How can physical educators address physical inactivity: the biggest public health problem of the 21st century?

AIESEP 2015 International Conference
July 9, 2015

Steven N. Blair
Departments of Exercise Science & Epidemiology/Biostatistics
University of South Carolina

Disclosures for Past 5 Years

- **Medical/Scientific Advisory Boards**
  - **Technogym**
  - **Cancer Foundation for Life**
  - **Santech**
  - **Clarity Project**
  - **Sports Surgery Center**
- **Research Funding**
  - **NIH**
  - **Body Media**
  - **The Coca-Cola Company**
  - **U.S. Department of Defense**
- **Royalties**
  - **Human Kinetics**

Lecture Outline

- What are the major health problems in the world?
  - What are the causes of these?
  - What is the importance of physical activity?
- How can we get more people to be physically active more of the time?
  - Cognitive and behavioral interventions
  - Use of modern technology

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Non-Communicable Diseases (NCDs)

- Changing patterns in leisure and work have led to a health crisis
- NCDs cause 65% of all deaths worldwide
- 36.1 million deaths from CVD, Stroke, Diabetes, Cancer & Respiratory diseases.

WHO. Mortality and burden of disease estimates for WHO Member States in 2008. Geneva: World Health Organization, 2010.





Economic Burden

- **Failure to reduce chronic diseases will result in heavy losses in terms of human life and economic production.**
- **Current losses:**
  - **US: $750 billion annually from CVD & diabetes alone.**
  - **China: $558 billion**
  - **India: $237 Billion**
  - **Britain: $33 Billion**
- **Trends suggest that risk factors and costs are on the rise.**

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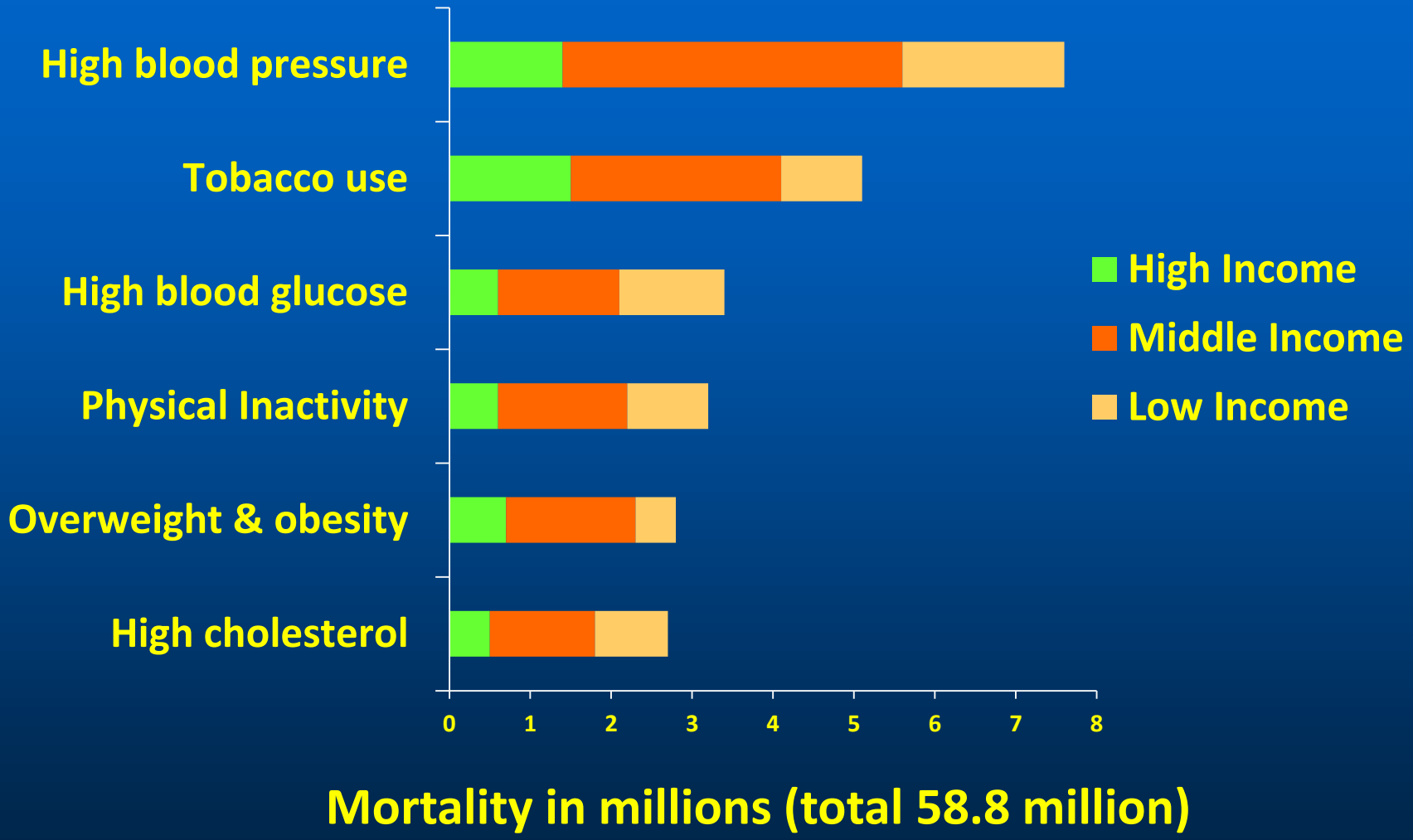
Question

