How Physical Activity Can Improve your Health and your Life!

UVic Elder Academy, October, 2017

David Docherty and Jochen Bocksnick***
Professor Emeriti

**School of Exercise Science, Physical and Health Education, University of Victoria*
***School of Kinesiology, University of Lethbridge*

Series of presentations.

1. ~~The effects of physical activity on the cardiovascular system~~
2. ~~***The effects of physical activity on strength***~~
3. The effects of physical activity on retaining memory and cognition
4. The effects of physical activity on balance/falls

Focus: *The theory, rationale (research), and practices to achieve positive outcomes.*

All presentations are available at:

- https://onlineacademiccommunity.uvic.ca/elderacademy/

Take home message

- Try to incorporate some form of strength training at least once (twice) per week
- Many programs currently available in Recreation and Seniors Centres (e.g. Stretch and Strength) or personal trainers
- Include at least three aerobic training sessions or combine with strength training
- Eat right! Ensure you are consuming enough protein and calories (follow the Canada's Food Guide)

Strength training:

- Exercises should be done slowly in both parts (up and down/concentric and eccentric)
- For each pull exercise do a push for the same joint area
- Do 15-20 repetitions that should be hard towards the end (muscle group should feel tired)
- Do at least 1-2 sets and at least 1-2/week
- Do one exercise for all major muscle groups (8-10 exercises)

For example:

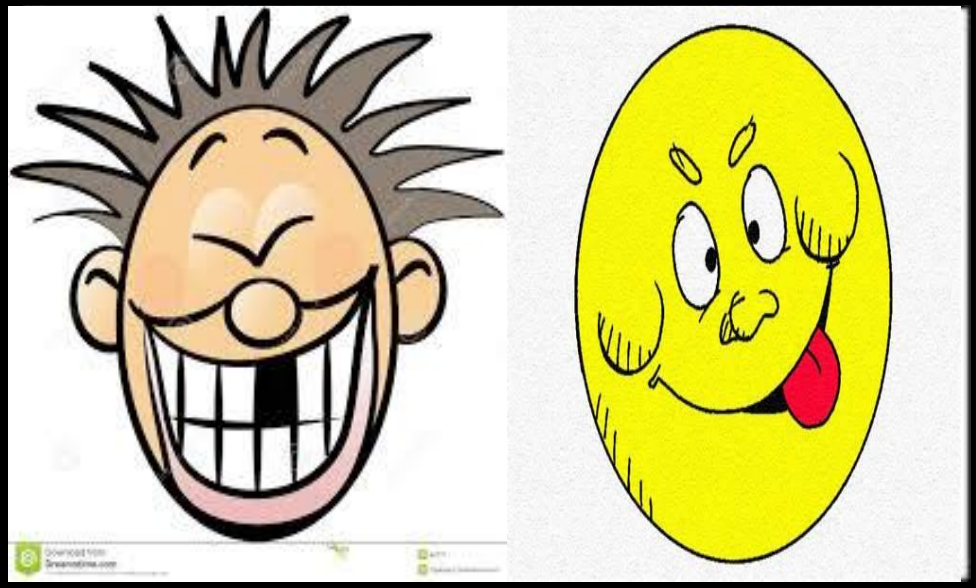
- Arm curl/arm extension
- Arm pull/arm push
- Front lunge/back lunge (legs)
- Arm lift to side/arm pull straight
- Split squats/dead lifts
- Do 1-2 core exercises

Can be done with free weights, stacked weights, body weight or therabands

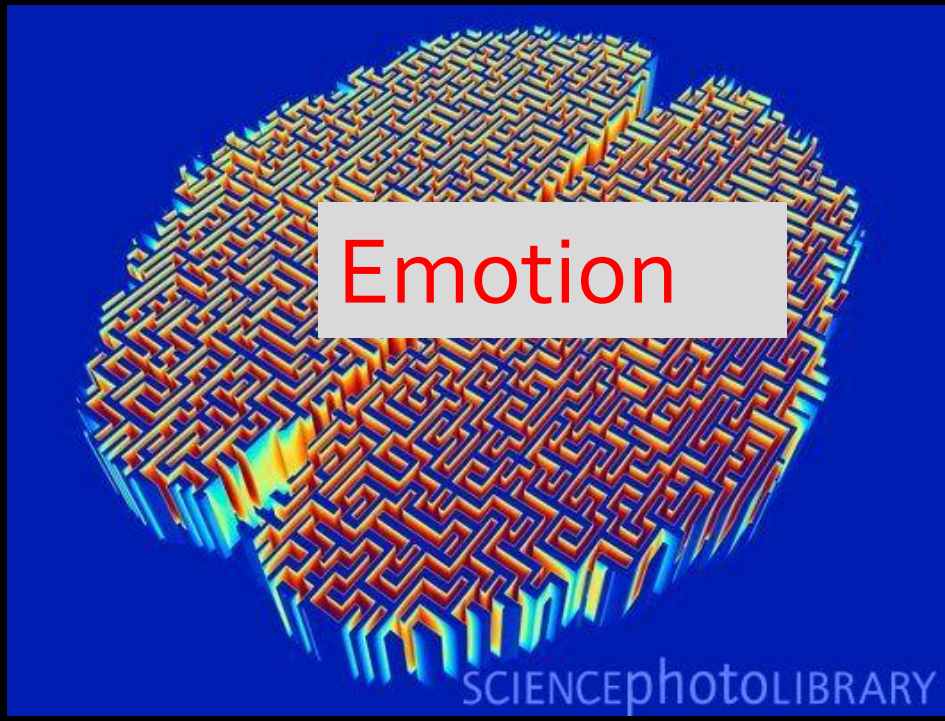
- The effects of physical activity on retaining memory and cognition
- Focus: *The theory, rationale (research), and practices to achieve positive outcomes.*

To start……

Differences between men's brains and women's brains with apologies to Mark Gungor (marriage expert)



Woman's brain



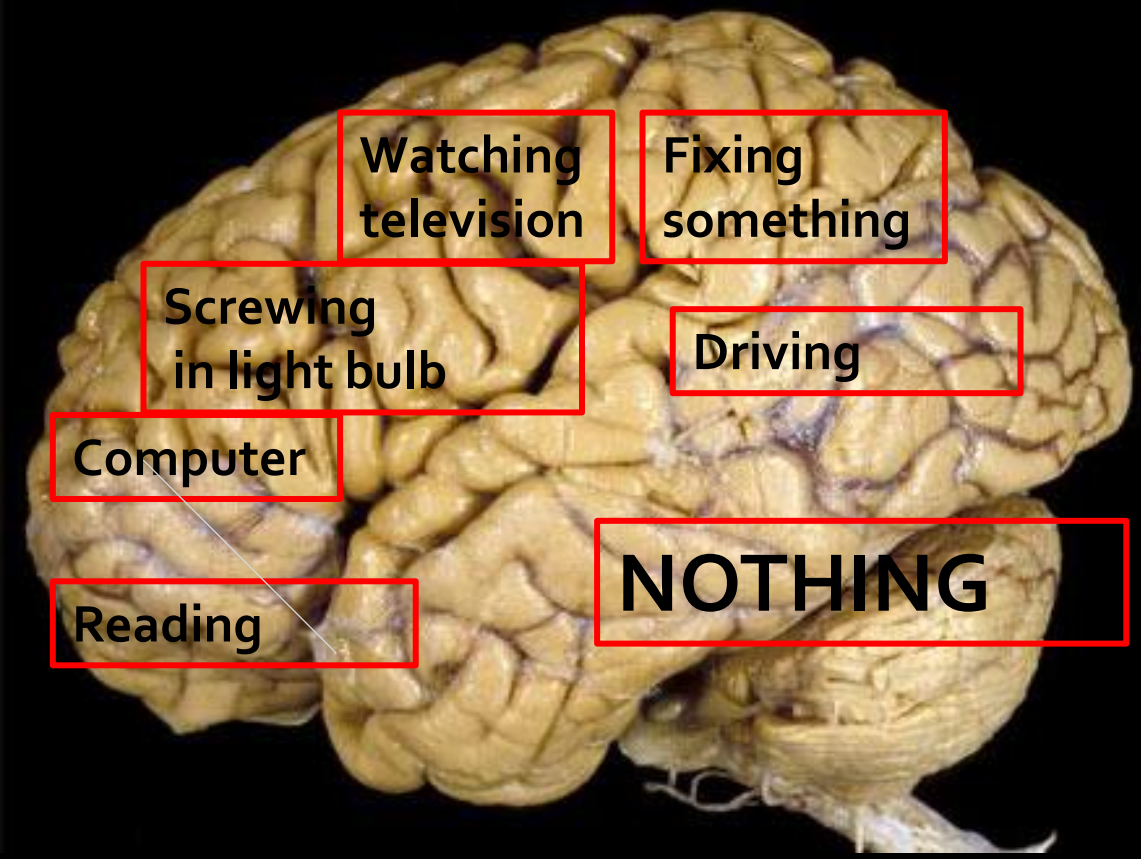
Complex circuits
Highly interconnected-like an internet highway.

