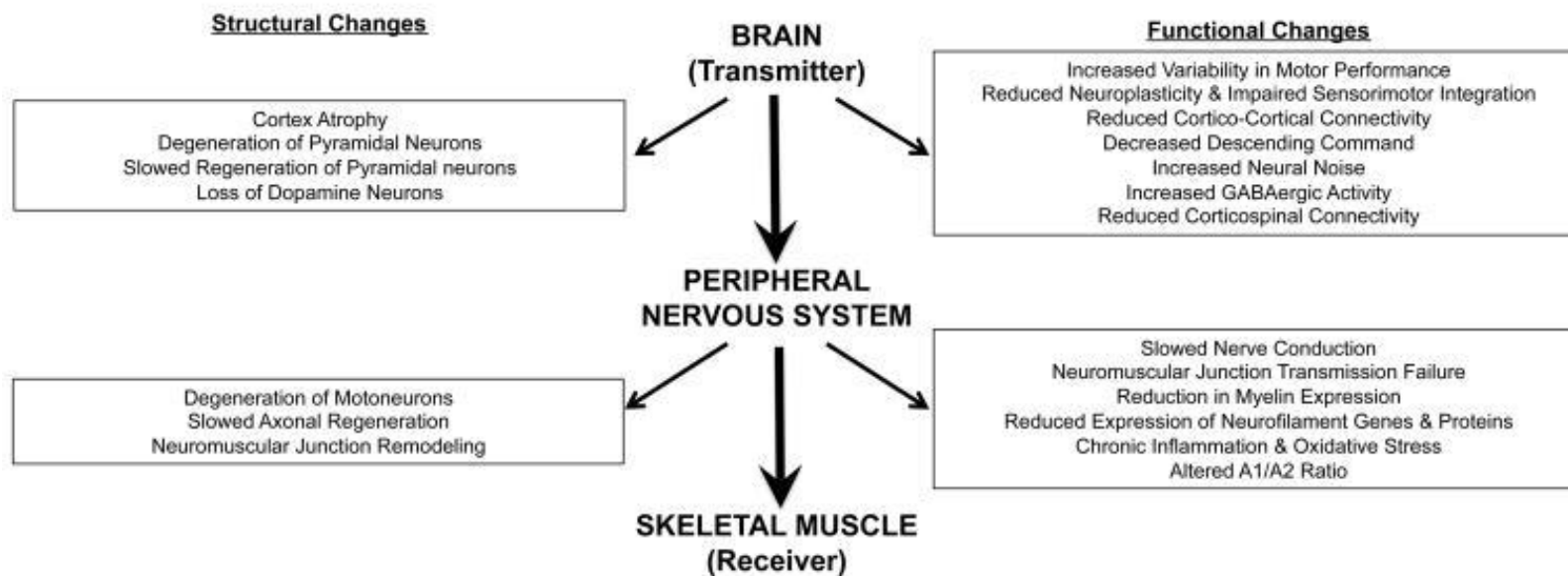
www.thelancet.com Published online October 17, 2012 [http://dx.doi.org/10.1016/S0140-6736\(12\)61263-X](http://dx.doi.org/10.1016/S0140-6736(12)61263-X)

Ridotta capacità di elaborazione (i.e. filtraggio) degli input sensoriali (p.es. aumento del tempo per elaborare stimoli relativi alla memoria di lavoro) che si presume possano spiegare i deficits relativi ai processi motori (i.e., selezione delle risposte motorie). La memoria di lavoro cognitiva si modifica durante l'invecchiamento, comportando una ridotta selezione delle risposte motorie.

