Exercise and a Healthy Brain ;

What's the Connection?

Robert E. Sallis, MD, FAAFP, FACSM

Co-Director
Sports Medicine Fellowship
Kaiser Permanente; Fontana, CA

Chairman
Exercise Is Medicine
Advisory Board

Clinical Professor
Family Medicine
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Every Body WALK!
The Campaign to Get America Walking

ExeRcise is Medicine™

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Exercise and Health

- Physical inactivity has an astonishing array of harmful health effects.
- Exercise is a powerful tool for both the treatment and prevention of chronic disease and obesity, as well as premature death.
  - There is a linear relationship between physical activity and health status.
  - The association between disease and an inactive and unfit way of life persists in every subgroup of the population.
- Physical inactivity is THE major public health problem of our time.

Boris Lushniak, MD, MPH
Acting United States Surgeon General

U.S. Department of Health & Human Services
Office of the Surgeon General

ACSM Annual Meeting
Orlando, Florida; May 30, 2014

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Most Powerful Effect of Exercise May be on the Brain!

- Observational studies showed:
  - More physically active are less likely to show cognitive decline & dementia.
  - Improvements in cognitive scores, psychomotor speed and info processing seen after exercise intervention.
  - Improvements in executive function seen after regular exercise.
  - Both aerobic and resistance exercise show benefits.

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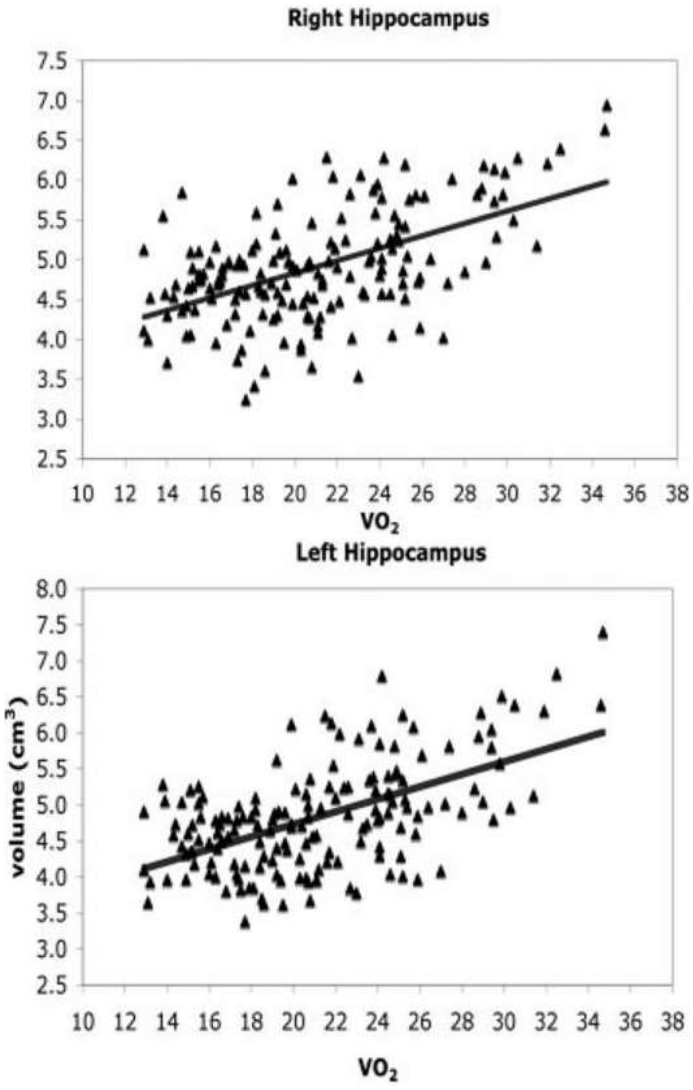
Aerobic Fitness Associated with Hippocampus Volume

- 165 healthy older adults (age 59-81) tested VO2 with max treadmill.
- Brain MRI done with volumetric analysis of hippocampus.
- Higher VO2 associated with;
  - Larger hippocampus volume.
  - Better spatial memory.
  - Higher levels of BDNF.
  - Similar studies in kids and middle age adults.



Erickson; Hippocampus; Oct 2009

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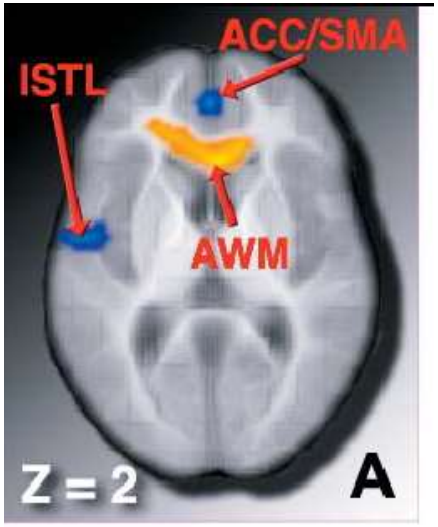
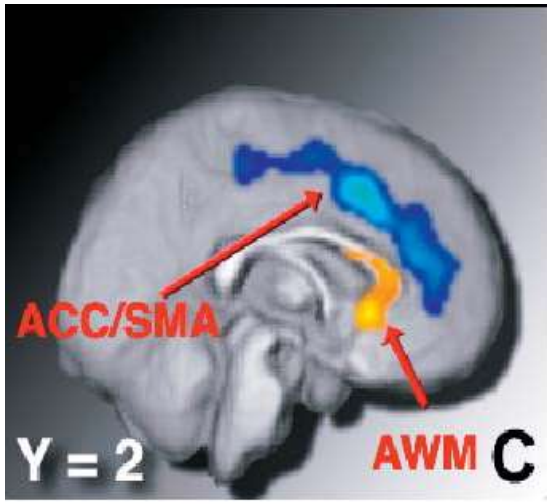
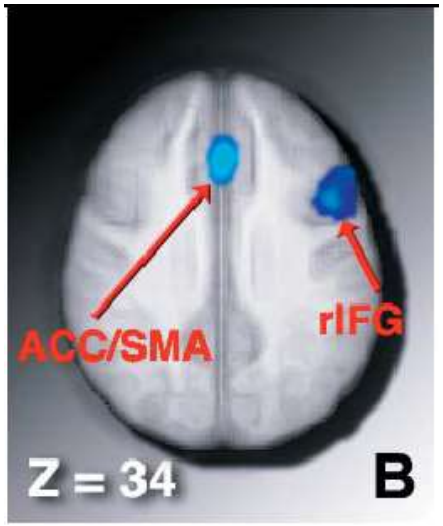
Exercise Increases Brain Volume

- 59 Healthy, sedentary old adults randomly assigned to exercise vs stretching.
- MRI done before and 6 months after and compared.
- Increases in grey and white matter in exercise group but not controls.
- 32.6% average increase; mainly frontal lobes.







Colcombe; J of Gerontology: 2006, Vol. 61A

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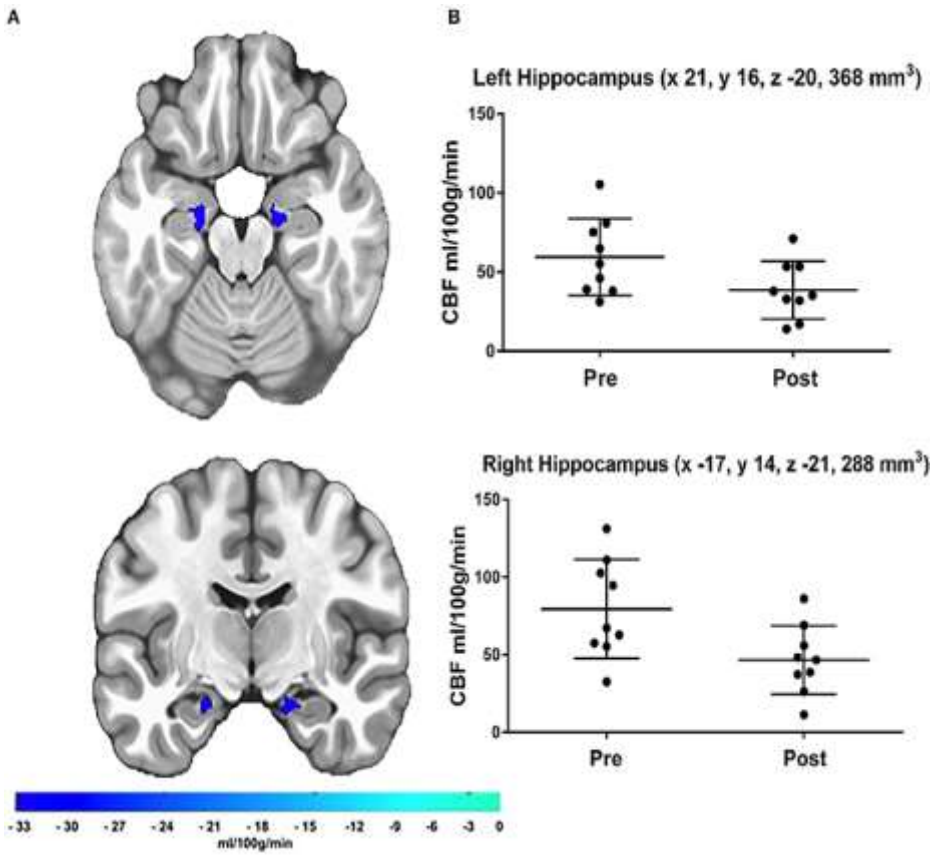
Cerebral Blood Flow Decreases with Detraining in Masters Athletes

- Perfusion weighted MRI done on 12 endurance athletes (avg age 60) before & after 10 day cessation of exercise
- Resting cerebral blood flow significantly decreased in 8 regions of brain, including L and R hippocampus.
- Detraining likely affects brain health like it does CV and metabolic health.



Alfini; Front. Aging Neurosci., Aug 2016

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Twins Study; One exercises, the Other Does Not

- Finland twins data base; 10 sets male twins in early to mid-30's; Divergent exercise patterns (avg ~3 yrs).
  - Compared active vs sedentary identical twins.
  - Diets were very similar.
- Measured endurance capacity, body comp, insulin sensitivity and brain scan; Sedentary twin had:
  - Lower endurance capacities, higher body fat percentages, and signs of insulin resistance.
  - Less grey matter, especially areas involved in motor control and coordination.

Rottensteiner; MSSE; Mar 2015

Benefits of Physical Activity in Kids

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Studies suggest Physical Activity Improves Mental Health in Kids

- Regular PA increases self esteem
- Regular PA decreases rates of anxiety/depression*
- Evidence shows teen girls have lower rates of sexual activity and pregnancy when PA is increased
- Evidence show regular PA associated with decreased smoking, alcohol and drug abuse

K.J. Calfas, W.C. Taylor. Ped Exerc Sci 1994. 6:406-423
Sabo et al. J Adolesc Health 1999;25:207-16