Compared to a man's brain

Complex network

Boxes

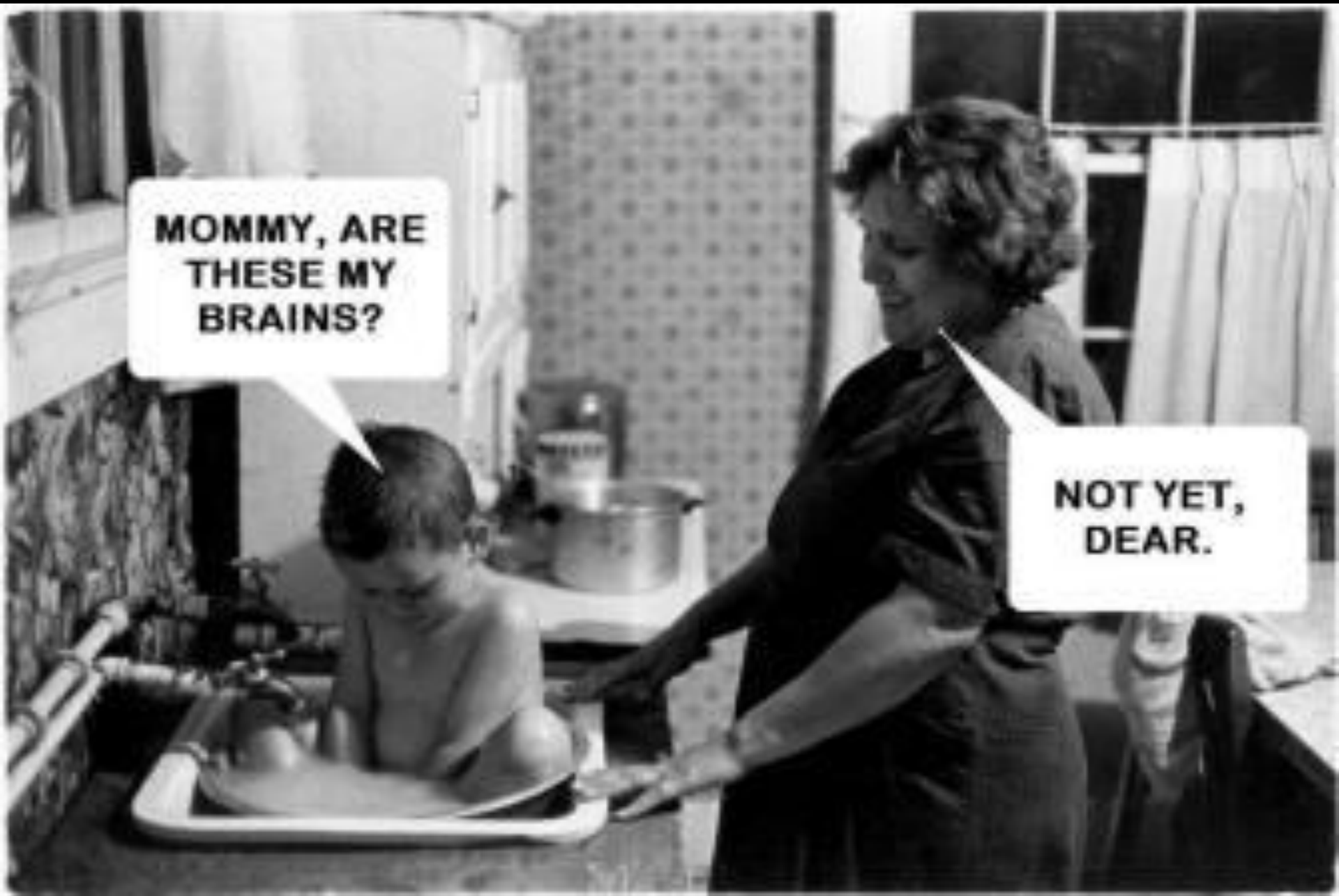
Man's brain



Organized into boxes that do not touch or connect.

Note: There is no shopping box

Another difference between men's and women's brains!



The more serious side!

- Factors that affect cognition and memory, especially as we age, but really important at all stages in life
- Some factors we cannot control
- Others we do have some control over

Acknowledgement: Brian Christie Ph.D., Neural Science Division of Medical Sciences, University of Victoria.

Canada's Challenge:

- **Diseases of the brain affect over 4 million Canadians, and cost over $30 billion annually** (Ernst and Young). **Could be as high as 10 million ($22.7 billion)** Neuroscience, 2006
- **Brain diseases are frequently chronic, requiring prolonged support from family, caregivers, and the health system.**
- **We face a *looming epidemic in brain diseases:***
  - **currently 400,000 Alzheimer's cases in Canada (over 1 million projected in 2020).**
  - **currently 100,000 Parkinson's cases (300,000 projected in 2020).**
  - **dramatic increases projected for stroke, glaucoma, macular degeneration.**

Canadian Institute for Health Information, *The Burden of Neurological Diseases, Disorders and Injuries in Canada (Ottawa: CIHI, 2007). Health Canada, Neuroscience, Canada, 2012*