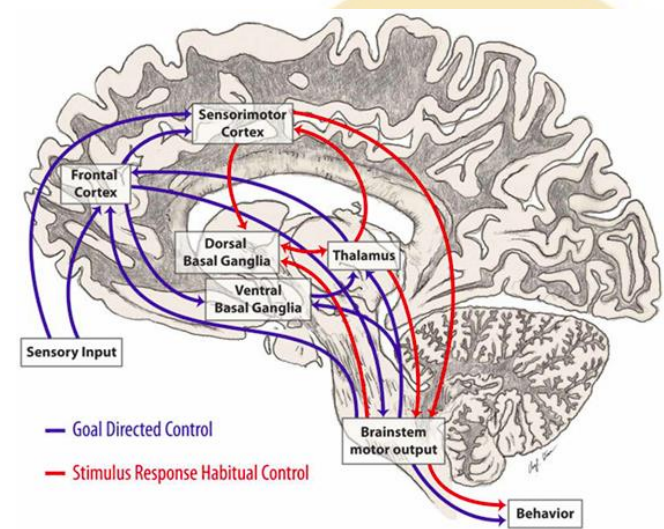
Cid-Fernandez et al. (2014). *Front. Hum. Neurosci.* 8:745. doi: 10.3389/fnhum.2014.00745

MANCANZA DI UN'EFFICIENTE COMUNICAZIONE TRA IL CERVELLO ED I MUSCOLI NELLA DYNAPENIA: UNA SINDROME DI NATURA NEUROGENICA?

FAILURE TO COMMUNICATE?



Il ruolo cognitivo nel cammino/nelle cadute



Front. Public Health
<https://doi.org/10.3389/fpubh.2016.00094>

processi
sensorimotori



Funzioni cognitive
di livello più alto

Il cammino nella terza età: **un compito cognitivo e motorio complesso**
attenzione, funzioni esecutive e memoria sono necessarie

de Bruin, E. D., & Schmidt, A. (2010). Walking behaviour of healthy elderly: attention should be paid. *Behavioral and Brain Functions*, 6. doi: 10.1186/1744-9081-6-59

Pichierri, G., Wolf, P., Murer, K., & de Bruin, E. D. (2011). Cognitive and cognitive-motor interventions affecting physical functioning: A systematic review. *Bmc Geriatrics*, 11. doi: 10.1186/1471-2318-11-29

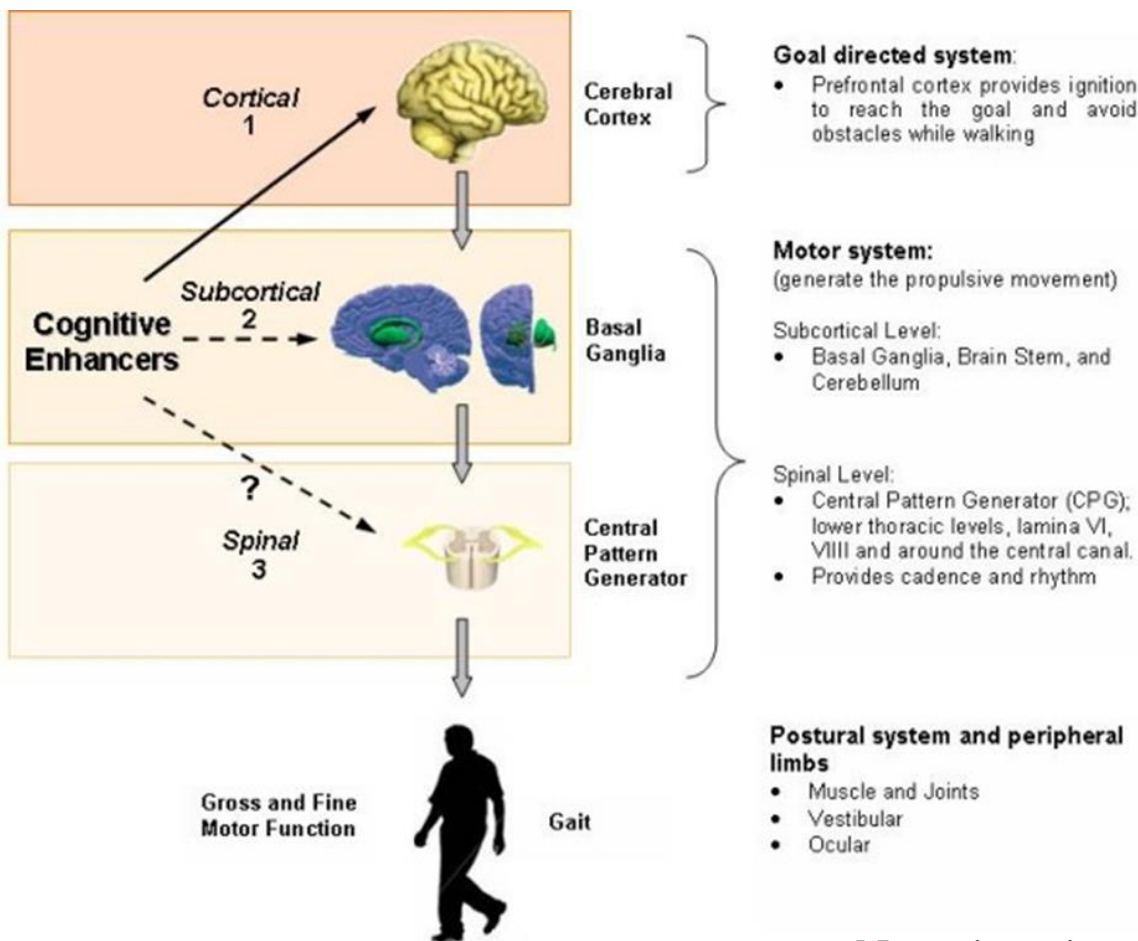
Loss of white matter integrity is associated with gait disorders in cerebral small vessel disease