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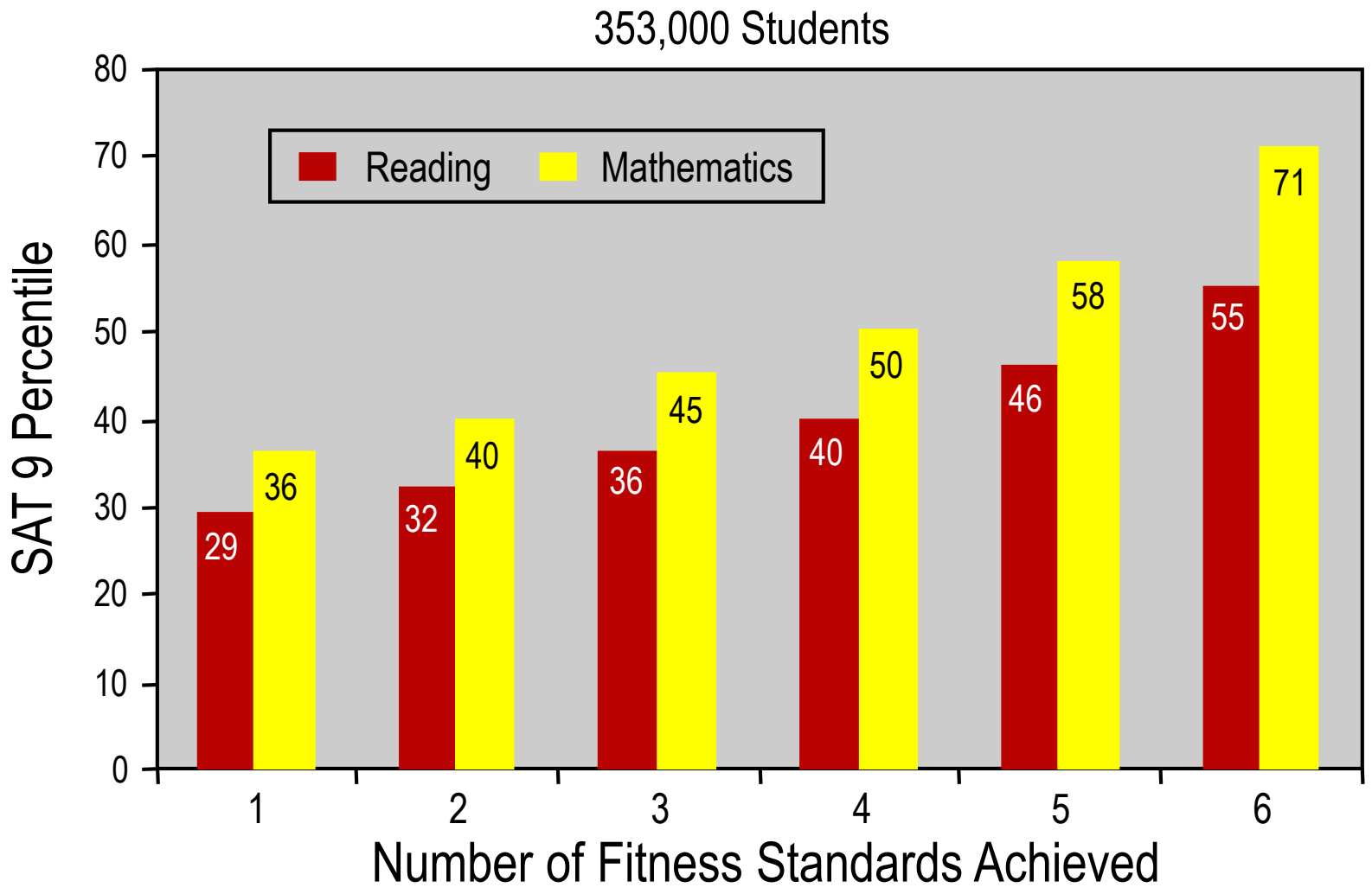
Fitness and Stanford Achievement Test 9th Ed
SAT-9 and Fitnessgram Results

- Fitnessgram test:
  - 1. Aerobic Capacity
  - 2. Body Composition (% of body fat)
  - 3. Abdominal Strength and Endurance
  - 4. Trunk Strength and Flexibility
  - 5. Upper Body Strength and Endurance
  - 6. Overall Flexibility

Grade 5
SAT 9 and Physical Fitness



Source: California Dept. of Education Study, December 10, 2002

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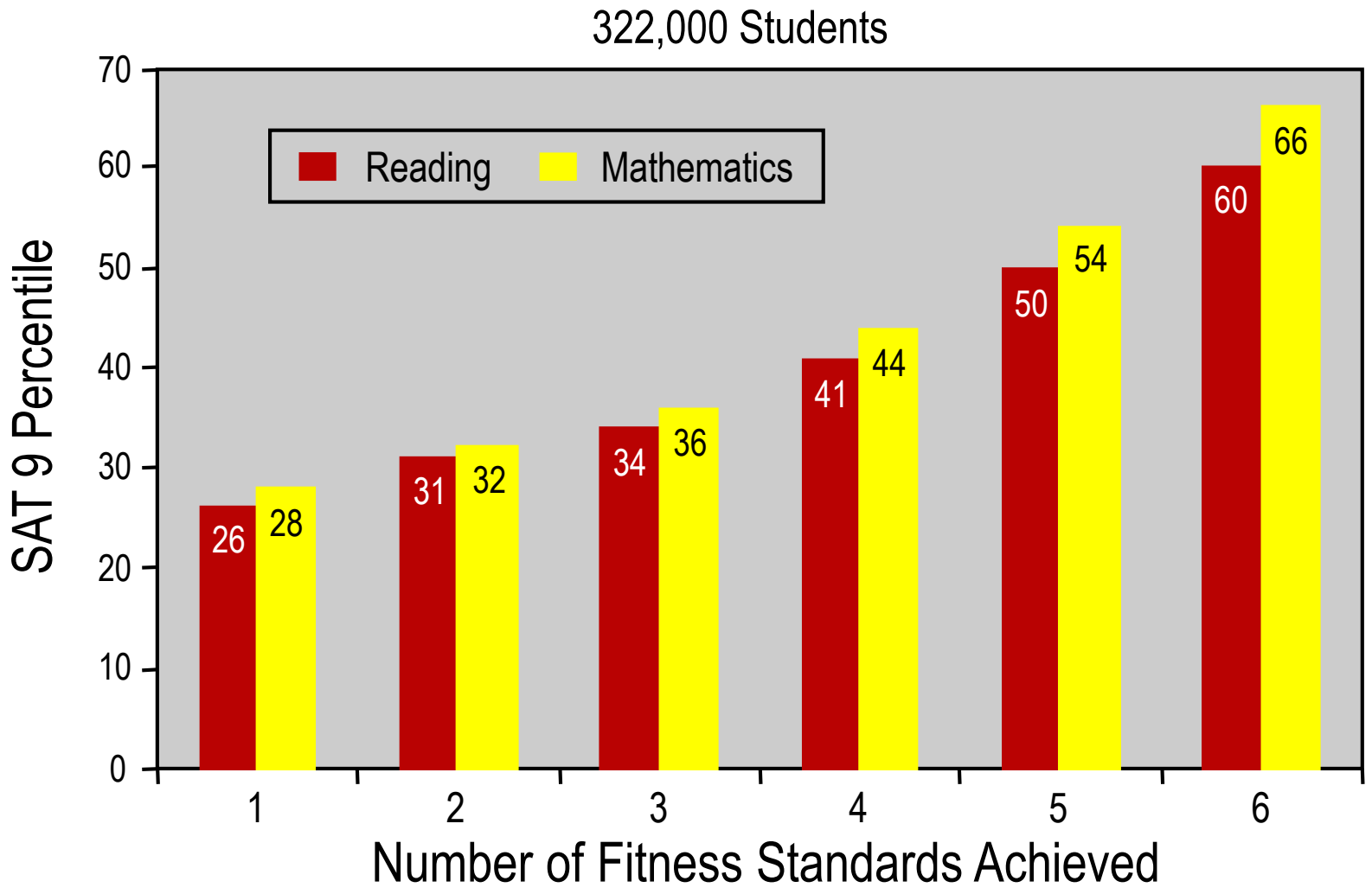
Grade 7
SAT 9 and Physical Fitness



Source: California Dept. of Education Study, December 10, 2002

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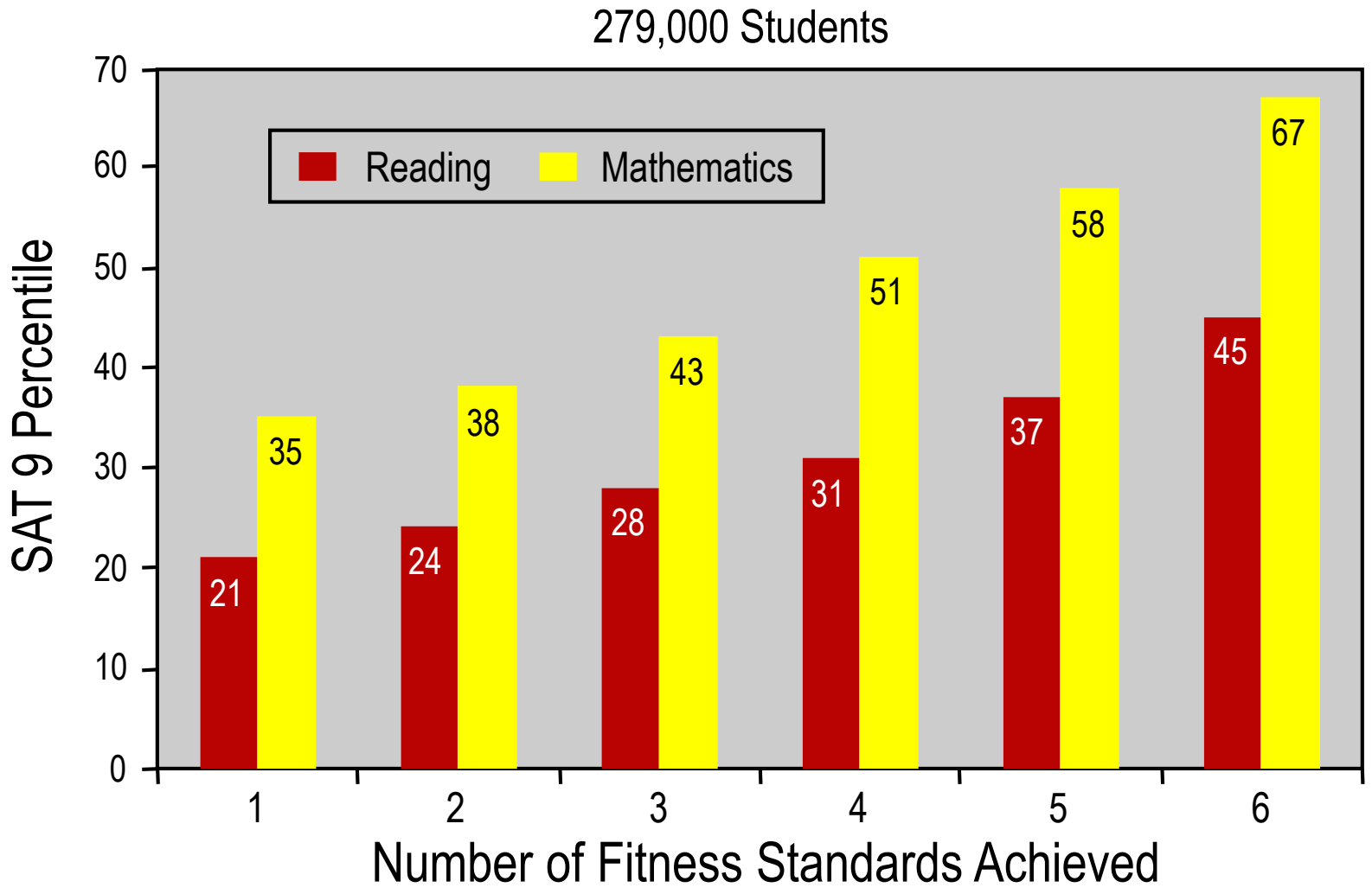
Grade 9
SAT 9 and Physical Fitness