- Rank the following exposures by the number of deaths caused worldwide.
  - Tobacco use
  - Obesity
  - High blood pressure
  - Physical inactivity
  - High blood glucose

Leading risk factors for mortality by income group (estimates from 2004)



EFFECT OF PHYSICAL INACTIVITY ON MAJOR NON-COMMUNICABLE DISEASES WORLDWIDE: AN ANALYSIS OF BURDEN OF DISEASE AND LIFE EXPECTANCY

I-Min Lee, Eric J Shiroma, Felipe Lobelo, Pekka Puska, Steven N Blair, Peter T Katzmarzyk, for the Lancet Physical Activity Series Working Group

Findings

- Between 6-10% of the world's major NCDs is attributable to inactivity
- By eliminating inactivity, >5.3 M deaths/y may be prevented
- This leads to an increase of 0.68 years in the world's life expectancy

(For perspective: smoking causes 5 M deaths/y worldwide)

The Costs of Inactivity in Europe—June 17, 2015

Centre for Economics and Business Research

- 1 in 4 adults across Europe is insufficiently physically active, as are 4 out of 5 adolescents
- Cost to the European economy of "doing nothing" is over 80bn Euros per year.
- Physical inactivity could become bigger risk to public health than smoking, but cheap and effective steps to get people moving could save Europe billions.