Karlijn F. de Laat,^{1,*} Anil M. Tuladhar,^{1,*} Anouk G. W. van Norden,¹ David G. Norris,² Marcel P. Zwiers^{2,3} and Frank-Erik de Leeuw¹

Brain 2011; 134; 73–83

Dai piccoli vasi sanguigni alle problematiche collegate al cammino...

- «.. in elderly subjects with small vessel disease, widespread disruption of white matter integrity, predominantly in the normal-appearing white matter, is involved in gait disturbances.
- In particular, loss of fibres interconnecting bilateral cortical regions, *especially the prefrontal cortex* that is involved in cognitive control on motor performance, may be important ..»



Montero-Odasso et al. BMC Neurol. 2009 Aug 12;9:42.

Neuroimaging of Mobility in Aging: A Targeted Review

Roe Holtzer,^{1,2} Noah Epstein,² Jeannette R. Mahoney,¹ Meltem Izzetoglu,³ and Helena M. Blumen⁴

Journals of Gerontology: MEDICAL SCIENCES

Cite journal as: J Gerontol A Biol Sci Med Sci. 2014 November;69(11):1375–1388

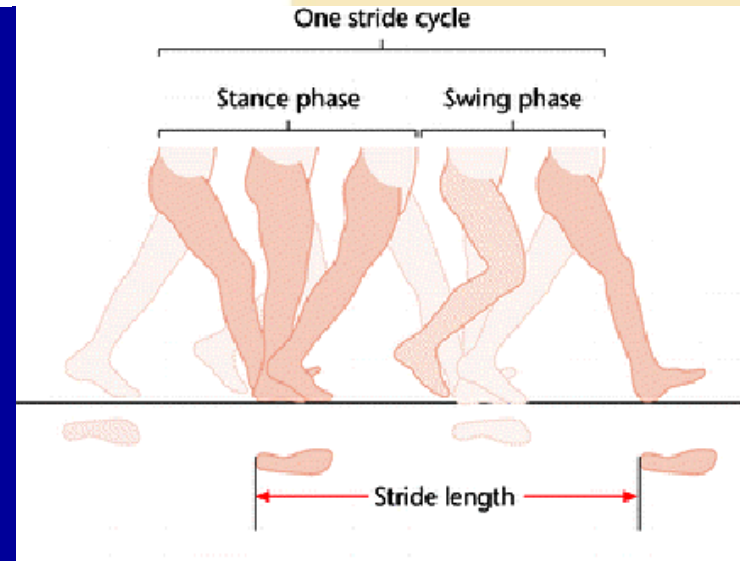
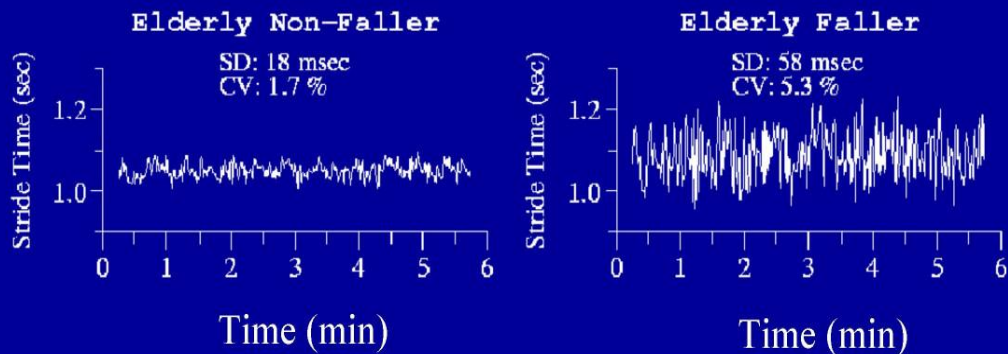
doi:10.1093/gerona/glu052