Source: California Dept. of Education Study, December 10, 2002

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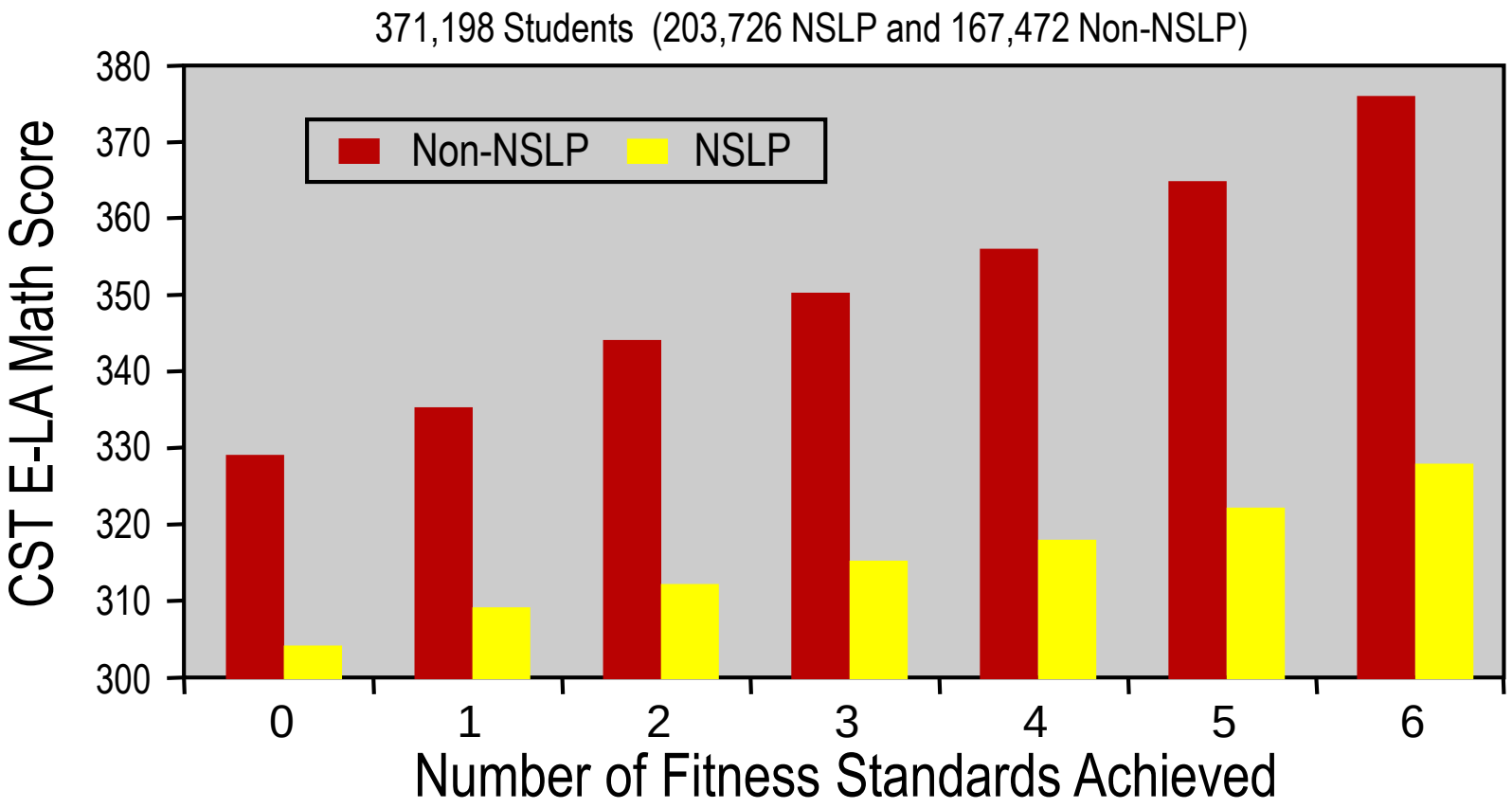
Socioeconomic Status** & Number of Fitness Standards
2004 CST* Scores in English- Grade 5



*California Standards Test

**National School Lunch Program

Results using math scores were consistent with those using English-Language Arts scores.

Results for seventh- and ninth-grade students were consistent with those for fifth graders.

Source: California Physical Fitness Test, 2004 Results, Calif. Dept. of Ed., April 2005

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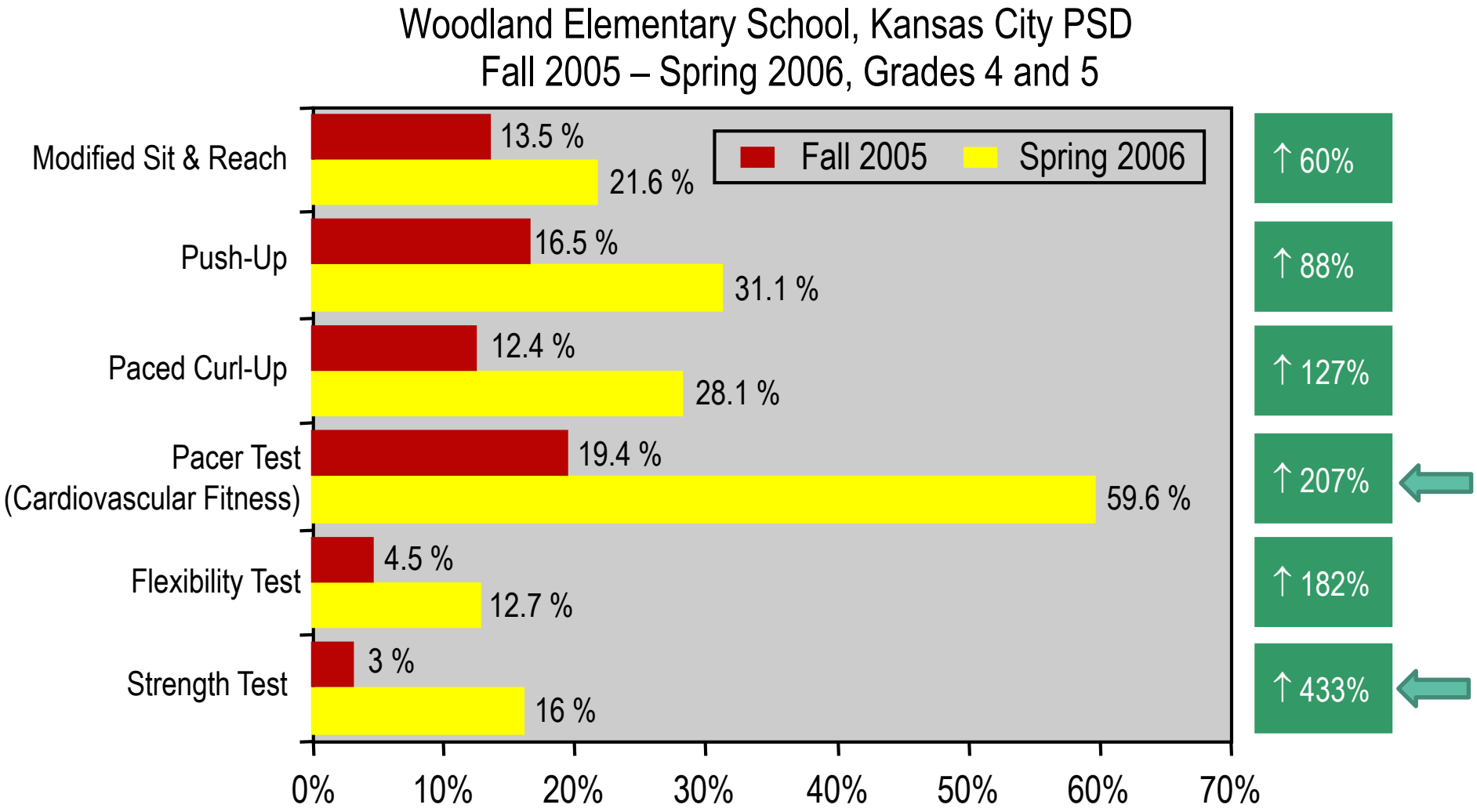
Improvements in Fitnessgram *Results*
PE 4 Life Program at 6 months



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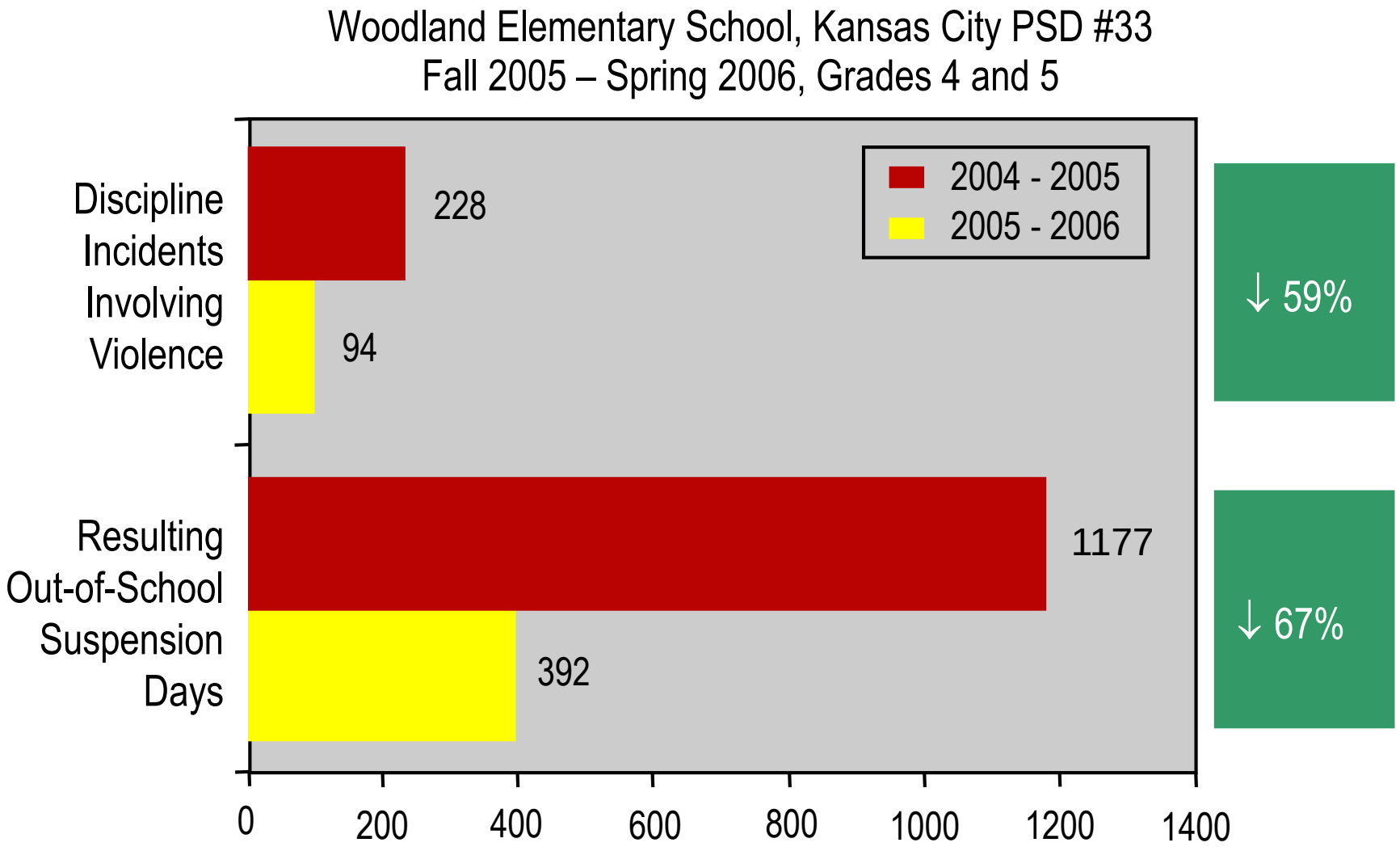
Percent Reduction in Disciplinary Issues
PE 4 Life Program at 6 months



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Fitness and Neurocognitive Function in Preadolescent Children

- 24 children, mean age, 9.6 years
- Fitness assessed by FITNESSGRAM
- Neurocognitive function assessed by responses to a stimulus discrimination task
- Fitness was positively associated with attention, working memory, response speed, and cognitive processing speed

Hillman CH et al. *Med Sci Sports Exerc* 2005

Benefits of Physical Activity as We Age

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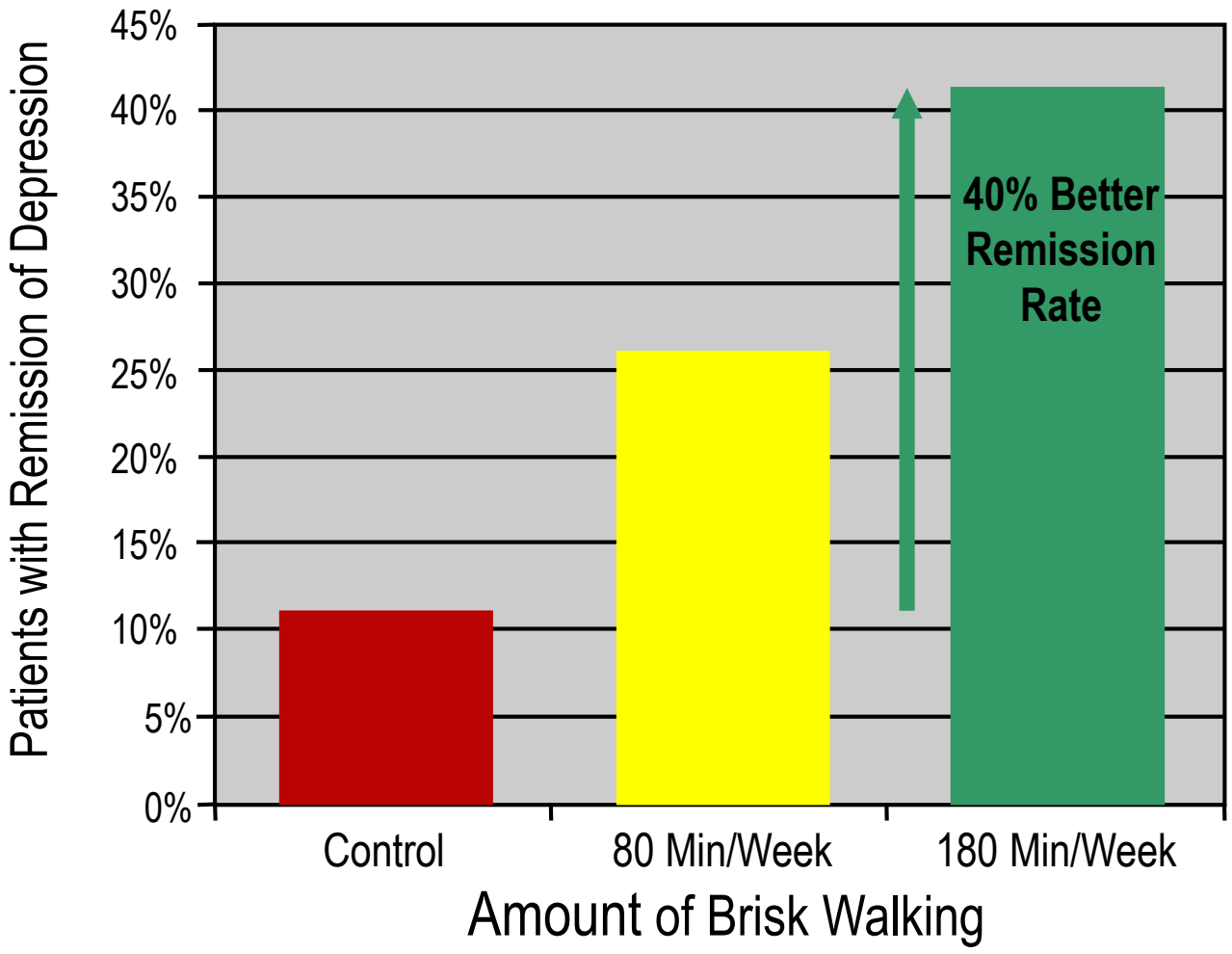
Exercise is a Treatment for *Depression*