The Good news: Brain Plasticity

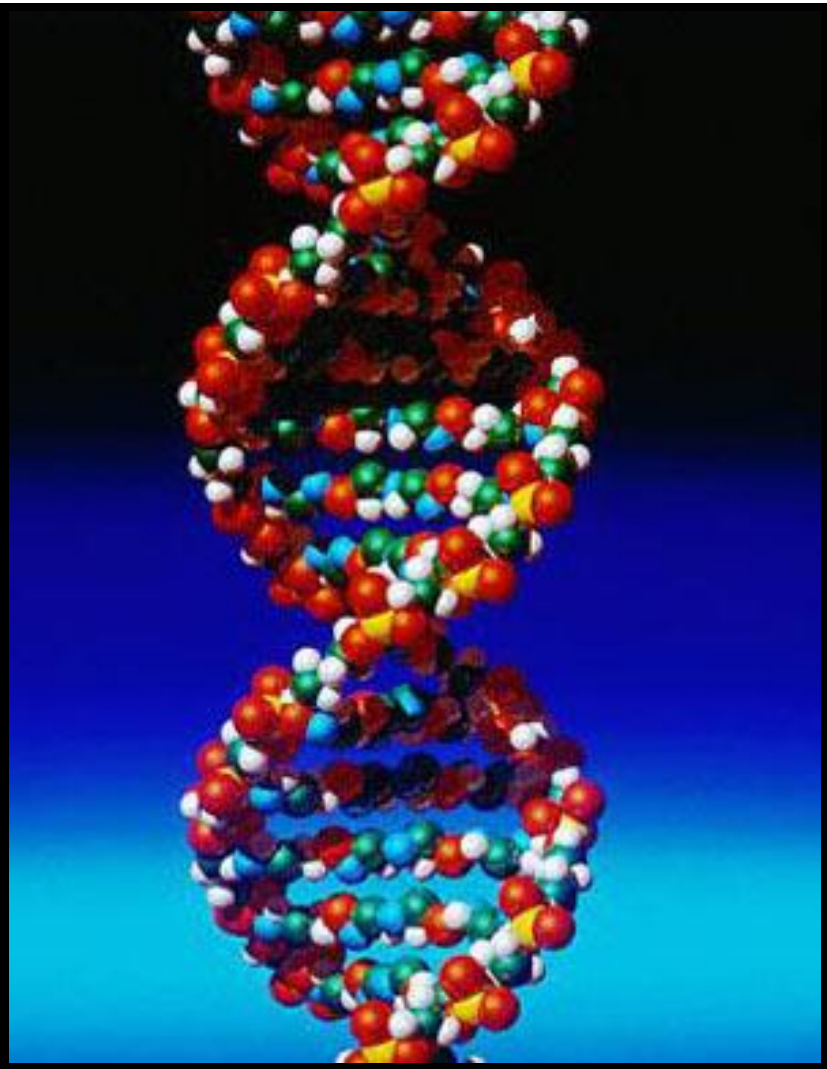
Neurogenesis

Things you can't change!

Genetics: Choose a good set of parents!

- - Up to 2/3 (67%) of our genes are used in the running of your brain
- - Twin studies estimate ~25% of your longevity is due to your parents.

Genetics influences the rate of neurogenesis.



Things you can't change!

- Employment (stress)
- Income (Socio-economic status)

Things you can do to help your brain as you age (and body)

1. Quench your thirst

- Dehydration can cause mental confusion and lead to Alzheimer's like symptoms.

  -Patients with dementia often don't drink enough and it worsens their condition.
- **How much? -** Your need will vary with heat, exertion, etc.
- - urine should be clear, not dark yellow.

- Dehydration reduces neurogenesis.

2. Eat right!

Ontario Brain Institute, 2012

- Energy intake from carbohydrates can enhance memory independently of elevations in blood glucose.
- Low Carb diets can actually impair memory in the elderly, make them more likely to guess or make up answers (D'Anci et al., 2008)
- Low Glycemic Carbs are best: Fruits (pears, peaches and oranges etc.), veggies (green beans, broccoli, cauliflower etc.), old fashioned oats, brown rice, and whole grain.

Also……

- Low fat dairy products
- Leaner meats
- Foods prepared with little or no fat
- Foods rich in omega-3 oils (cold water fish such as trout, salmon, halibut, tuna, and nuts such as walnuts, almonds, pecans)

Salad is the meal!

(Noel Fuhrman) The importance of micronutrients

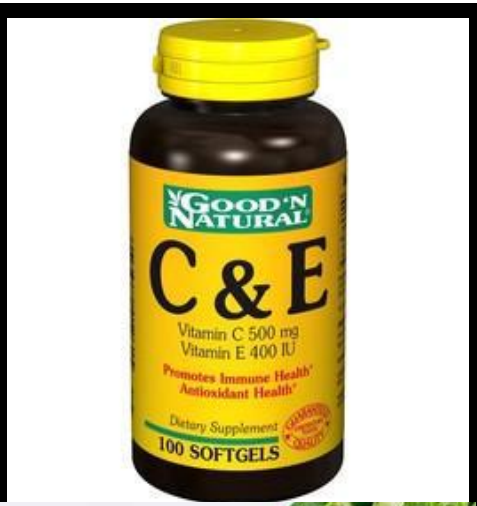
A rainbow of colours on your plate

A poor diet reduces neurogenesis

"I'd like to take Ginkgo to improve my memory, but I'm still trying to forget the Disco years."

3. Anti-oxidants

- Anti-oxidants: Long-term, current users of vitamin E (abundant in leafy green vegetables, vegetable oils, and nuts) and vitamin C had significantly better mean memory performance. There was a trend for increasingly higher mean scores with increasing durations of use (Grodstein et al., 2003). Also folic acid (B9)
- Omega-3 and Memory: Randomized control study showed healthy people with memory complaints that took algal DHA capsules for 6 months had half again fewer errors than individuals that took placebos. However, another study reported no benefits in individuals already diagnosed with Alzheimer's. Need to use them early on to get benefits.



Anti-oxidants can increase neurogenesis.

However,……

There is currently insufficient evidence to confirm a relationship between the micro- and macronutrients described above (vitamin B6, vitamin B12, folate, vitamin C, vitamin E, flavonoids, omega-3, Mediterranean diet) and cognitive function. Although some studies have shown positive results, particularly those using cross-sectional designs, the findings have not been consistently supported in prospective cohort studies, and preventive interventions have generally failed the critical test of randomized controlled trials.

World Alzeimer Report, 2014

4. Be social(able)

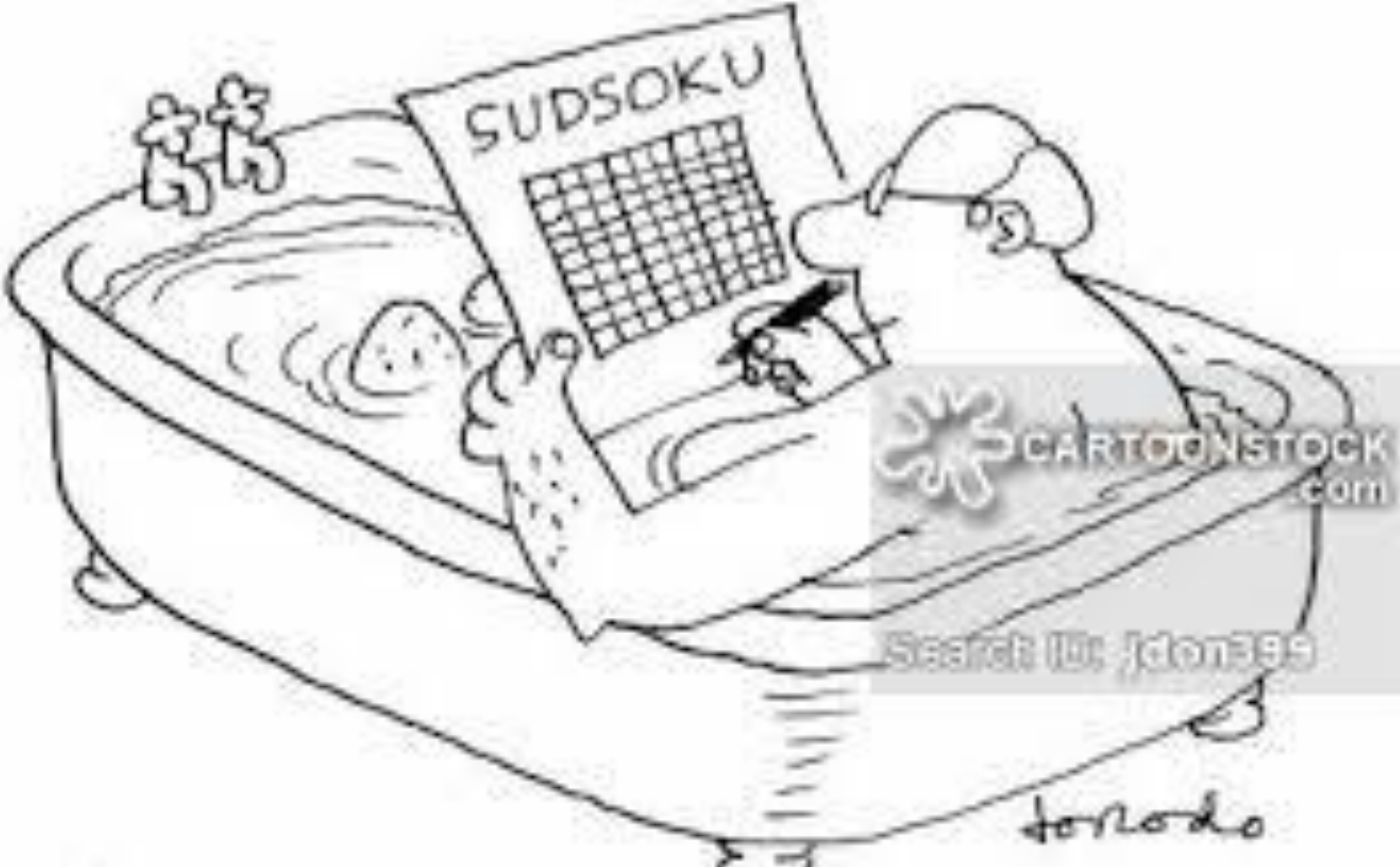
- Having an active social life appears to delay memory loss. – Harvard School of Public Health, 2008
- Stay connected
- Accept and extend invitations
- Help someone out
- Laugh/smile with someone
- Volunteer