Results. Poor mobility outcomes were reliably associated with reduced gray and white matter volume. Fewer studies examined the relationship between changes in task-related brain activation and mobility performance. Extant findings, however, showed that activation patterns in the cerebellum, basal ganglia, parietal and frontal cortices were related to mobility. Increased involvement of the prefrontal cortex was evident in both imagined walking conditions and conditions where the cognitive demands of locomotion were increased.

Example of Increased Stride Time Variability in Elderly Fallers

Quantification of Stride-to-Stride Fluctuations



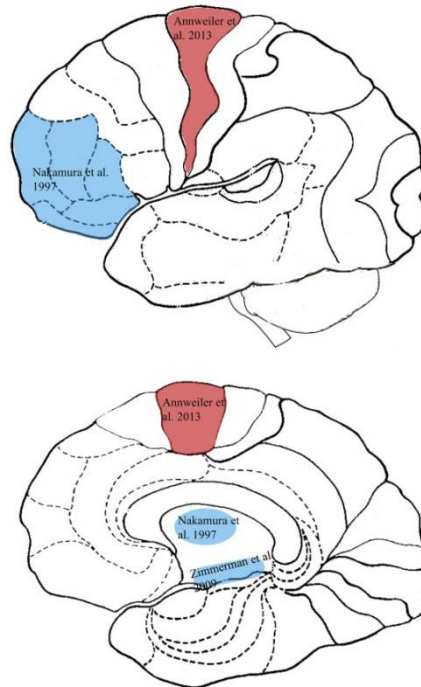
Upper threshold 2.6% - Lower threshold 1.1% for **pathologic variability**

N. König et al. / Neuroscience and Biobehavioral Reviews 68 (2016) 111–119

The mean values of the stride time are essentially identical in both subjects, the magnitude of the stride-to-stride fluctuations is much larger in the faller. SD: standard deviation; CV: coefficient of variation