Dunn A et al. *Am J Prev Med* 2005

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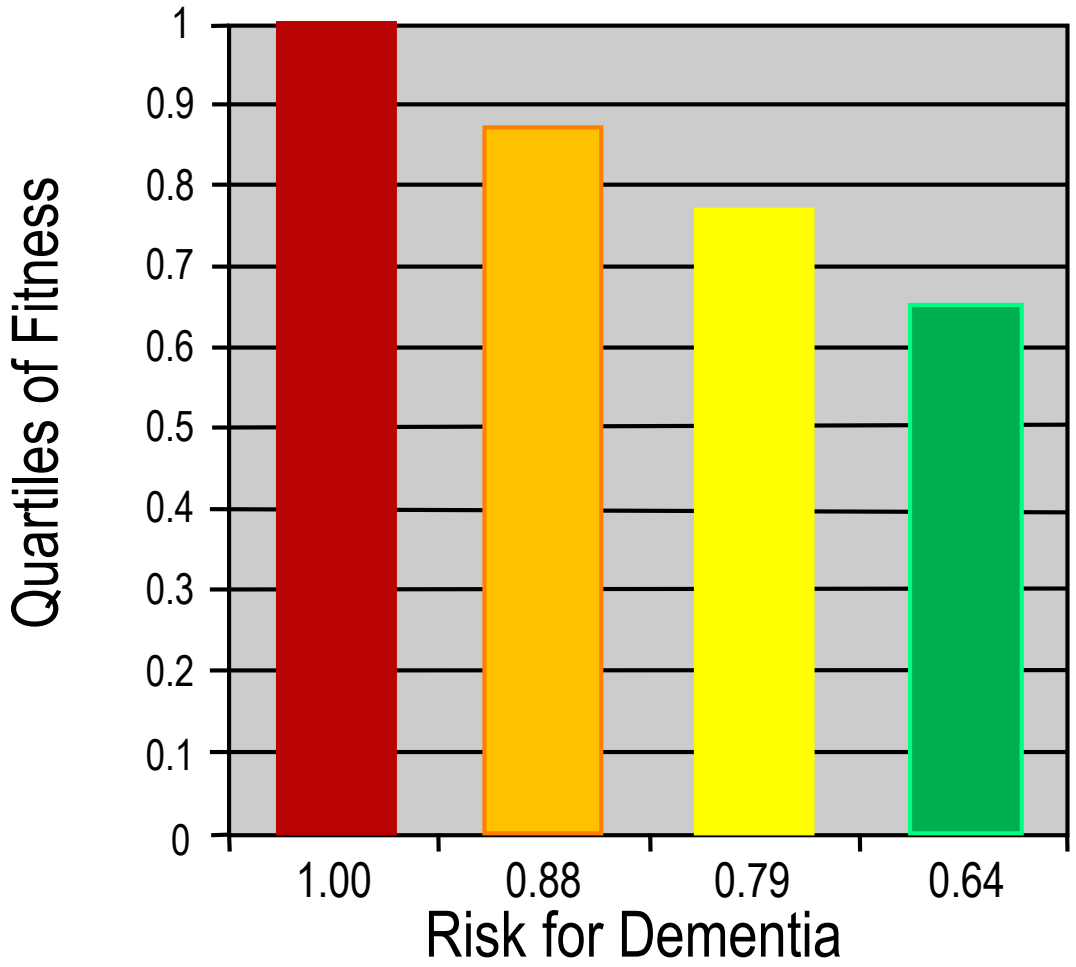
Middle Age Fitness and Dementia *Risk*



Most fit ~36%

- **19,458 men & women;**
- **Mean age 49.9 yrs**
- **Fitness tested (Balke)**
- **Followed avg. 25 yrs;**
- **1659 dementia cases.**

Defina LD et al. *Annals of Int Med;* 2013; 158(3)

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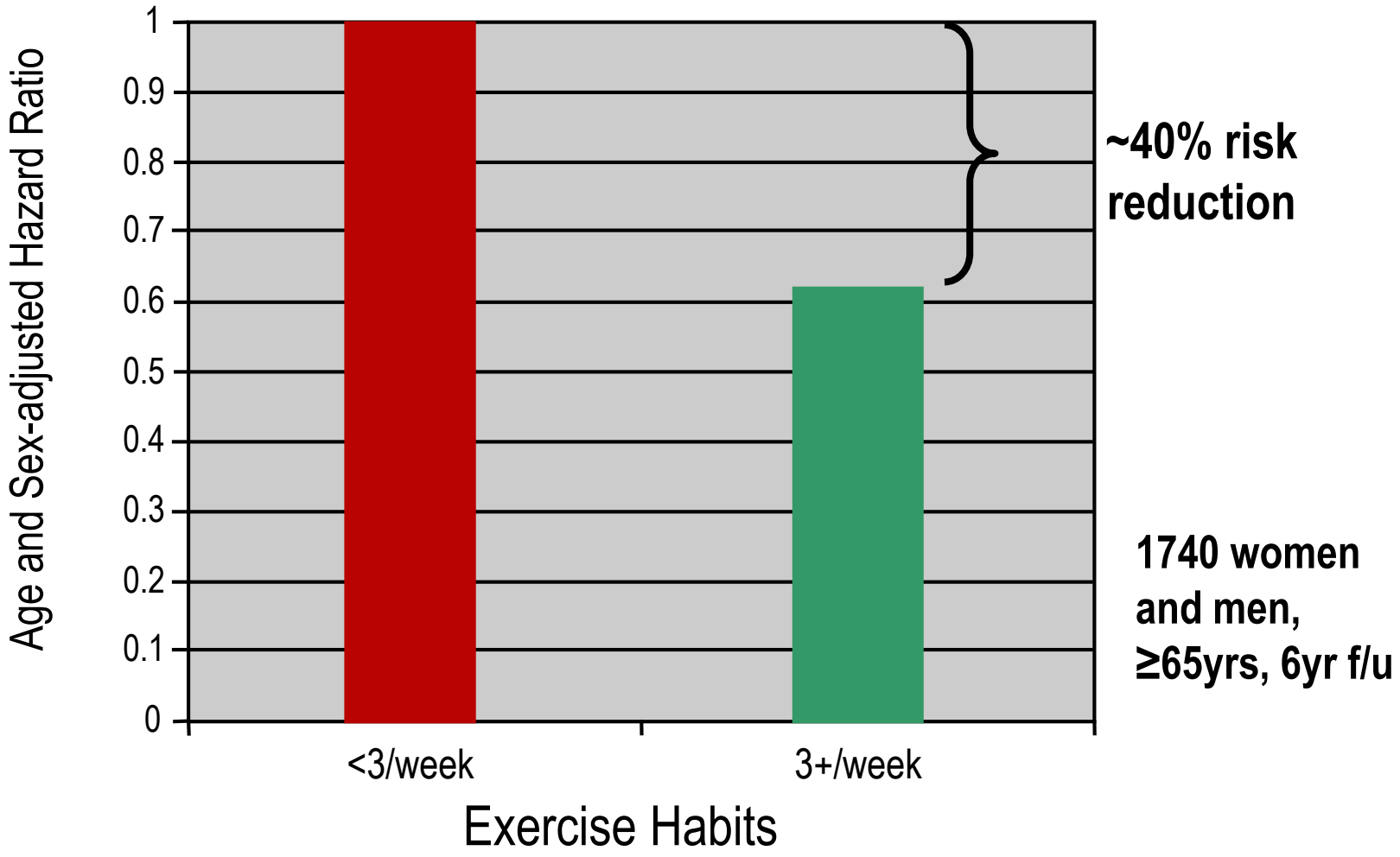
Exercise and *Dementia*



Larsen EB et al. *Ann Int Med* 2006; 144:73-81

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Exercise and Quality of Life

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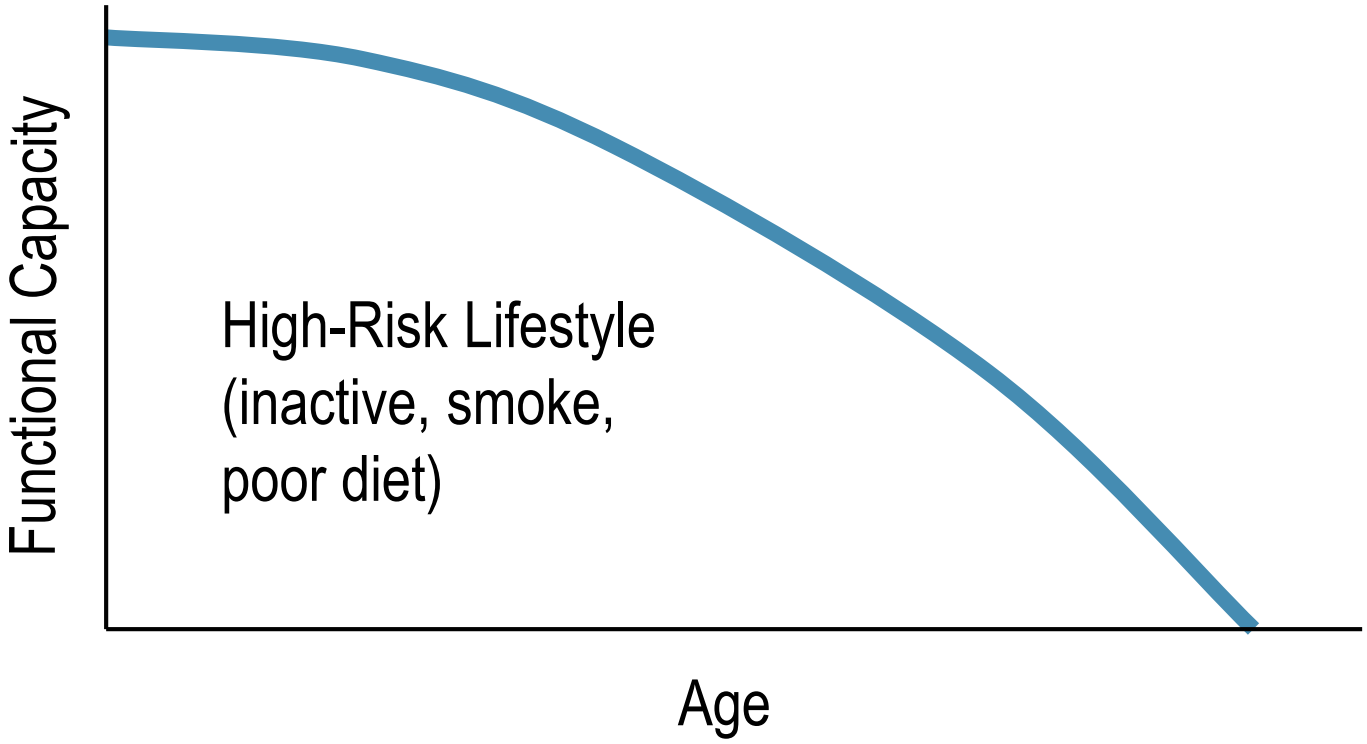
Quality of Life; The Geriatric Curve