Social Activity Enhances Neurogenesis, Isolation decreases it.

5. Challenge your brain

- Play games (chess, work and number puzzles, jigsaws, crosswords and memory games
- Pursue a new interest (play a musical instrument, go to the theatre)
- Keep up hobbies
- Join a book club
- "Lumosity"?

An active brain increases neurogenesis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The Brain Game!

- Do they really work: evidence is encouraging but not compelling.
- Get better at the game but does it help in real life?
- They can be expensive!
- They can be frustrating!
- Probably do not do any harm and may do some good.
- Psychologists have found that cognitive training can, in fact, have payoffs for skills like memory and problem solving. But scientists are still sorting out the specifics about how best to turn that training into brain games that work*.

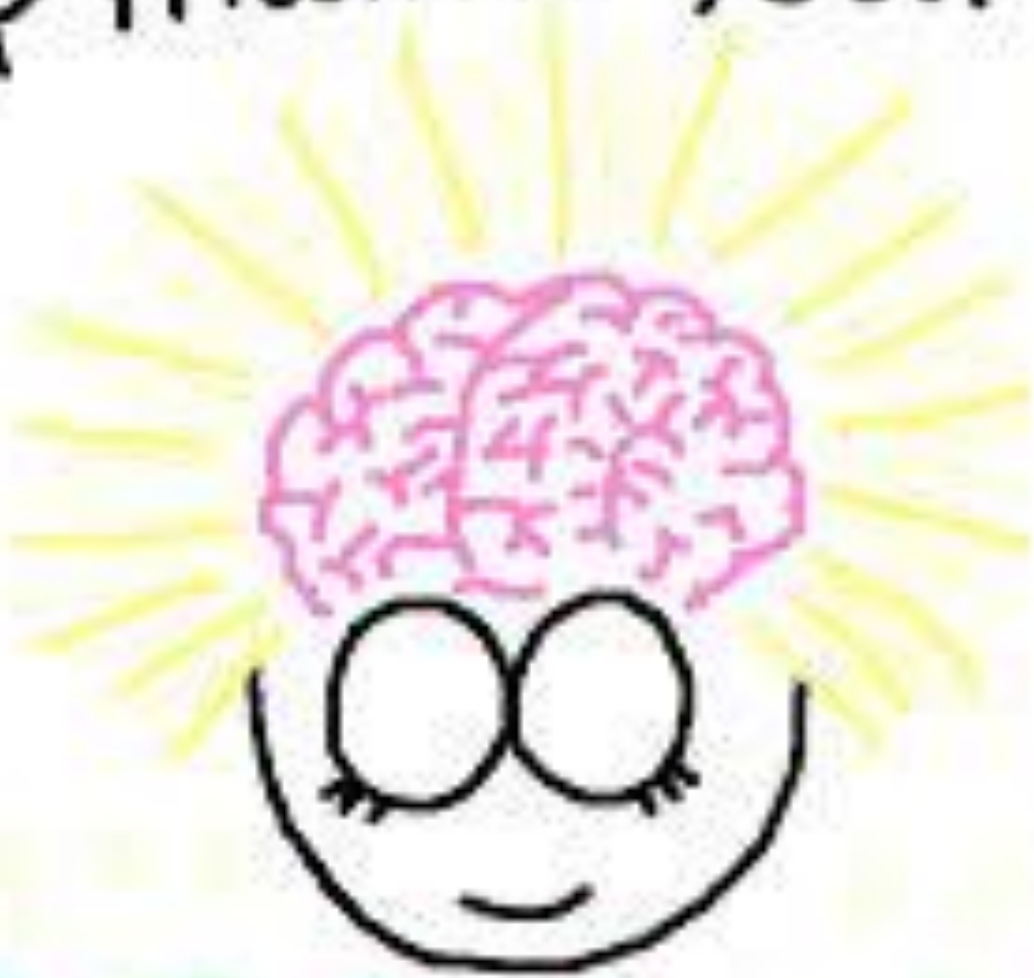
P.M. Doraiswamy & M.E. Agronin, Brain Games: Do they really work? *Scientific American*, April 28th, 2009. *Kirsten Weir, Mind Games: Can brain-training games keep your mind young? *American Psychological Association.* October 2014, Vol 45, No. 9

6. Sleep on it.

- Older women (65+) who suffer from sleep apnea are more than twice as likely to develop dementia as those who don't (UCSF Study)
- •Sleep only when sleepy!
- •20 minutes to sleep rule
- •Get up and sleep at regular times
- •Develop sleep rituals
- •Only use your bed for sleeping, not reading or TV.
- •Avoid caffeine, nicotine, alcohol 4 hrs before bed
- •Avoid napping
- •Make sure you get some natural light in the morning.

Lack of sleep decreases neurogenesis.

sleep makes your brain



SPARKLE

And (7) the ***number one*** way to boost your brain power..

- Through physical activity!

Summary…….

There is persuasive evidence that the dementia risk for populations can be modified through reduction in tobacco use and better control and detection for hypertension and diabetes, as well as cardiovascular risk factors. A good mantra is "What is good for your heart is good for your brain".

World Alzeimer Report, 2014

"Boosting your brain power could be as easy as a walk in the park!"

- *Paul Taylor, Globe and Mail, Oct 14th, 2010*
- *Alan Mozes, Healthfinder.gov (US Dept of Health and Human Serivces*

Study by Kirk Erickson, *University of Pittsburgh (Epub in Neurology, Oct 13th, 2010)*

- Followed 299 seniors over 9 years in regard to the distances they walked in a week
- Did MRI scans of their brains to measure size (brain shrinks with age which is associated with memory problems and dementia)
- Tested for cognitive impairment or dementia

Erickson, K., Neurology, 75(16), 1415-1422, 2010.

Results……..

- People who walked between 6-9 miles (9.7- 14.5 km) a week had
  - less brain shrinkage
  - Cut risk of developing cognitive problems in half!

Also another study by Kirk Erickson et al.

(Proceedings of the National Academy of Sciences, on line Jan 31, 2011).

- 120 older people who were not regular exercises.
- Half walked around a track 3 days per week for 40 min. for 12 months. Others did stretching and some weights.
- Increased hippocampus volume in aerobic exercise group and fitter subjects (associated with improved memory and spatial navigation).