**cerebrale grigio
(to) e mediale (cammino**

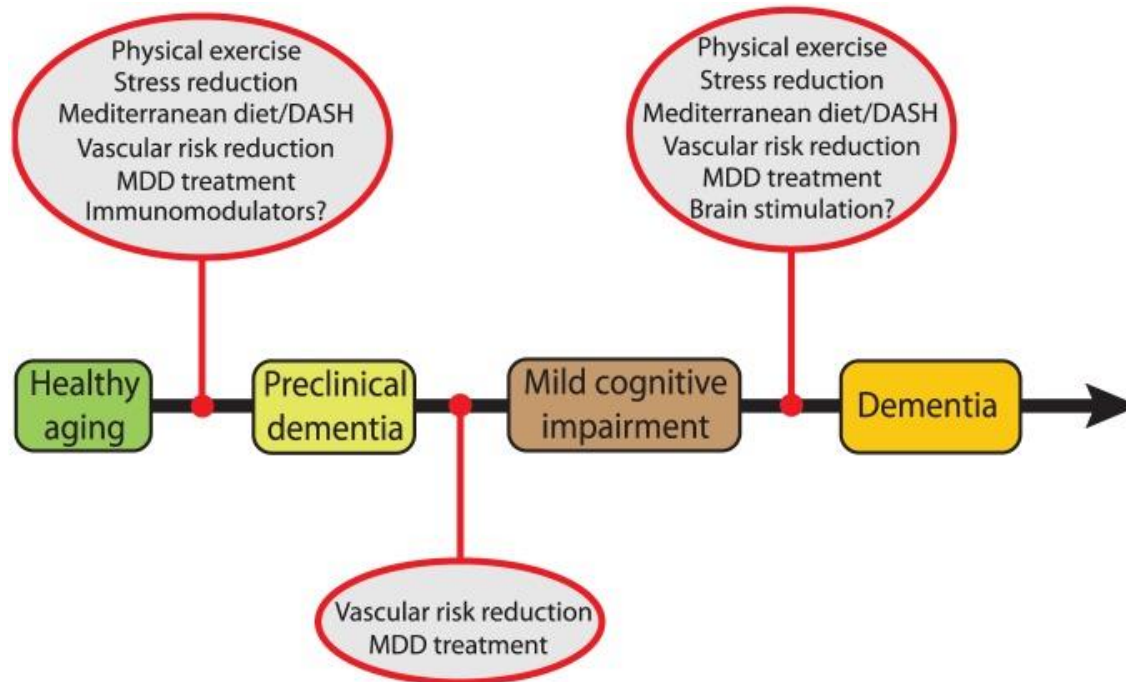
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Mappa cerebrale relativa alla variabilità del cammino nei soggetti con problematiche cognitive e/o demenza senile: La materia cerebrale grigia (aree colorate) e la materia bianca (linee) sul piano sagittale in visione laterale (in alto) e mediale (in basso), associate alla variabilità temporale (in rosso) e spaziale (in blu) del cammino

Qu Tian, Nathalie Chastan, Woei-Nan Bair, Susan M. Resnick, Luigi Ferrucci, Stephanie A. Studenski. **The brain map of gait variability in aging, cognitive impairment and dementia—A systematic review.** Neuroscience & Biobehavioral Reviews, Volume 74, Part A, 2017, 149–162; <http://dx.doi.org/10.1016/j.neubiorev.2017.01.020>

Preventive strategies that may show promise



Intervention	Strength of evidence
Physical activity	+++
Treatment of vascular risk factors	+++
Dietary modification	++
Treatment of MDD	++
Cognitive retraining	++
Stress reduction	++
Immunomodulators	+
Brain stimulation	+

+++ , moderate; ++, low; +, very low; MDD, major depressive disorder

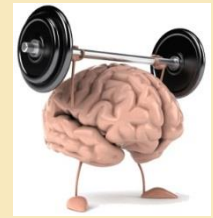
Schema riassuntivo delle strategie che potrebbero rivelarsi promettenti nella prevenzione della demenza senile...

DASH, Dietary Approach to Systolic Hypertension diet; MDD, major depressive disorder.

Valutazione complessiva delle strategie esistenti per la prevenzione del declino cognitivo. (classificazione basata sul sistema GRADE)

Ther Adv Chronic Dis. 2017 Aug; 8(8-9): 121–136.

„Exergaming“



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is defined as technology-driven physical activities, such as video game play, that requires participants to be physically active or exercise in order to play the game.



www.dividat.ch

www.didac.ch

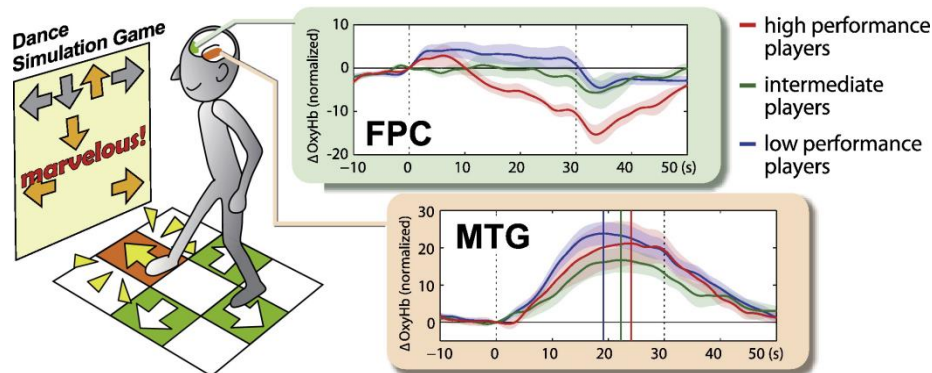
© Didac AG. Tutti i diritti riservati.