NEJM, April 1998

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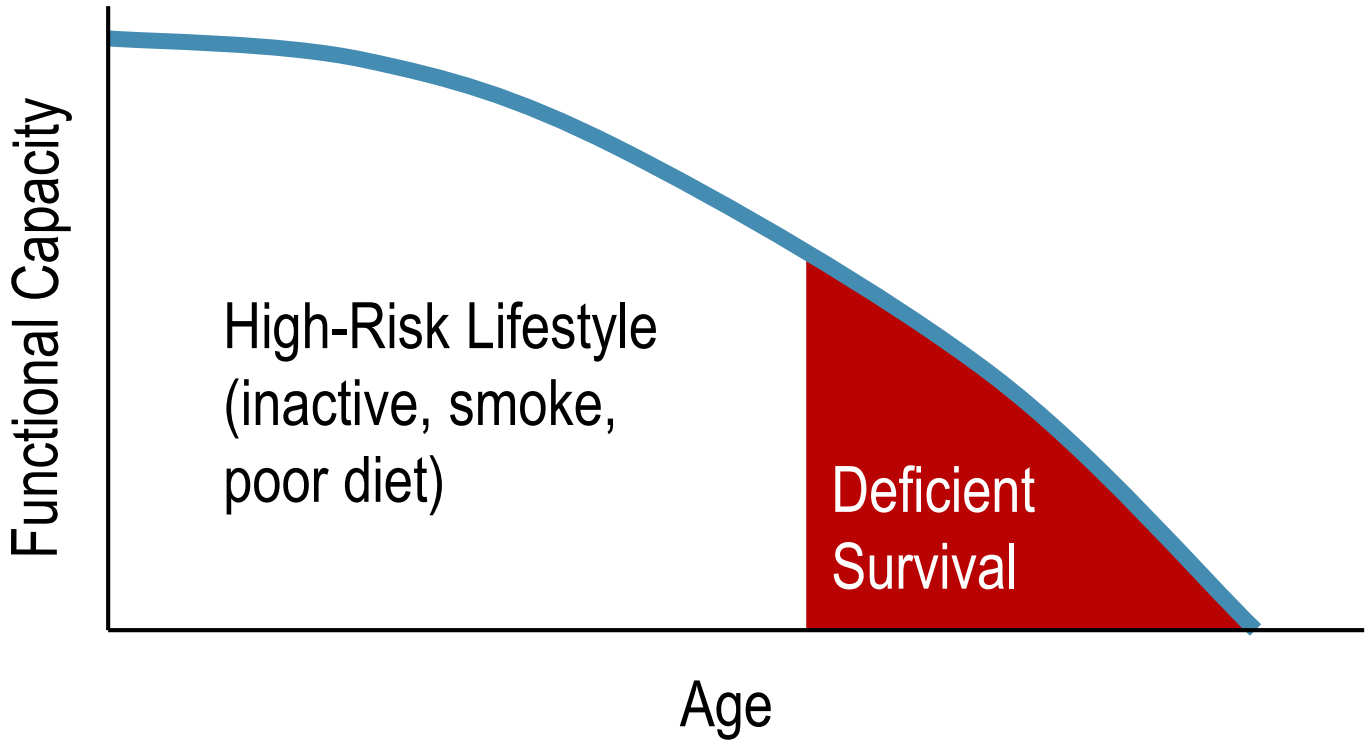
The Effect of an Unhealthy Lifestyle "Deficient Survival"



NEJM, April 1998

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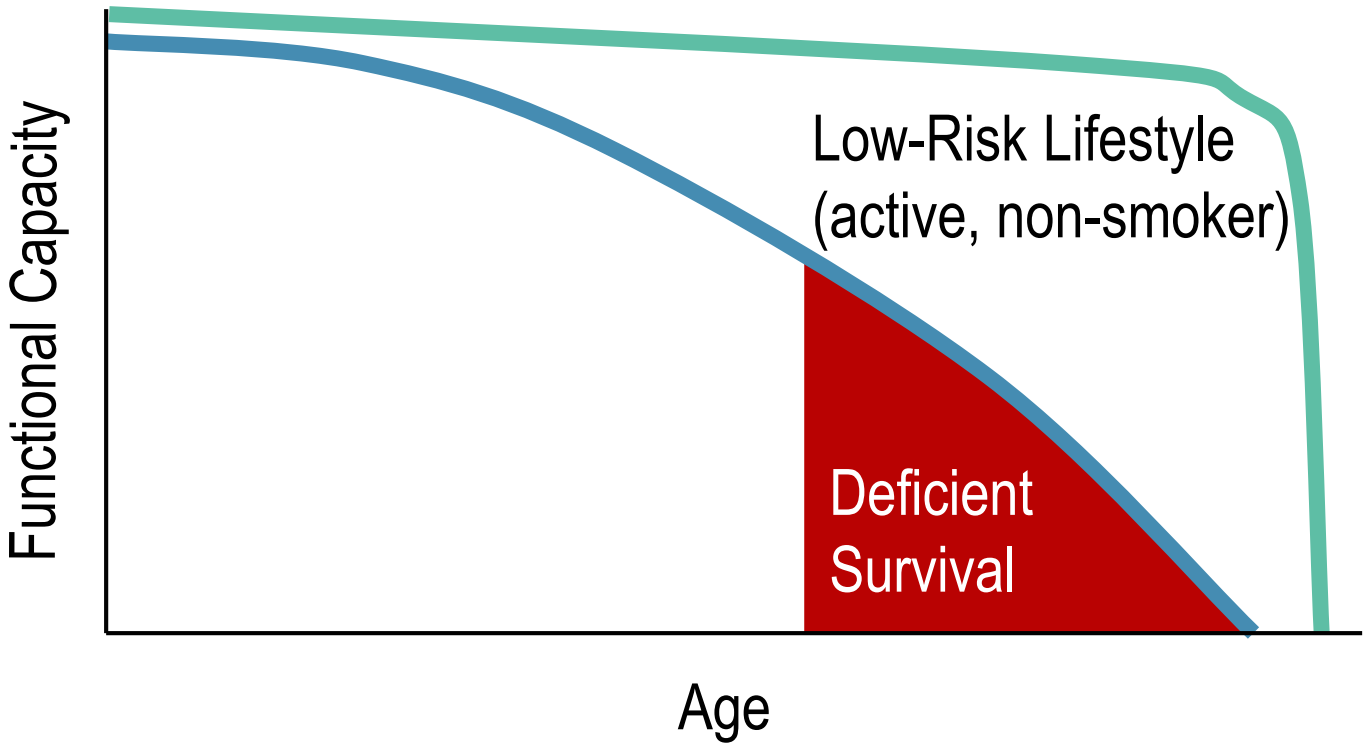
The Effect of a Healthy Lifestyle
"Squaring off" the Geriatric Curve



"The idea is to die young as late as possible"

Ashley Montagu

NEJM, April 1998

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The Exercise Prescription
"Think FITT"

F = Frequency

Most days of the week; 5 or more.

I = Intensity

Moderate; 50-70% of max HR or use "sing-talk" test.

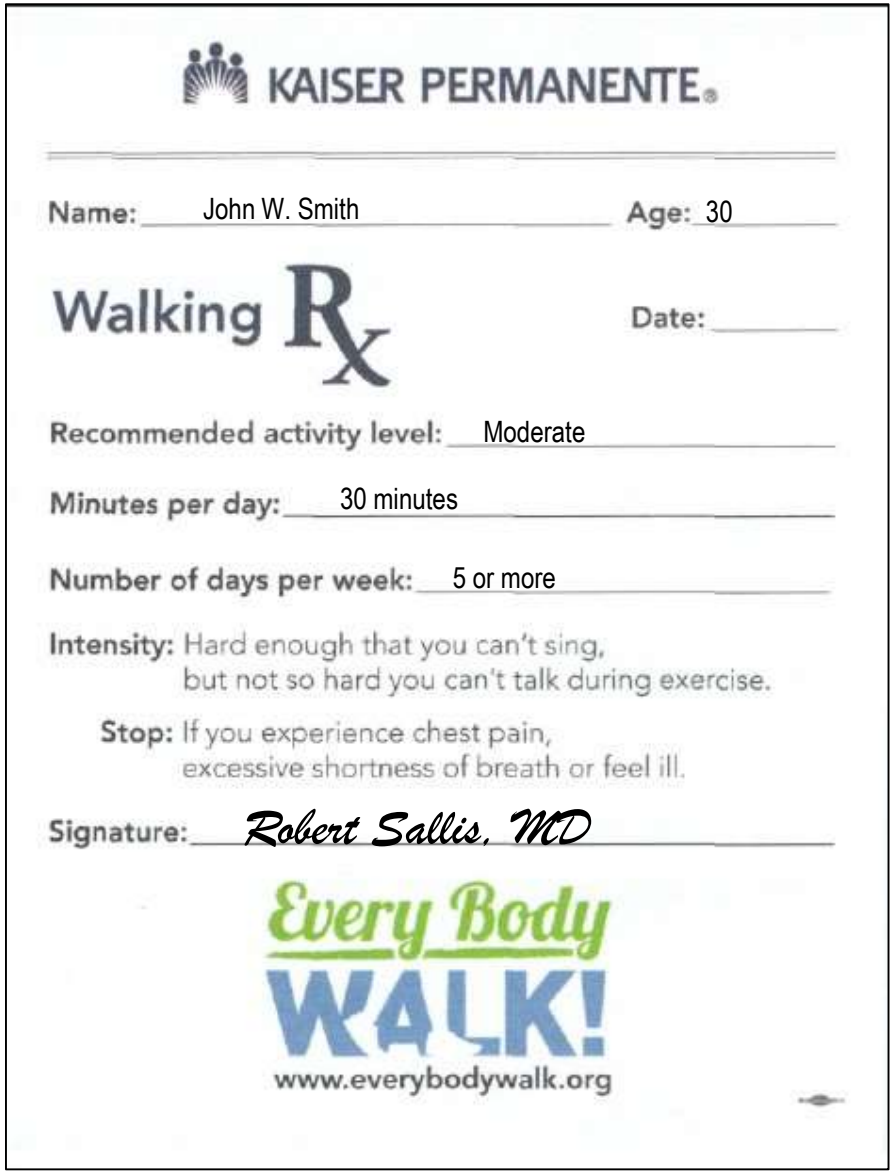
T = Type

Use large muscle groups; something enjoyable.

T = Time

30 minutes.

The Walking Prescription for Brain Health!



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Name: John W. Smith Age: 30

Walking Rx Date:

Recommended activity level: Moderate

Minutes per day: 30 minutes

Number of days per week: 5 or more

Intensity: Hard enough that you can't sing, but not so hard you can't talk during exercise.

Stop: If you experience chest pain, excessive shortness of breath or feel ill.

Signature: Robert Sallis, MD

Every Body WALK!

www.everybodywalk.org

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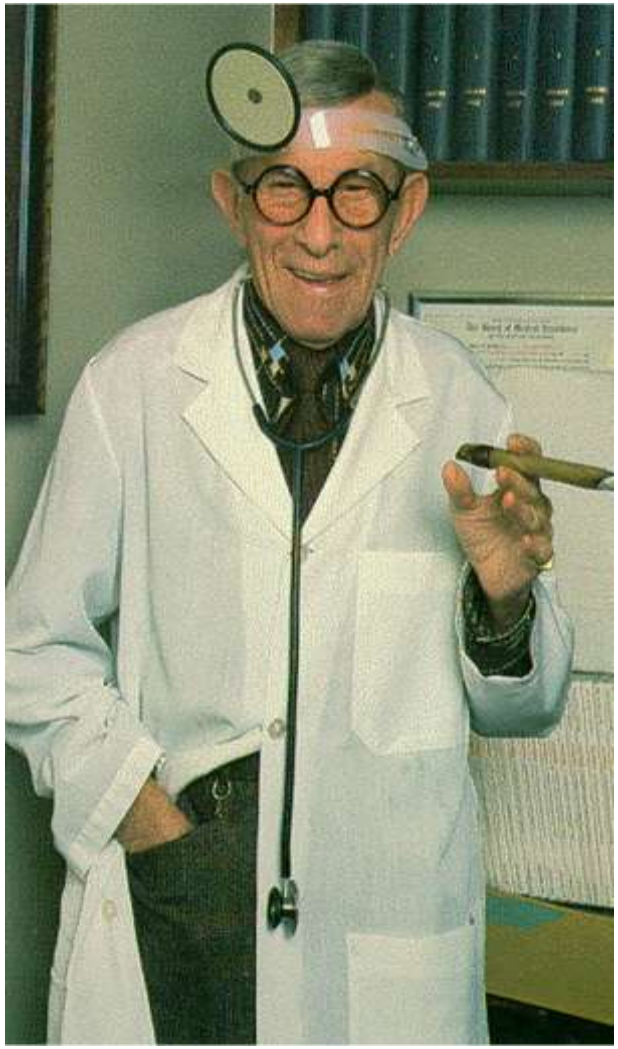
Why Choose Walking as the Default Exercise Prescription?