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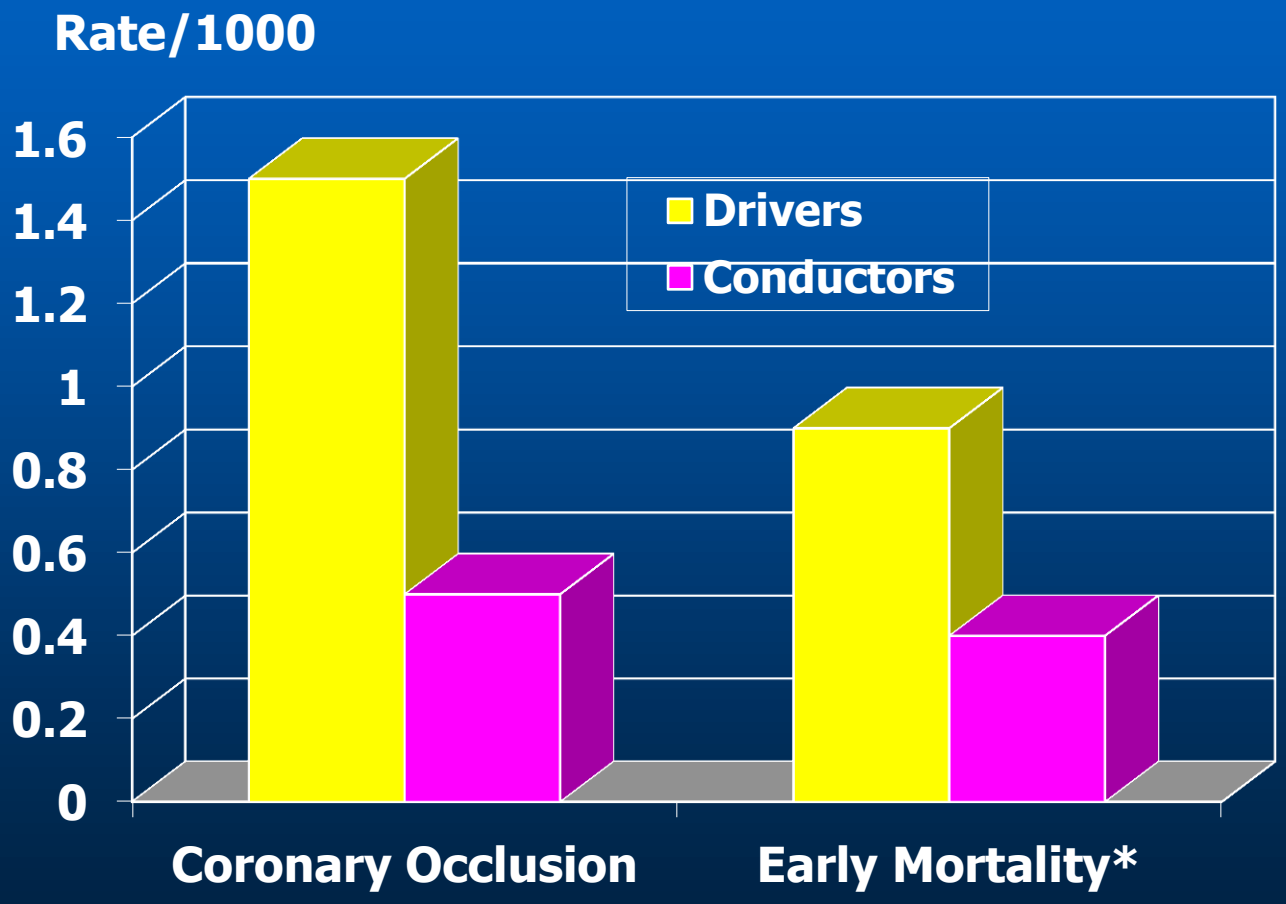
Professor Jerry Morris—Pioneer in studying physical activity and cardiovascular health