Erickson et al., PNAS, Jan 31, 2011

"Just a little exercise can reduce onset of Alzeimer's, report says"

(National Post, March 8th, 2013)

- Taking brisk walks in 10 minute bouts a few times a day can significantly delay onset of dementia and even prevent it!
- Regular physical activity also helps people with Alzeimer's and other forms of dementia better manage their disease!

(Ontario Brain Institute [2013]-published a report based on almost 900 studies done in the last 50 years)

Chapman et al., 2013

(Frontiers in Aging Neuroscience)

- Healthy sedentary adults (57-75 years)
- Supervised aerobic program on cycle ergometer or treadmill, 3 x 1 hr sessions per week for 12 weeks (50-75%MHR)
- Results suggest that even shorter term aerobic exercise can facilitate neuroplasticity to reduce both the biological and cognitive consequences of aging to benefit brain health in sedentary adults.

Chapman et al., 2013

Researcher* says exercise is a key to brain health

(Times Colonist, January 4th, 2015).

- In response to the Q "What is the most important thing we can do to slow cognitive aging: "Physical activity is associated with a decreased risk of cognitive decline and diseases like Alzeimer's".

**Stuart MacDonald, Cognitive Aging Psychologist at UVic) Recently inducted into the Royal Society of Canada.*

"Protect your brain by going out for a walk"

Times Colonist, 3rd Feb 2017 , W.Gifford-Jones

- References several recent studies indicating physical activity helped brain function as people aged (in particuar Dr. Tammy Scott at Tuft's Neurosciences and Aging Laboratory, University of Boston).
- Quoted Abraham **Lincoln-*"I have the two best doctors, my left leg and my*** right".

Running or jogging:

- *Escargots*
- *Rabbits*
- *Waltons*

"You must have run a mile this time—you've been gone four minutes."

A study published in Arch Neurol (2010) found that:

- Aerobic activity four times per week for 45-60 min (running on a treadmill, elliptical running machine, stationary cycling) **reversed** the decline in cognitive ability (memory)
- This was especially true for women

Baker et al., 2010

"Dance your way to healthier, happier living" (Times Colonist, April 3rd, 2011)

- Improved balance and gait and reduced factors associated with falls
- Associated with reduction in dementia (attributed to neuroplasticity and rewiring of neurons)

Krampe, 2010 (Dissertation, University of Missouri), Verghese et al., 2003 (New England Journal of Medicine), Van de Winckle et al., 2004 (Clin Rehab).

Weight training improves cognitive function in seniors (Arch Intern Med. 2010;170(2):170-178.)

- 12 months of once or twice weekly resistance training (free weights and air pressure machine) improved cognitive function in women aged 65-75 years.
- The program also led to increased walking speed, a predictor of considerable reduction in mortality.
- Proposed as an attractive alternative for seniors with limited mobility.
- Suggested a relationship between cognitive function and falls.

Liu-Ambrose et al., 2011, Voss et al., JAP, 2011.

Exercise, brain and cognition across the lifespan, Voss et al., J Appl Physiol, 2011

This suggests that while aerobic exercise would be a good starting point for intervention programs, beneficial effects for brain and cognition may be further enhanced if followed by the addition of other activity types, such as resistance training, cognitive training, or some combination thereof.

Voss et al., JAP, 2011

Hot off the press!

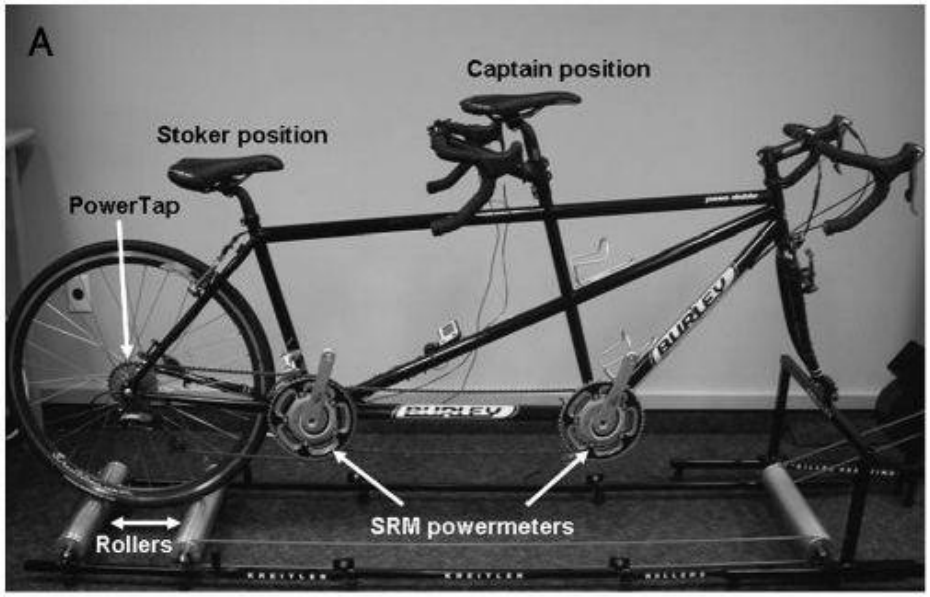
- Older adults (71 yrs plus) "who engage in strenuous exercise are more mentally nimble and have better memory function than their more sedentary peers"
- Followed over 5 year period

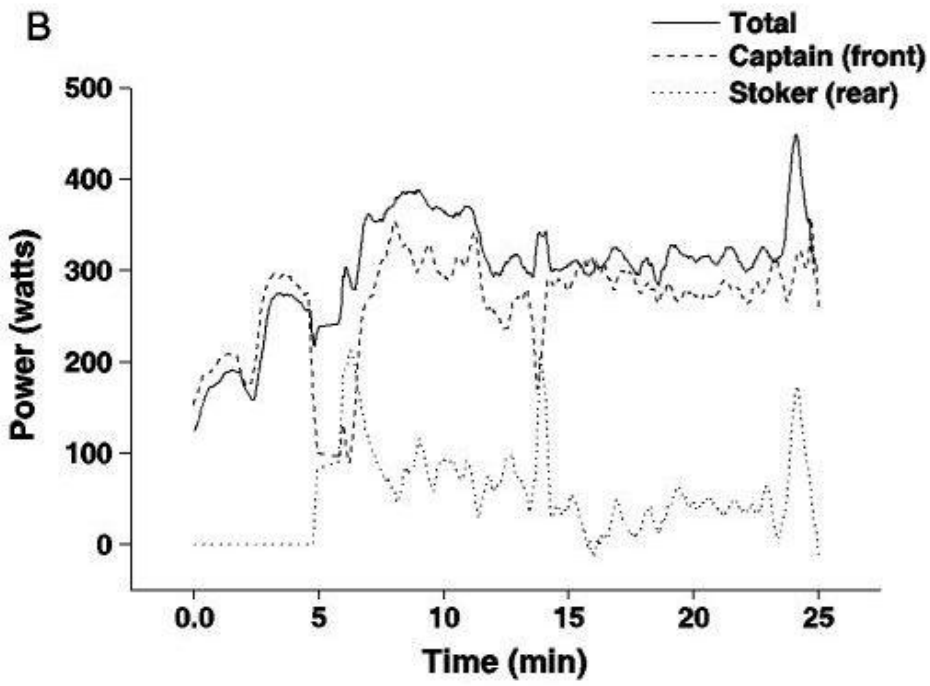
From LA Times "Science Now"(March 23, 2016), Melissa Healy citing recent study by Clinton B. Wright, recently published in Neurology