ETH

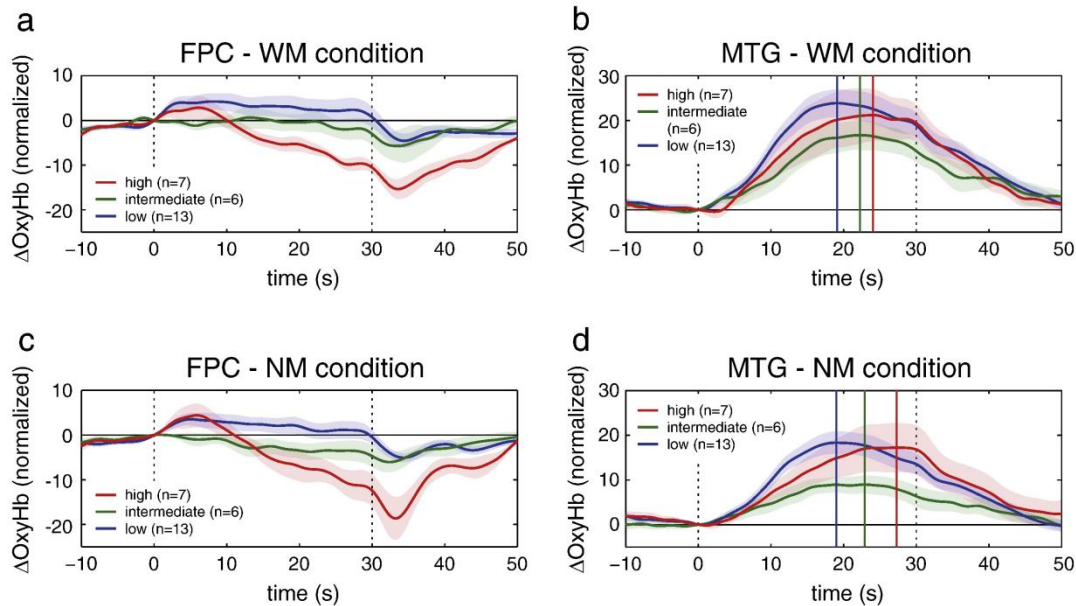
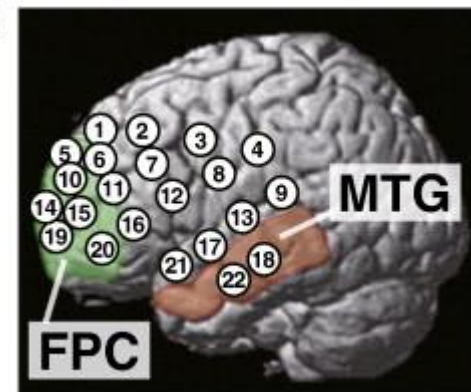
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Frontotemporal oxyhemoglobin dynamics predict performance accuracy of dance simulation gameplay: Temporal characteristics of top-down and bottom-up cortical activities

Yumie Ono^a, Yasunori Nomoto^a, Shohei Tanaka^a, Keisuke Sato^a, Sotaro Shimada^a, Atsumichi Tachibana^a, Shaw Bronner^a, J. Adam Noah^a