- Walking is accessible
  - All ages, fitness level, ability, alone or in groups
- Walking is low cost
  - No gym, no equipment
- Walking is measureable
  - Pedometer, stop watch, distance
- Walking is the most common adult activity
  - Good long term adherence
- Walking is proven
  - Multiple studies prove benefit
- Walking is cost saving
  - Health costs lower, its “Green”



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Clinicians need help!
How do we integrate fitness into healthcare?

- I need something beyond telling my patient to go walk!
- Components of fitness
  - CV fitness
  - Strength
  - Flexibility
- Need to be able to refer
  - Health Club and Fitness professional
  - Exercise is Medicine Solution

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A Challenge to the Fitness Community

- Role of the fitness professional;
  Merging fitness with healthcare
  - Change focus from clients to patients.
  - Change focus from abs and buns to hearts and lungs.
  - **How do we engage them?!**
- Role of Health Clubs;
  Place emphasis on ***health***
  - Reach out to new demographic.
  - Target the population that really needs your services.
  - **Why aren't more clubs interested?!**

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The Claremont Club

- Founded in 1973
  - Primarily as tennis club.
  - Small fitness component.
- *Mike Alpert* joined the club in August of 1997.
- Vision to Transform the Club
  - Actively promote health & wellness.
  - Helping people struggling with injury and illness.

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Created Programs for Patients

- Breast cancer
- Parkinson's and MS
- Stroke
- Cerebral Palsy
- Prostate and other cancers
- Pediatric Cancer
- Diabetes
- Spinal Cord Injury (Project Walk)

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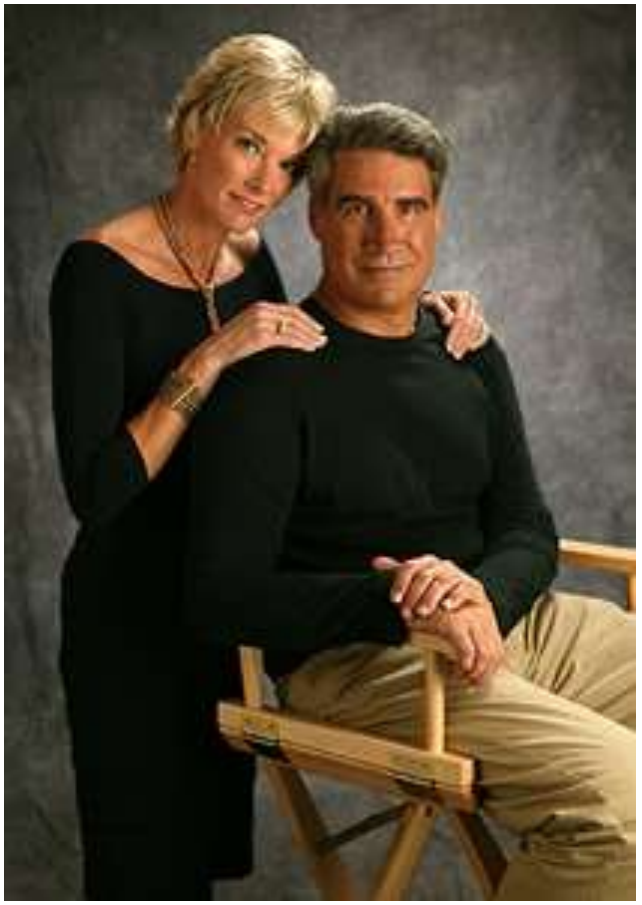
The Augie Nieto Story

- Icon in the fitness world.
- Founder and former owner of Life Fitness.
- Former owner of Hammer Strength.
- Sold companies in 1999 to Brunswick Corp for $325 Million.



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Augie Diagnosed with ALS 2005

- Started with weakness in legs and stumbling.
- Rapidly progressed despite all medical treatments.
- Saw countless specialists.
- No good treatment and little hope.
- Depression and suicide attempt.

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Can Exercise Help ALS?

- Heard about Project Walk at The Claremont Club.
- No good studies to prove it.
- There were concerns:
  - Respirator & feeding tube.
  - Might injure Augie.
  - Communication issue.
- Give it a try.

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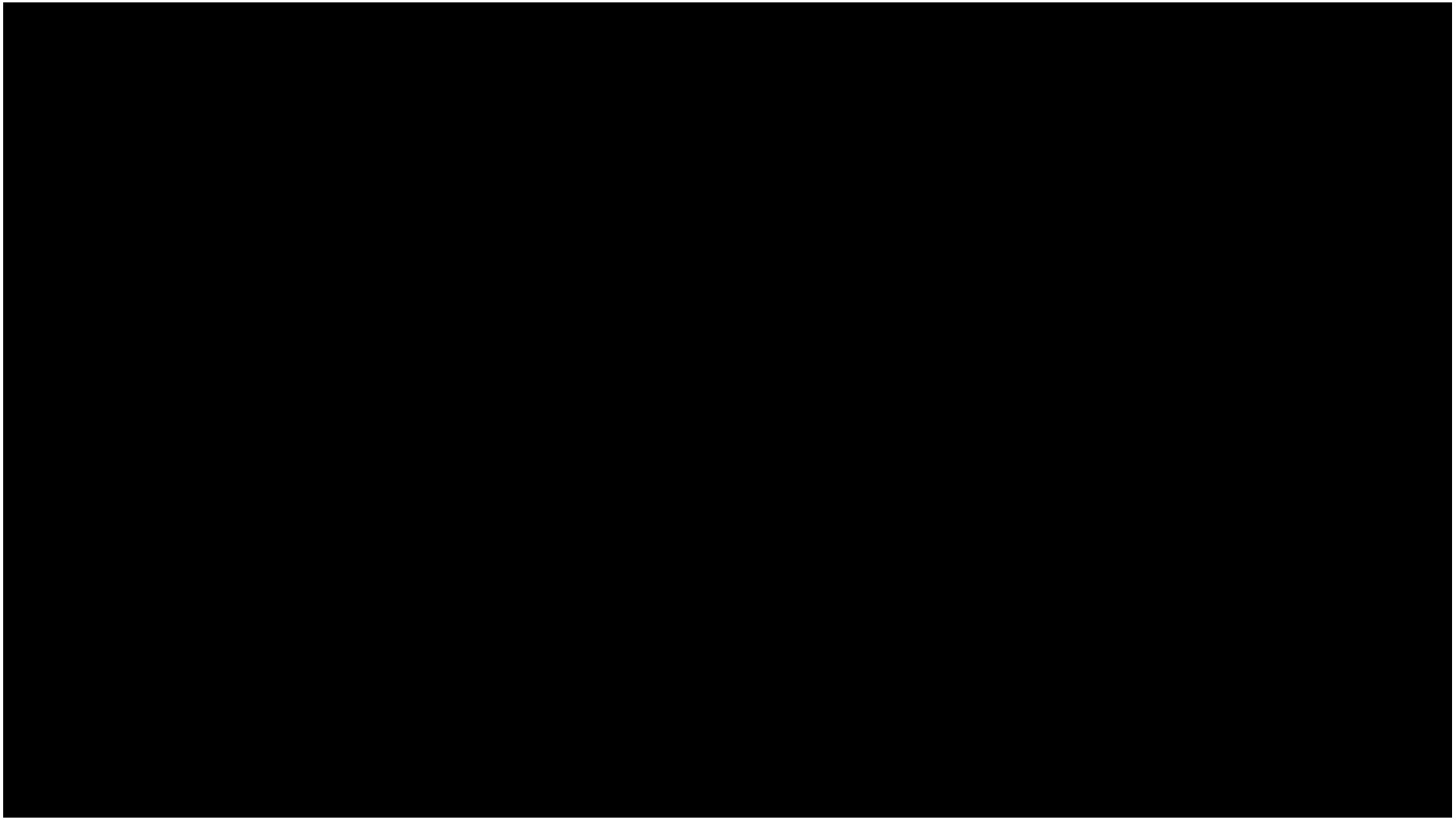
Augie back in the gym at The Claremont Club



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The results have been amazing…

- Dramatic improvements in strength and endurance.
- Able to whisper to his wife for the first time in 8 years.
- Depression has lifted – feels hopeful again.
- Was able to walk his daughter down the isle at her wedding using a standing frame.

Augie out for a bike ride…

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Cycling with Parkinson's Disease (Snidjers, NEJM 2010)

Dr. Jay Alberts

- Cleveland Clinic scientist who studies Parkinson's Disease.
- In 2003 rode a tandem bike across Iowa with friend who has PD.
- Saw dramatic improvements in his symptoms with less tremor and improved writing.
- Led to studies using cycling to treat PD.

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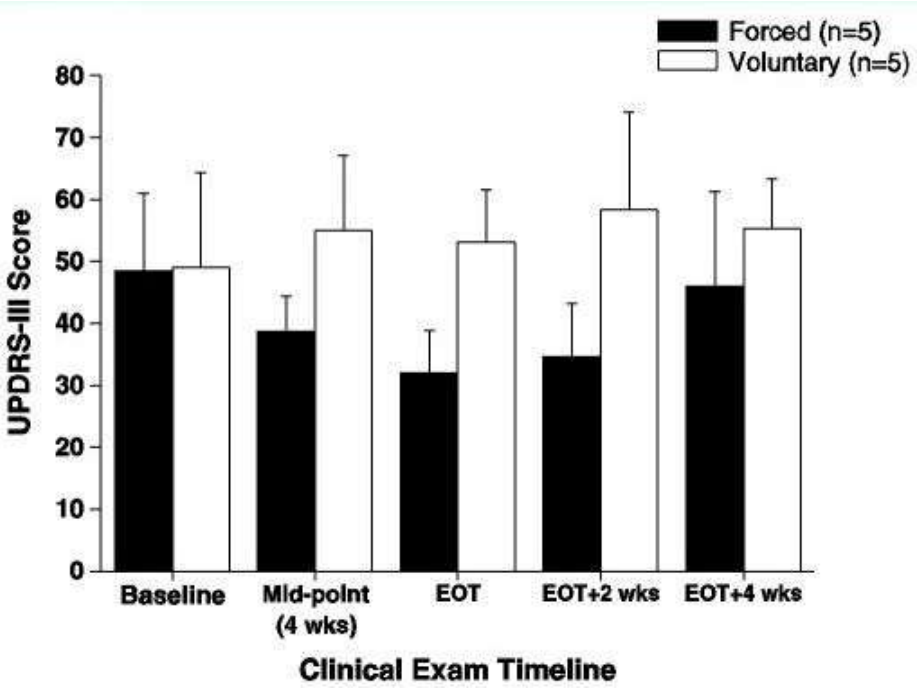
High Cadence Cycling improves Parkinson's Disease Symptoms

- 10 mild to moderate PD pts did 8 wks (three 1-hr sessions at Forced (~85 rpm) or Voluntary (~60 rpm) intensity.
- Used blinded Unified Parkinson's Disease Rating Scale III (UPDRS III).
- Forced group improved 35% from baseline; No change seen in Voluntary Group.



Theracycle

Alberts, Exerc Sport Sci Rev. 2011

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Spin Class for Parkinson's Patients at the Claremont Club

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Spinning for Parkinson's Disease

- Enrolled 13 patients with Parkinson's disease in a 12 week long spin class.
  - 9 Men and 4 Women.
  - Age ranged from 47-89 yr.; Mean age 69.8 yr.
- Met 3 days per week (Mon-Wed-Fri) at 11 AM at the Claremont Club spin studio with an instructor.
- Each session lasted 45 min and subjects were encouraged to spin at a pace of 85-90 RPM.

Spinning for Parkinson's Disease

- All patients had mild to moderate PD and all but one were on Levodopa.
- 11 of 13 subjects completed the full 12 week spinning trial.
- Subjects were assessed using the Unified Parkinson's Disease Rating Scale (UPDRS) at the start of the trial, at 6 weeks and again at 12 weeks.
- All assessments were done by the same physician (sports medicine fellow).