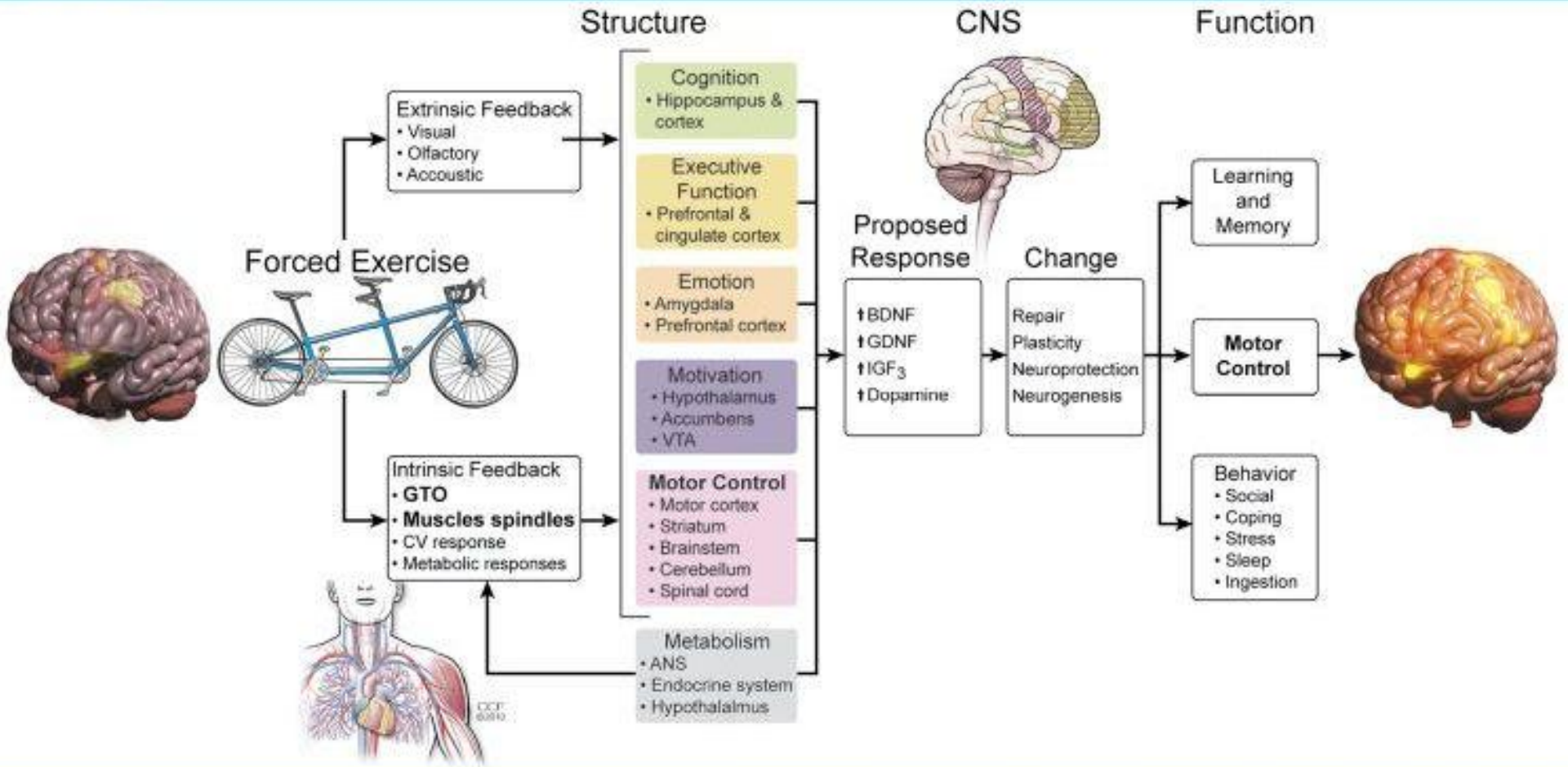
It is not about the bike, it is about the pedalling

Alberts, J.L., et al. Exerc Sport Sci Rev., 2011, 39(4):177-186

- Results show FE leads to improvement in PD motor function and an alterations in CNS function.
- The evidence suggests that patients with PD derive motor benefits from exercise, assistance is required to achieve a rate of exercise that triggers the release of neurotrophic factors or possibly dopamine.







The Parkinson's Wellness Centre, to be located in a midtown Victoria, will offer rigorous exercise programs, including boxing.

- The latest research on Parkinson's disease is that exercise actually slows the progression of the disease. And the sooner you get doing Parkinson's specific exercises, the better," she (Jillian Carson) said.
- Carson said to achieve the release of natural dopamine in the body — the chemical lacking in Parkinson's patients — sufferers have to, "exercise harder than you (sic) think you could ever do in your life."

Jillian Carson: *On the Island* host Gregor Craigie

GOING BEYOND RISK REDUCTION: PHYSICAL EXERCISE MAY BE AN EFFECTIVE TREATMENT FOR ALZHEIMER'S DISEASE AND VASCULARD EMENTIA

http://dx.doi.org/10.1016/j.cmet.2017.02.009

"Based on the results we heard reported today at AAIC 2015, exercise or regular physical activity might play a role in both protecting your brain from Alzheimer's disease and other dementias, and also living better with the disease if you have it,"

Maria Carrillo, PhD, Alzheimer's Association Chief Science Officer.
Alzheimer's Association AAIC newsroom, 202-249-4002, media@alz.org
Niles Frantz, Alzheimer's Association, 312-335-5777, niles.frantz@alz.org

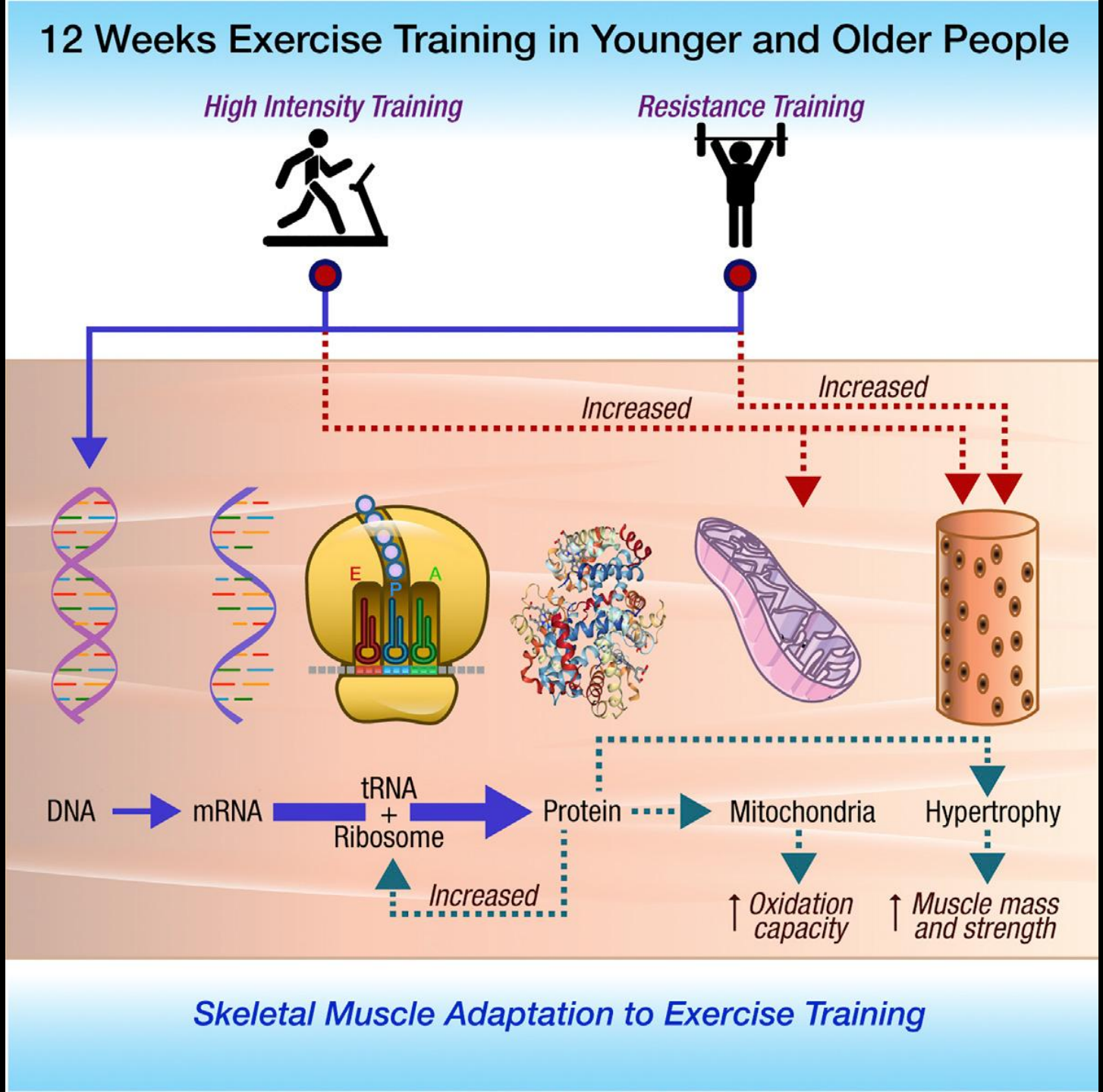
Exercise interventions for cognitive function in adults older than 50: a systematic review with meta-analysis