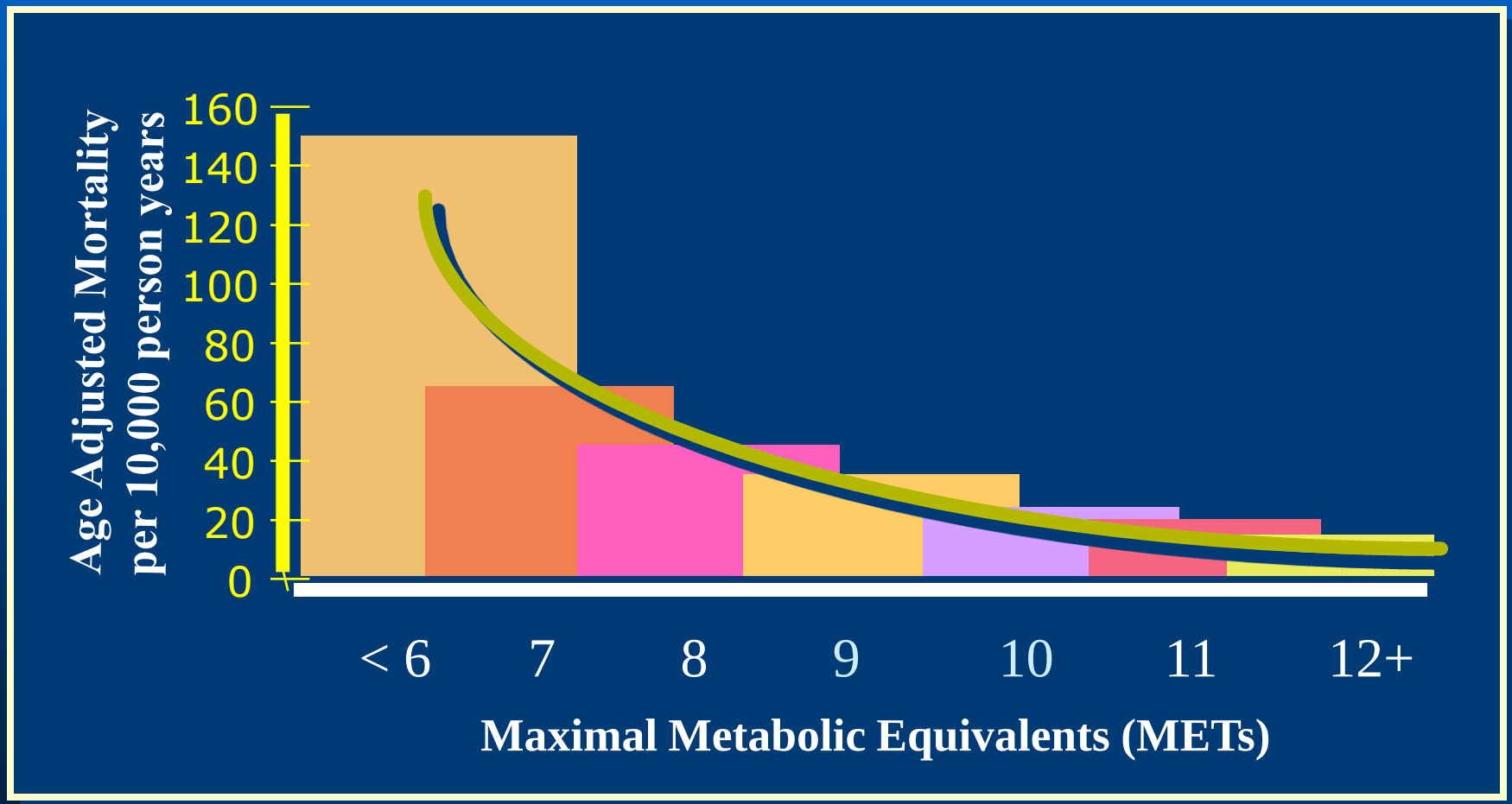
Physical Activity at Work and Coronary Artery Disease, 31,000 London Transport Workers



*Within 3 days of MI

Morris JN et al. *Lancet* 1953

All-Cause Mortality and Physical Fitness



Blair et al. JAMA. 262:2395, 1989

Lecture Outline

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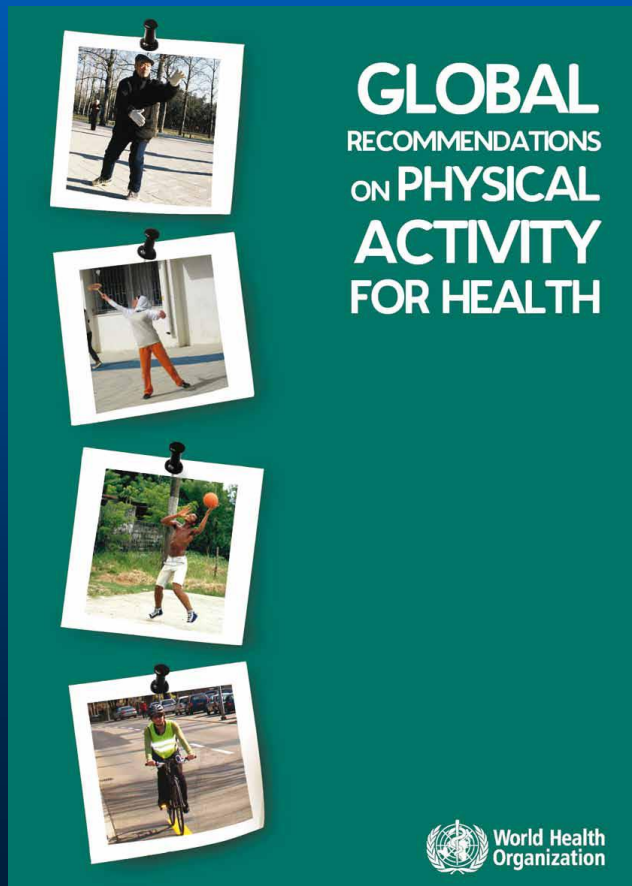
WHO PA Recommendation