Unified Parkinson's Disease Rating Scale

- Validated rating tool used to gauge the course of Parkinson's disease in patients to evaluate progression of disease, treatment and for research.
- Consists of 4 segments evaluated by medical pro:
  - 1. Mentation, Behavior and Mood.
  - 2. Activities of Daily Living.
  - 3. Motor Examination.
  - 4. Motor Complications
- Max score is 199 (worst disability) and lowest score is 0 (no disability)

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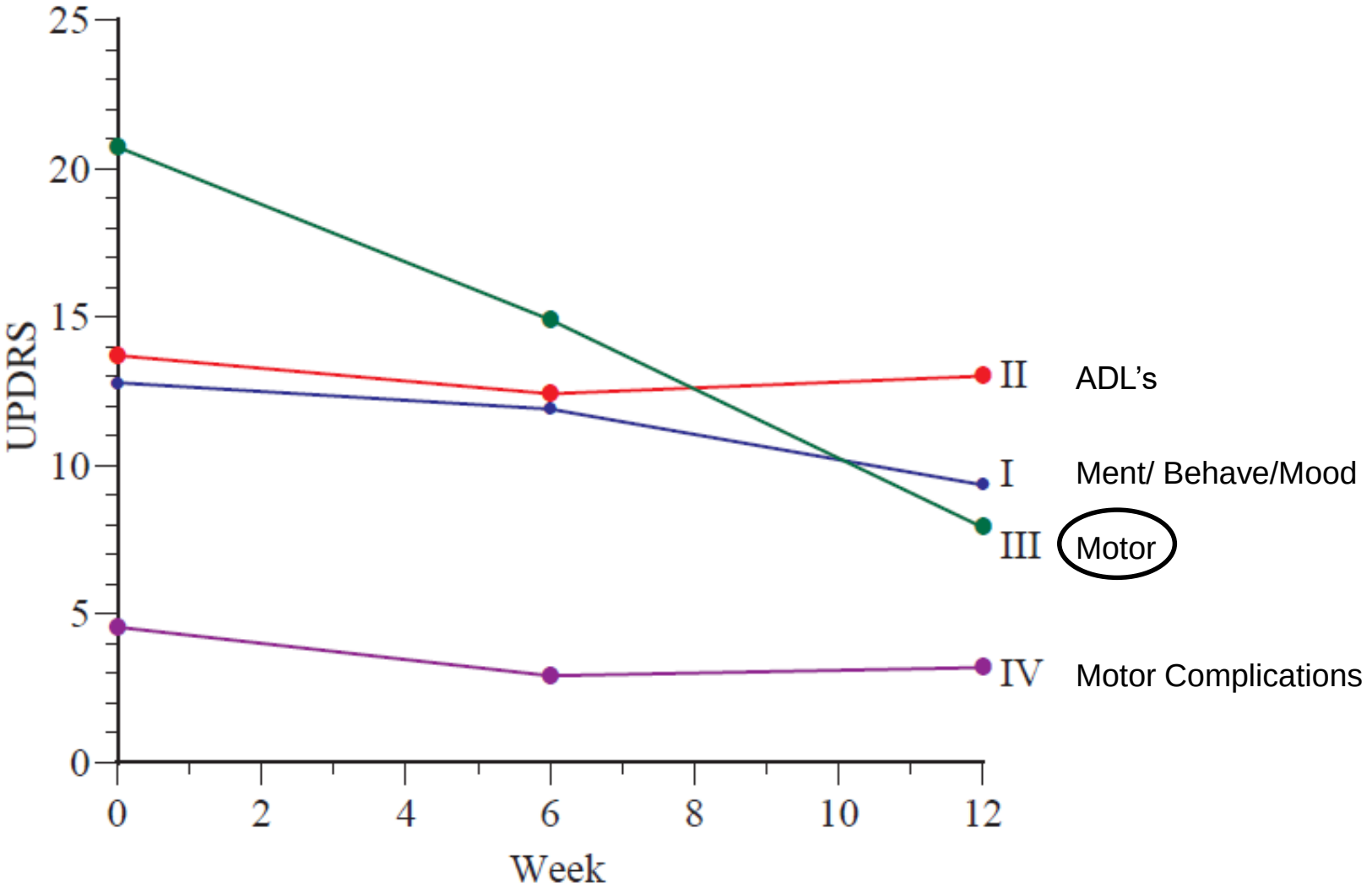
UPDRS I-IV *Results*



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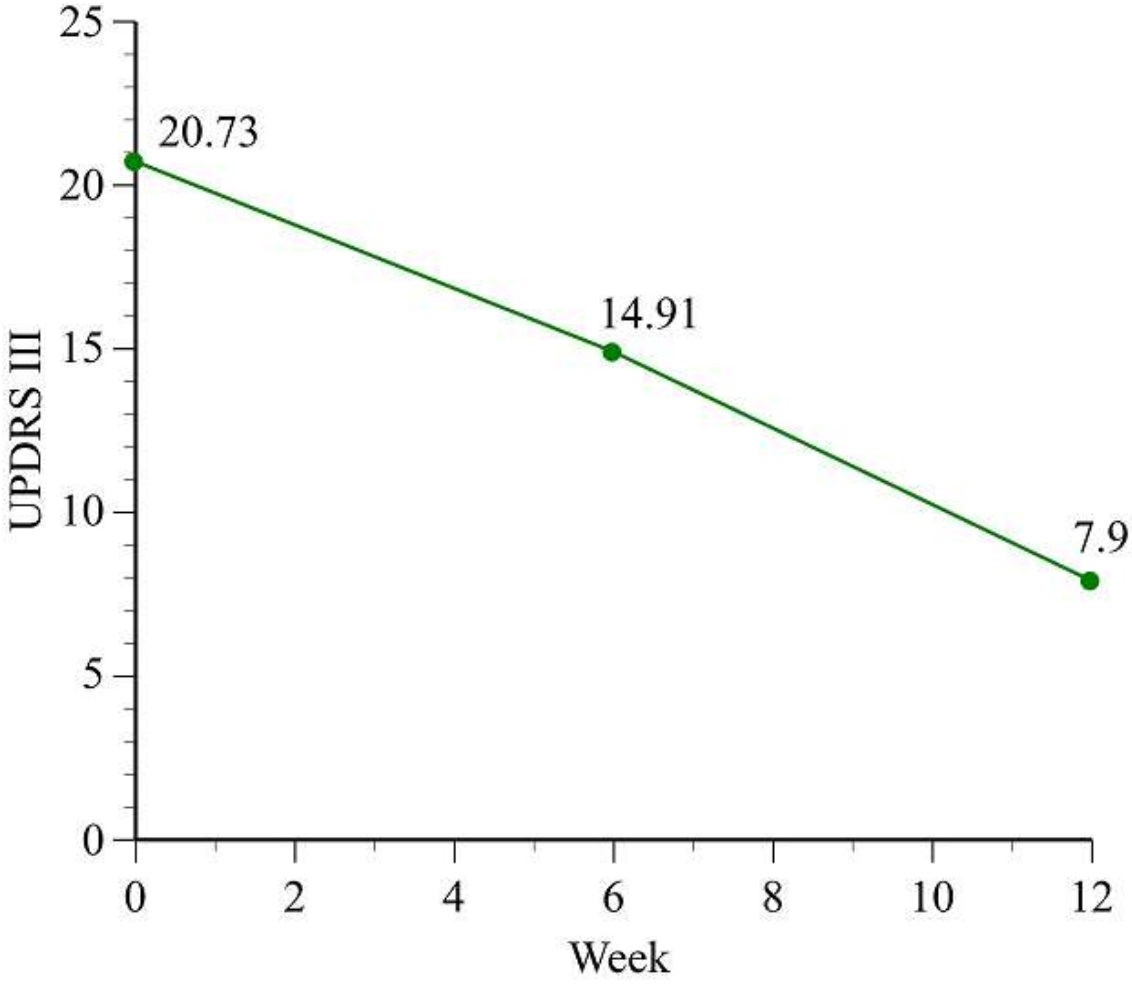
UPDRS III (Motor) *Results*



12.82 point drop
62% Improvement

p = .0013

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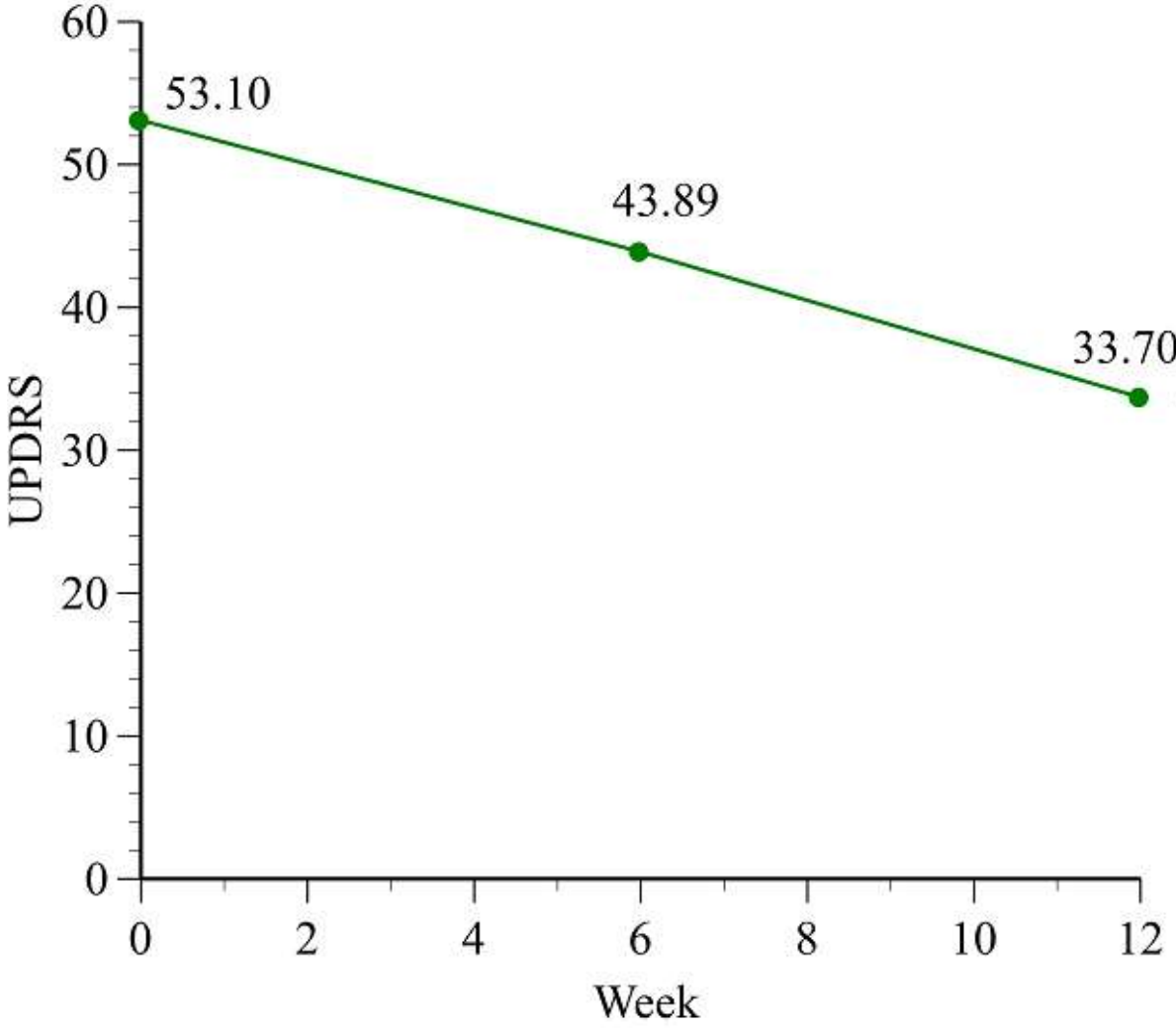
Total UPDRS *Results*