- Physical exercise improved cognitive function in the over 50s, regardless of the cognitive status of participants. To improve cognitive function, this meta-analysis provides clinicians with evidence to recommend that patients obtain both aerobic and resistance exercise of at least moderate intensity on as many days of the week as feasible, in line with current exercise guidelines.

Northey, J.M. et al., July 25, 2017 http://bjsm.bmj.com/

Enhanced Protein Translation Underlies Improved Metabolic and Physical Adaptations to Different Exercise Training Modes in Young and Old Humans, Robinson M.M. et al., Cell Metabolism, http://dx.doi.org/10.1016/j.cmet.2017.02.009

Robinson et al. assessed the effects of three different exercise modalities on skeletal muscle adaptations in young and older adults. While all enhanced insulin sensitivity, only HIIT and combined training improved aerobic capacity, associated with enhanced translation of mitochondrial proteins. HIIT effectively improved cardio-metabolic health parameters in aging adults.


12 Weeks Exercise Training in Younger and Older People
High Intensity Training
Resistance Training
Increased
Increased
E
P
A
DNA
mRNA
tRNA
+
Ribosome
Protein
Mitochondria
Hypertrophy
Increased
↑ Oxidation capacity
↑ Muscle mass and strength
Skeletal Muscle Adaptation to Exercise Training

Other ways to help your brain

- Try to remember!
- - Dementia is rare before age 65 (1-3%)
- - You can train your brain to be forgetful
- - Reinforce the idea you're losing your memory and you will (risk factor)
- Reinforce positive habits:
- - find an easy way to remember new names
- - focus on learning "important" information
- - focus on being calm. Panic impairs memory
- - recognize the strengths of an adult brain (pattern recognition, experience)

Recommendations

- 30 min of moderate aerobic physical activity **3**/5X per week (**90**/150 min)

OR

- 20 min of vigorous activity 3X per week (60 min)

OR

- 3X per week HITT (4-20 min)

AND

- 30 min of some form of resistance training 2X per week (60 min)

Take home message

Keeping a healthy brain

Thank you

Questions?

More on HITT!

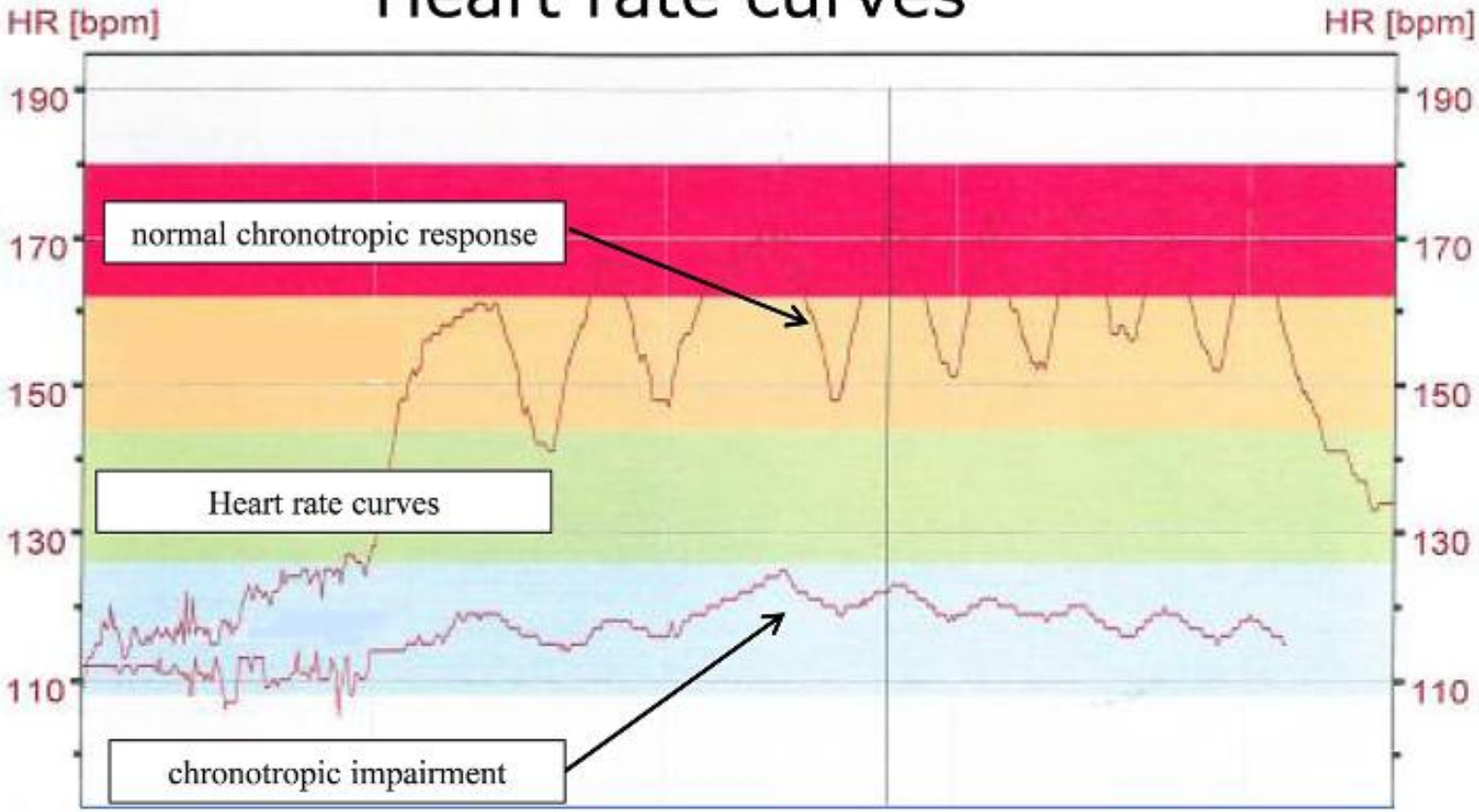
- Performed by >12 month heart transplant recipients!