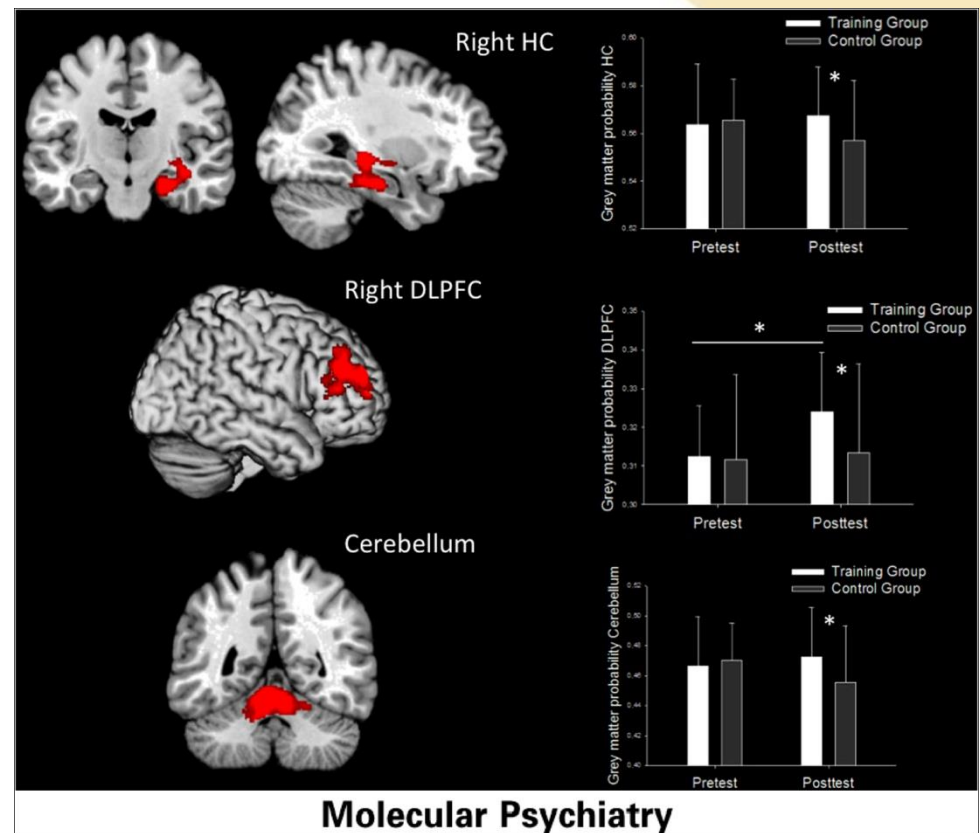
a



Playing Super Mario induces structural brain plasticity: gray matter changes resulting from training with a commercial video game

Molecular Psychiatry (2014) **19**, 265-271;
doi:10.1038/mp.2013.120

S Kühn¹, T Gleich², RC Lorenz^{2,3}, U Lindenberger¹ and J Gallinat²



Review

Step training improves reaction time, gait and balance and reduces falls in older people: a systematic review and meta-analysis

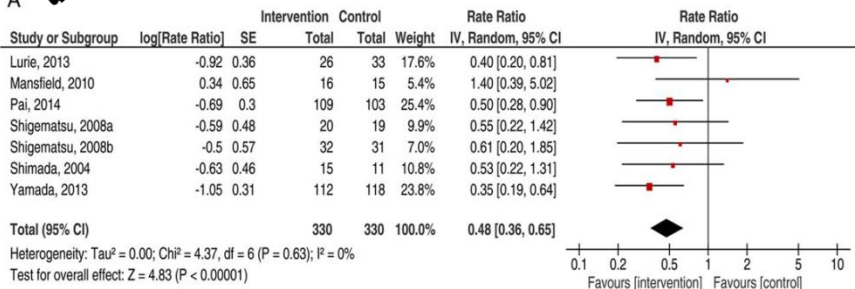
Yoshiro Okubo^{1,2}, Daniel Schoene³, Stephen R Lord^{1,4}