- Released by WHO in December 2010
- PA recommendations
  - 5-17 yr—60 min MVPA/day, vigorous intensity, including muscle and bone strengthening 3 X week
  - 18-64 yr—each week accumulate in bouts of at least 10 min, 150 min moderate intensity, 75 min vigorous intensity, or combination of both; and resistance training 2 X week
  - 65 yr & older—same as 18-64 yr, those with poor mobility should also do balance exercises, and take health conditions into account



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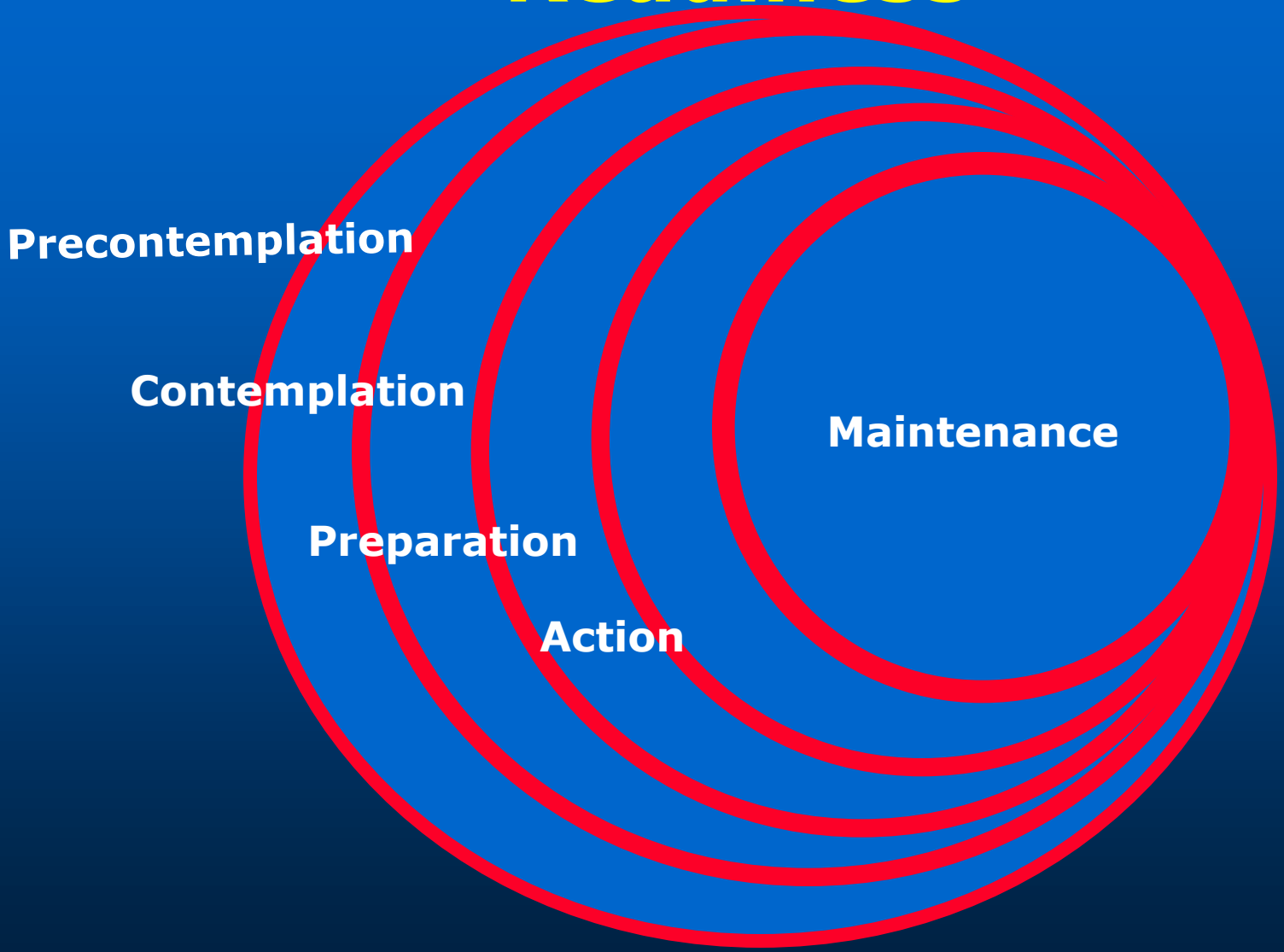
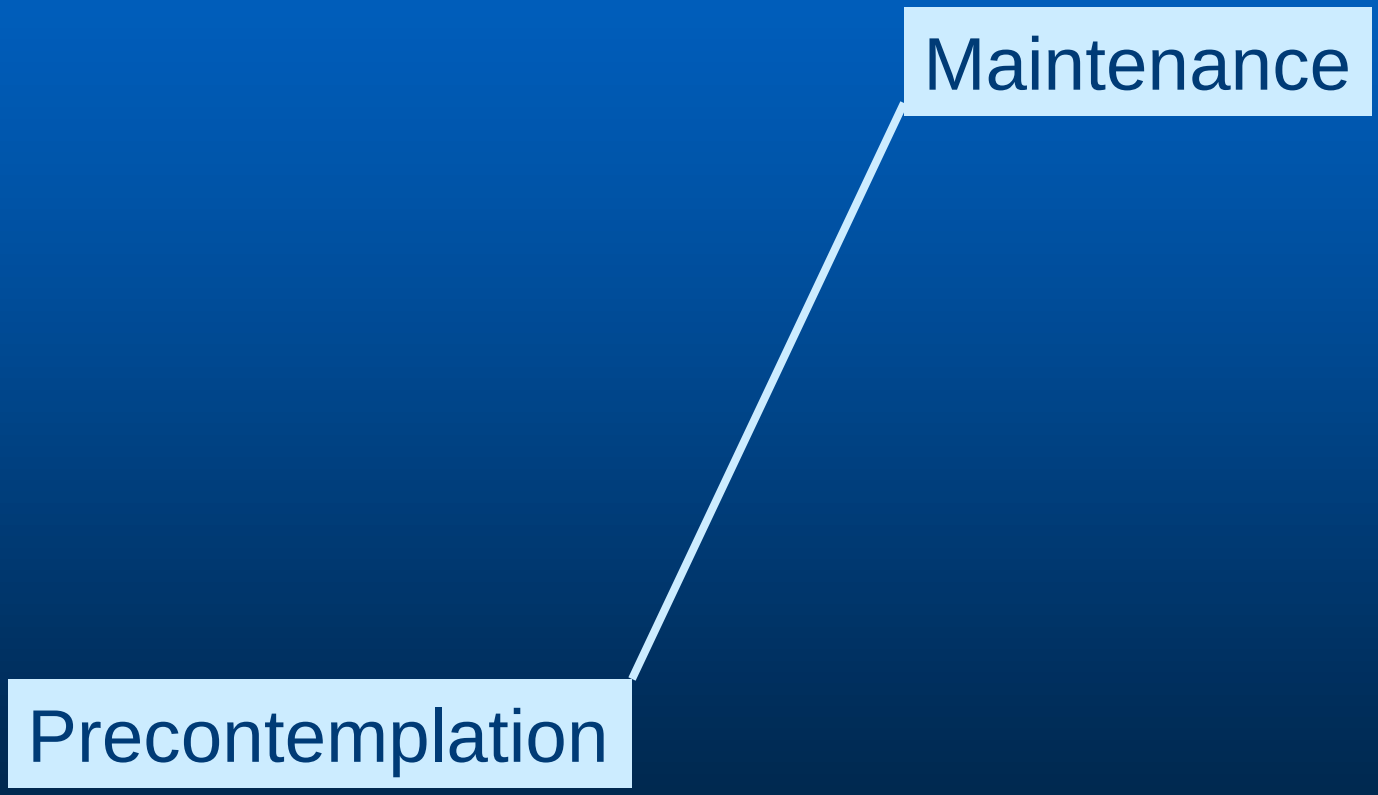
Behavioral Approaches to Physical Activity Interventions