Effect of High-Intensity Training Versus Moderate Training on Peak Oxygen Uptake and Chronotropic Response in Heart Transplant Recipients: A Randomized Crossover Trial

- HITT was well tolerated, had a superior effect on oxygen uptake, and led to an unexpected increase in HR peak accompanied by a faster HR recovery (better chronotropic effects) compared to continuous exercise.

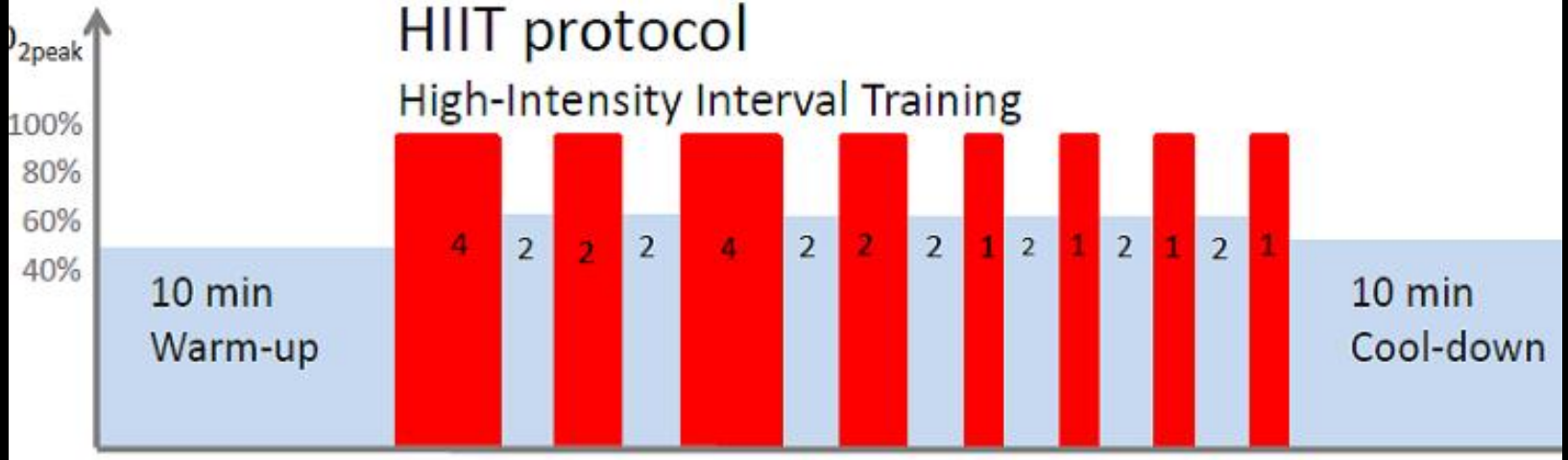
Dall et al., 2014, Amr J of Transplantation.

Heart rate curves

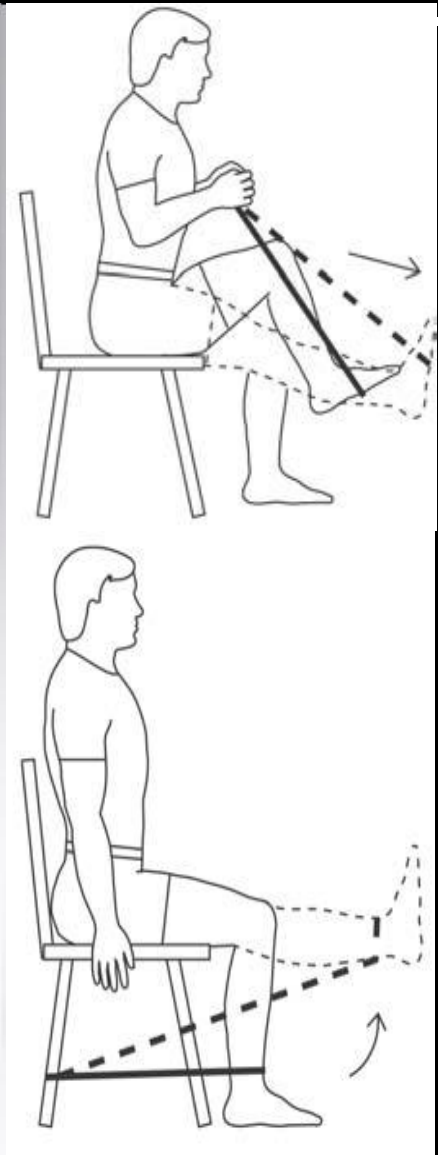


HIIT protocol

High-Intensity Interval Training



Therabands: http://www.thera-bandacademy.com/



Exercises for Older Adults

PERFORM ALL THESE EXERCISES SLOWLY AND REMEMBER TO BREATHE DURING EACH REPETITION.

Thera-Band® Upper Body Exercises

BICEPS CURLS: Grasp band at waist-level. Bend elbows, bringing hands to shoulders. Keep back straight. Hold & slowly return.

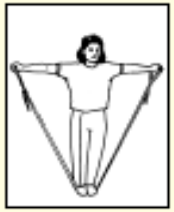
Color_____ Reps_____

TRICEPS EXTENSION: Grasp band with elbows bent. Keep elbows at side. Straighten elbows, bringing hands to hips. Hold & slowly return.

Color_____ Reps_____

FRONT RAISE (FLEXION): Grasp band at waist-level. Keep elbows straight and lift arms forward to shoulder level. Keep back straight. Hold & slowly return.

Color_____ Reps_____



LATERAL RAISE (ABDUCTION): Grasp band at waist-level. Keep elbows straight and lift arms outward to shoulder level. Hold & slowly return.

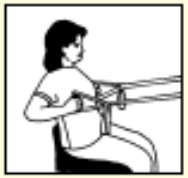
Color_____ Reps_____

LAT PULL DOWN: Attach band overhead and grasp band in front of you. Bend elbows, bringing hands to chest and elbows backward. Hold and slowly & return.

Color_____ Reps_____

CHEST PRESS: Grasp band at shoulder-level. Straighten elbows, pushing hands away from body. Hold and slowly & return.

Color_____ Reps_____



SEATED ROW: Grasp band at chest-level. Bend elbows, bringing hands to chest and elbows backward. Hold & slowly return.

Color_____ Reps_____

ALWAYS CONSULT YOUR PHYSICIAN BEFORE BEGINNING ANY EXERCISE PROGRAM

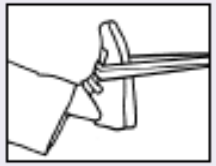
Thera-Band® Lower Body Exercises

CHAIR SQUATS: Hold band at waist. Keep elbows straight. Slowly lower to chair by bending knees and hips; keep back straight. Hold & slowly return to standing.

Color_____ Reps_____

CALF RAISES: Hold band at waist. Keep elbows straight. Go up onto your toes. Hold and slowly return.

Color_____ Reps_____



ANKLE DORSIFLEXION: Pull toes back toward head against band. Hold and slowly return.

Color_____ Reps_____

4-DIRECTION KICK: Perform kicks in 4 directions against the band. Hold & slowly return. Repeat on other leg. Use chair for support if needed.

Color_____ Reps_____

PERFORM THESE KICK EXERCISES ON A FIRM SURFACE FIRST; PROGRESS TO A STABILITY TRAINER AS BALANCE IMPROVES.

References: Mikesky et al. Eur J Appl Physiol. 69(10):316-320, 1994
Topp et al. Gerontology 33(4):501-506, 1993
Topp et al. Rehabil Nur 19(5):266-273,1994

KNEE FLEXION: Bend knee and pull leg back toward chair. Hold & slowly return.

Color_____ Reps_____

KNEE EXTENSION: Extend knee and point foot toward ceiling. Hold & slowly return.

Color_____ Reps_____

HIP FLEXION: Lift hip upward toward ceiling. Hold & slowly return.

Color_____ Reps_____