19.4 point drop
37% Improvement

p = .00002

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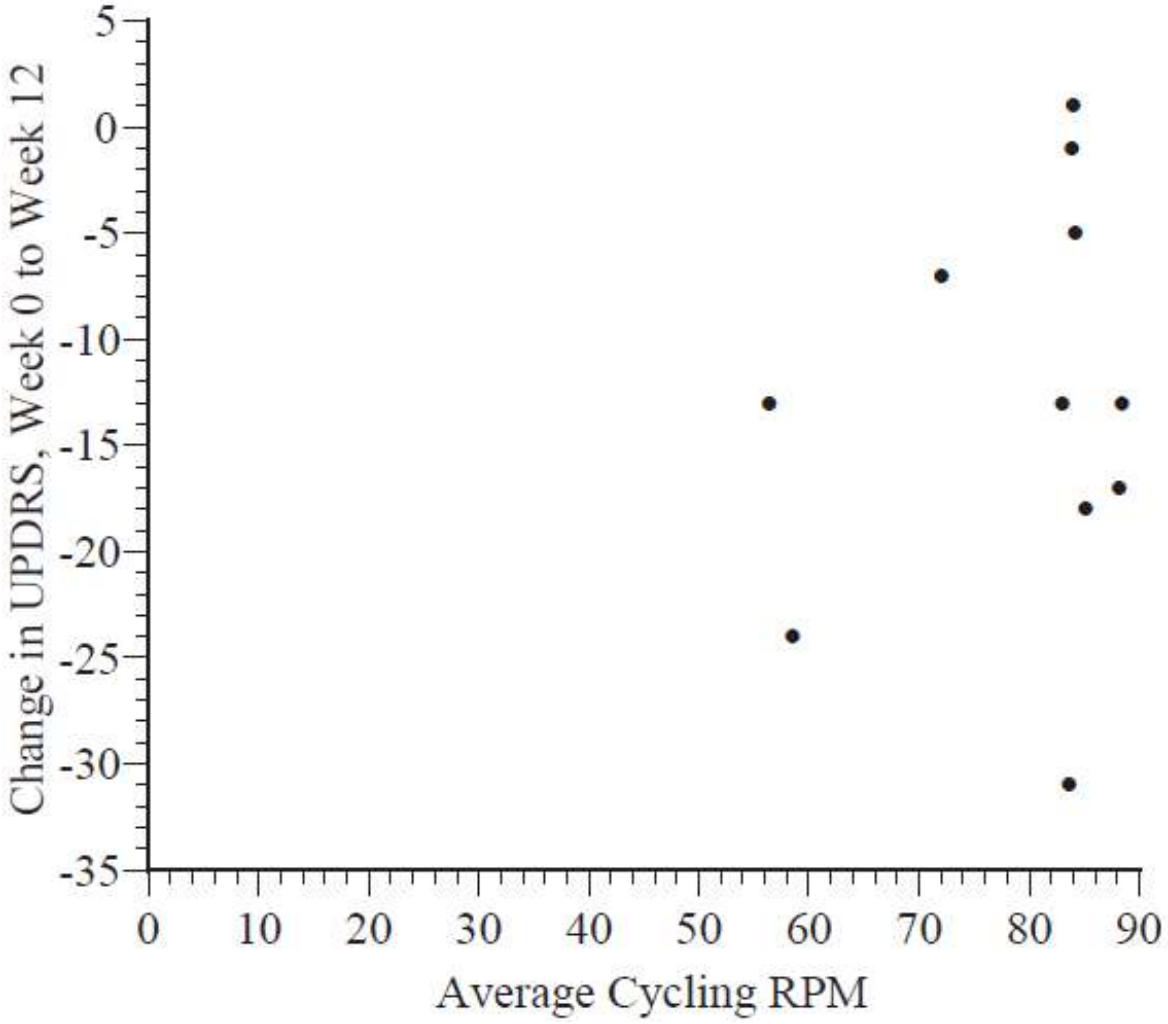
Average Spin RPM and Change in UPDRS from Week 0-12; No Significant Relationship



- Mean Avg RPM 78
- Ranged 56-89

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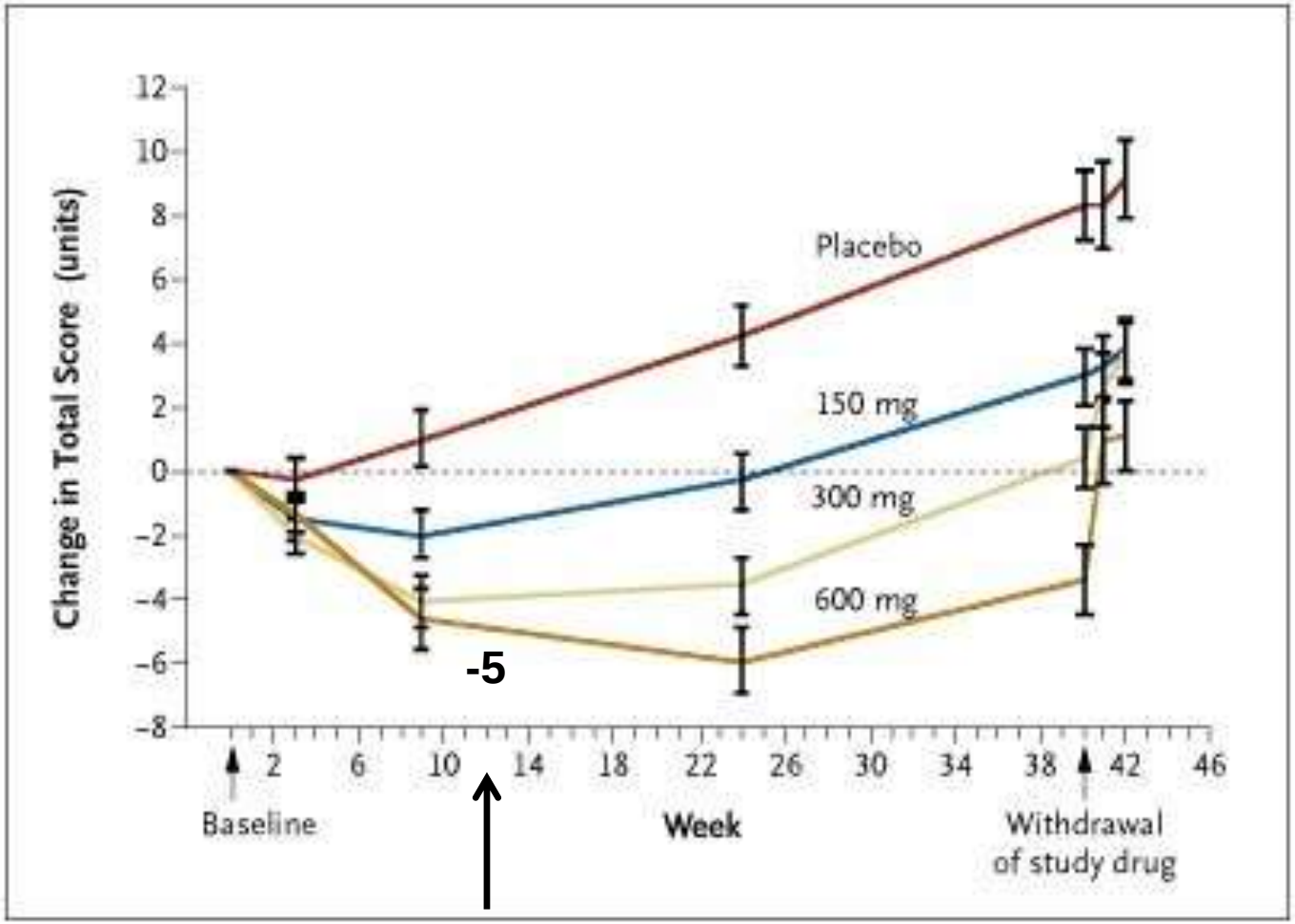
Change in UPDRS Scores with Varying Doses of Levodopa



Parkinson's Study Group, NEJM, 2004

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Study Conclusions

- Results limited by small sample size.
- ALL the UPDRS average scores improved in this study, but some did not reach statistical significance at 5% level.
- Over the 12 week period, the average subject's score improved in 39 of the 50 categories of the UPDRS. ($p = .000100$)
- The average diastolic BP decreased by 11.09 mmhg.
- All 11 subjects wish to continue these workouts.

Benefits went well beyond improved PD symptoms!

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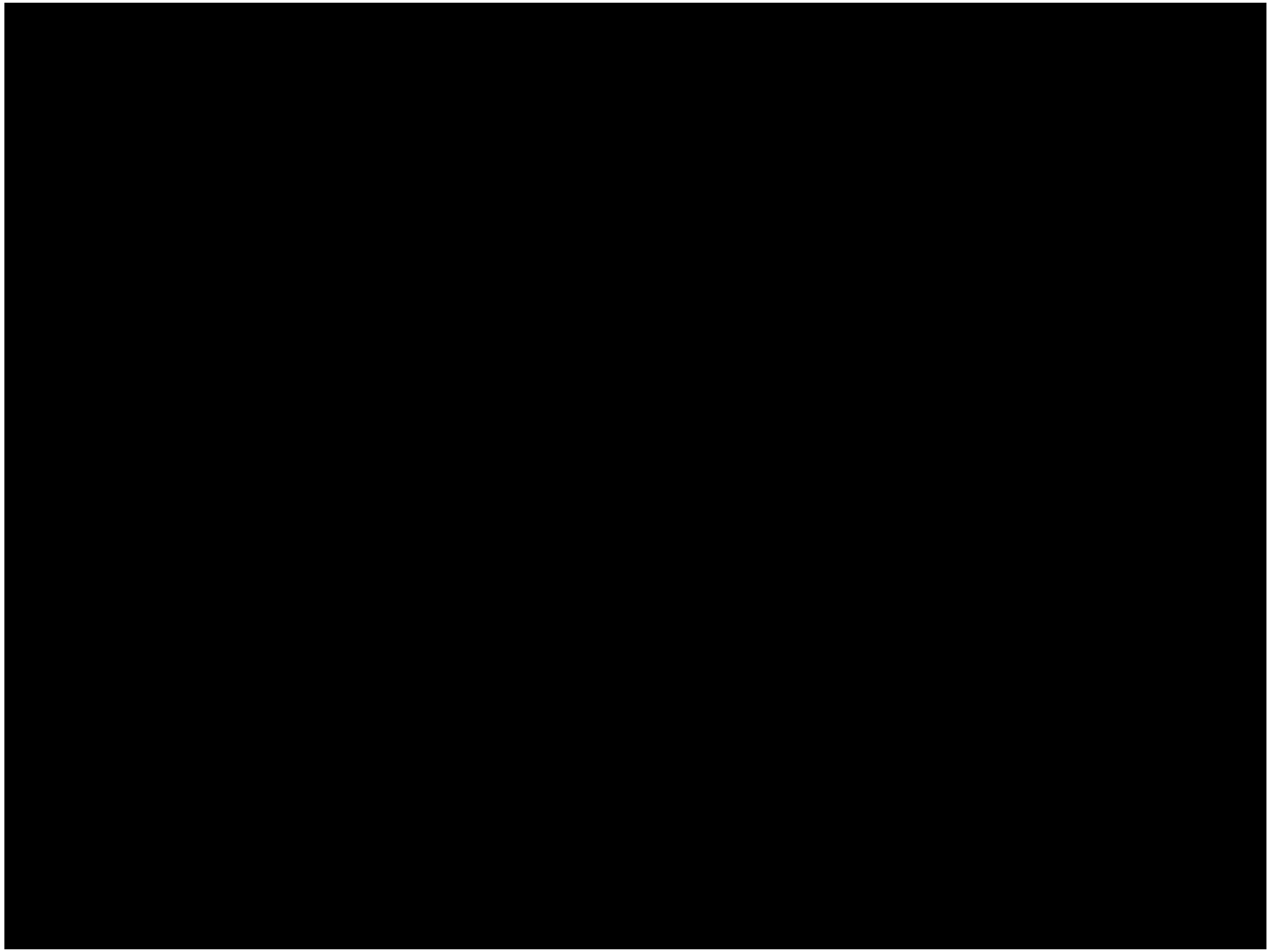
Summary

- Benefits of exercise in treatment and prevention of chronic disease are irrefutable.
- Evidence is also overwhelming on the positive affect of exercise on brain health and aging!
  - Studies show improved neurologic function at all ages with regular exercise.
  - MRI evidence of brain growth in those who exercise.
  - Results in better test scores in kids and lower rates of cognitive decline and Alzheimer's as we age.
- Exercise is Medicine to keep your brain healthy – you need to take it and prescribe it to your patients!

Exercise is Medicine for Life's Journey…



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Upcoming Exercise is Medicine Presentations
Robert Sallis, MD

- **Wednesday @ 5 PM**; *"Fitness Vs Weight: What's More Important to Your Health?"*
- **Wednesday @ 8 PM**; *"Managing Chronic Pain: What Are the Best Non-Drug Options?"*

Thank You!

Questions?