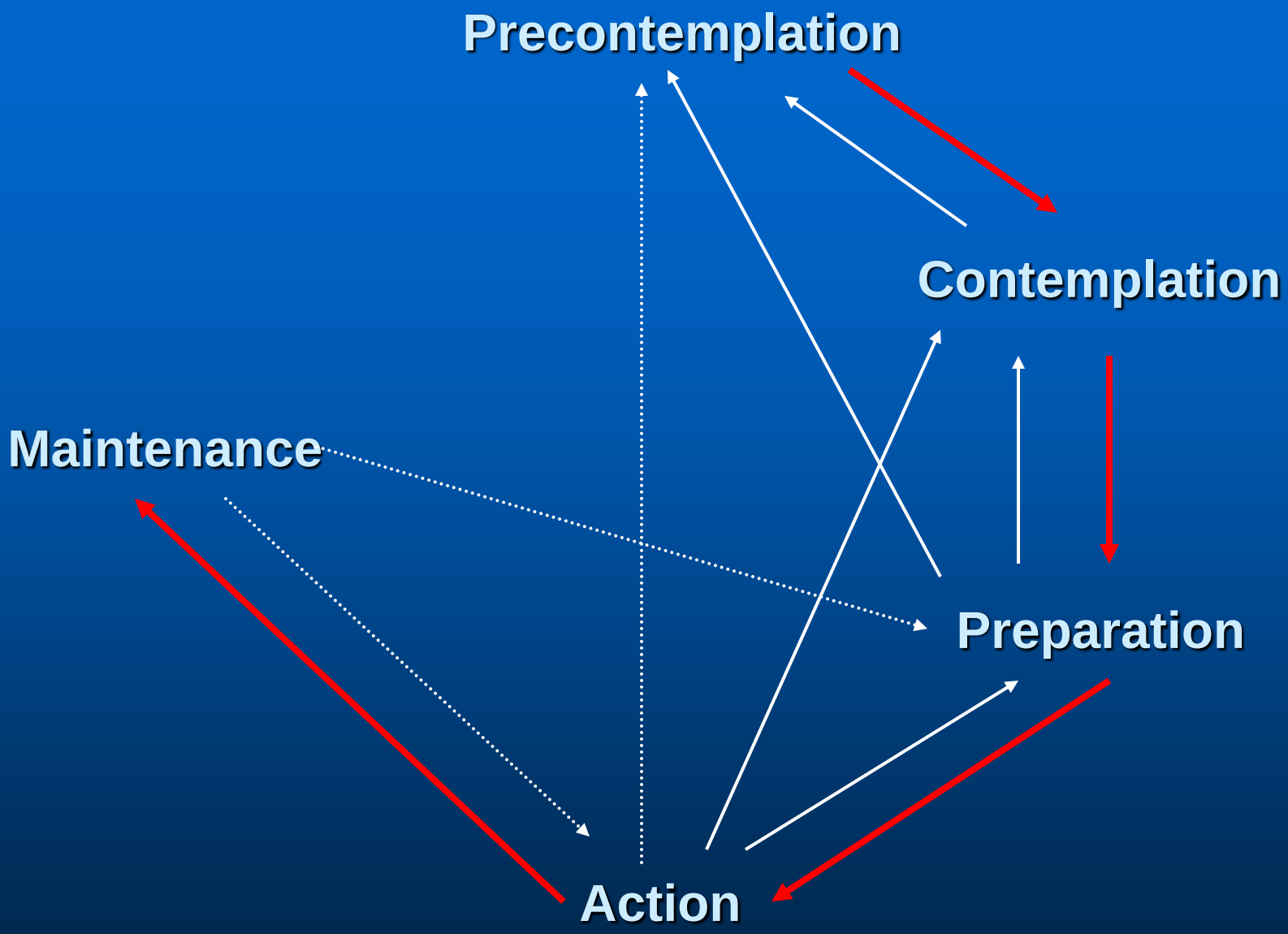
- **Theoretical foundations**
  - Social Learning Theory
  - Stages of Change Model
  - Environmental/Ecological Model
- **Methods**
  - Problem solving
  - Self-monitoring
  - Goal setting
  - Social support
  - Cognitive restructuring
  - Incremental changes
  - Manipulating the environment