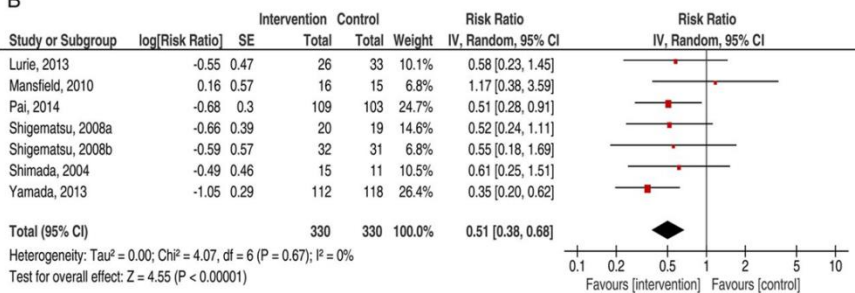
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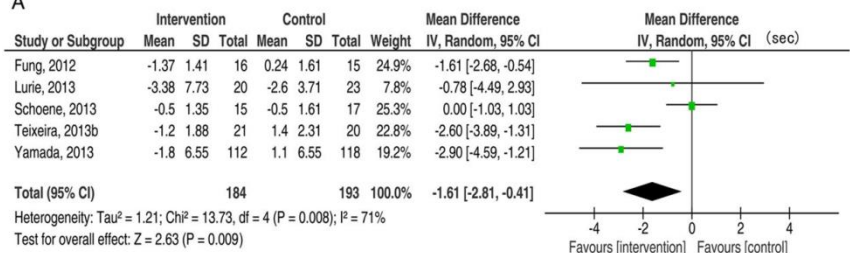
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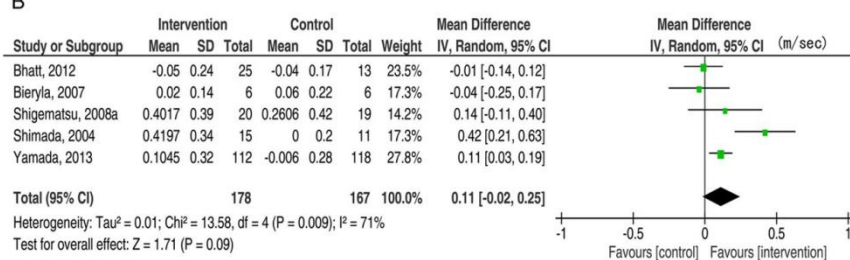
B



A



B

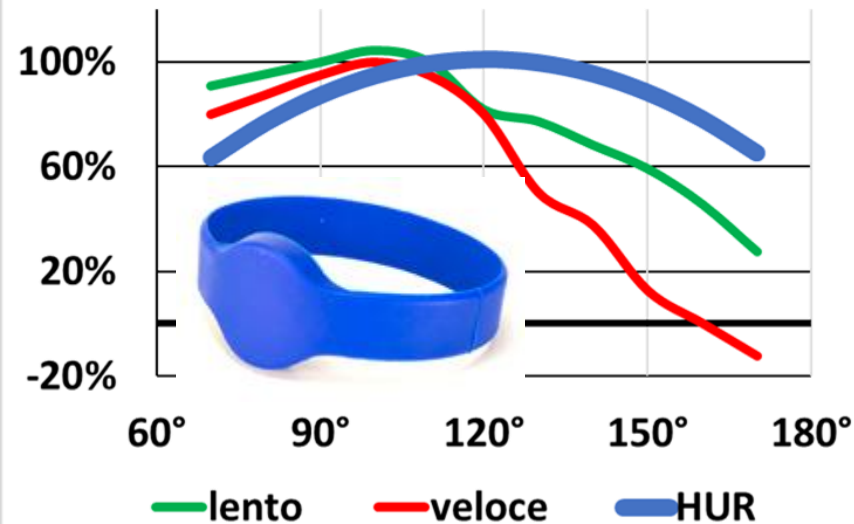




ASSOCIAZIONE
CENTRO DEL
MOVIMENTO

Caratteristiche del Centro del Movimento

Allenamento muscolare



- Nessuno sforzo supplementare iniziale per sollevare il peso all'inizio dell'esercizio
- ... e di frenarlo alla fine
- Esecuzione di movimenti fluida e delicata
- Allenamento rispettoso delle articolazione
- Simula la normale attività muscolare
- Limitatori di movimento
- Accesso facilitato
- Aumento graduale del carico

Allenamento Cardiocircolatorio



- Accesso facilitato
- Incremento graduale
- Allenamento motorio completo
- Immersione in una realtà virtuale



Allenamento cognitivo-motorio

Migliora

- Attenzione
- Concentrazione
- Pianificazione
- Reazione

Ha effetti positivi su

- Cadute
- Cammino
- Mobilità
- Autonomia
- Sicurezza



***“L'uomo non smette di giocare perché invecchia,
ma invecchia perché smette di giocare.”***

George Bernard Shaw



Grazie per l'attenzione