Five Stages of Motivational Readiness



The Way People Want To Change




Precontemplation
Contemplation
Preparation
Action
Maintenance

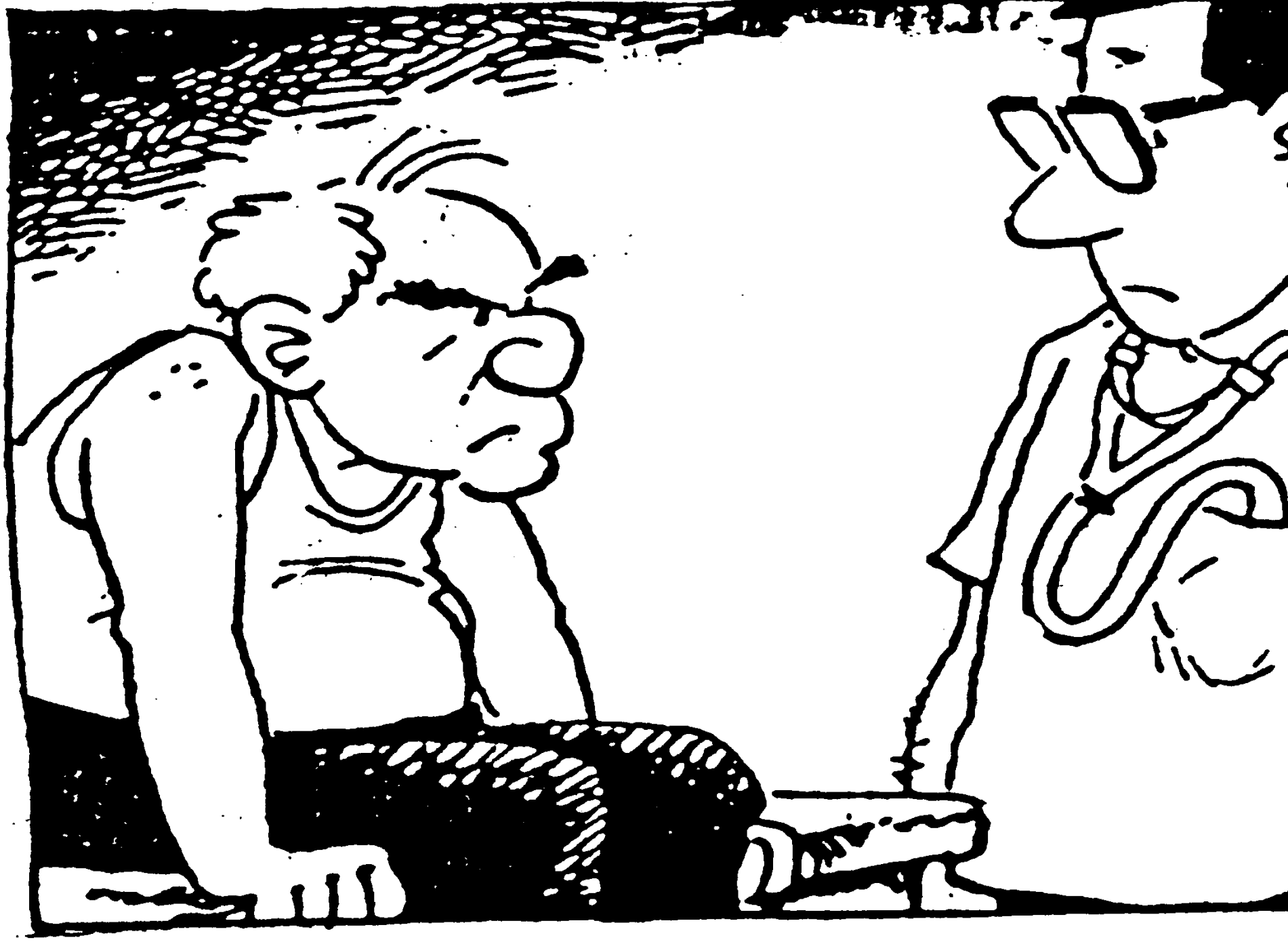
Precontemplation Stage

Not Intending to Change

- **Doesn’t believe behavior has negative consequences**
- **May be resistant to change**
- **Cons >> Pros**
- **Self-confidence**

CRANKSHAFT


IF I WERE YOU, MR. CRANKSHAFT...I'D THINK ABOUT GETTING SOME MORE EXERCISE!



By Tom Batiuk and Chuck Ayers

Contemplation Stage

Intending to Change

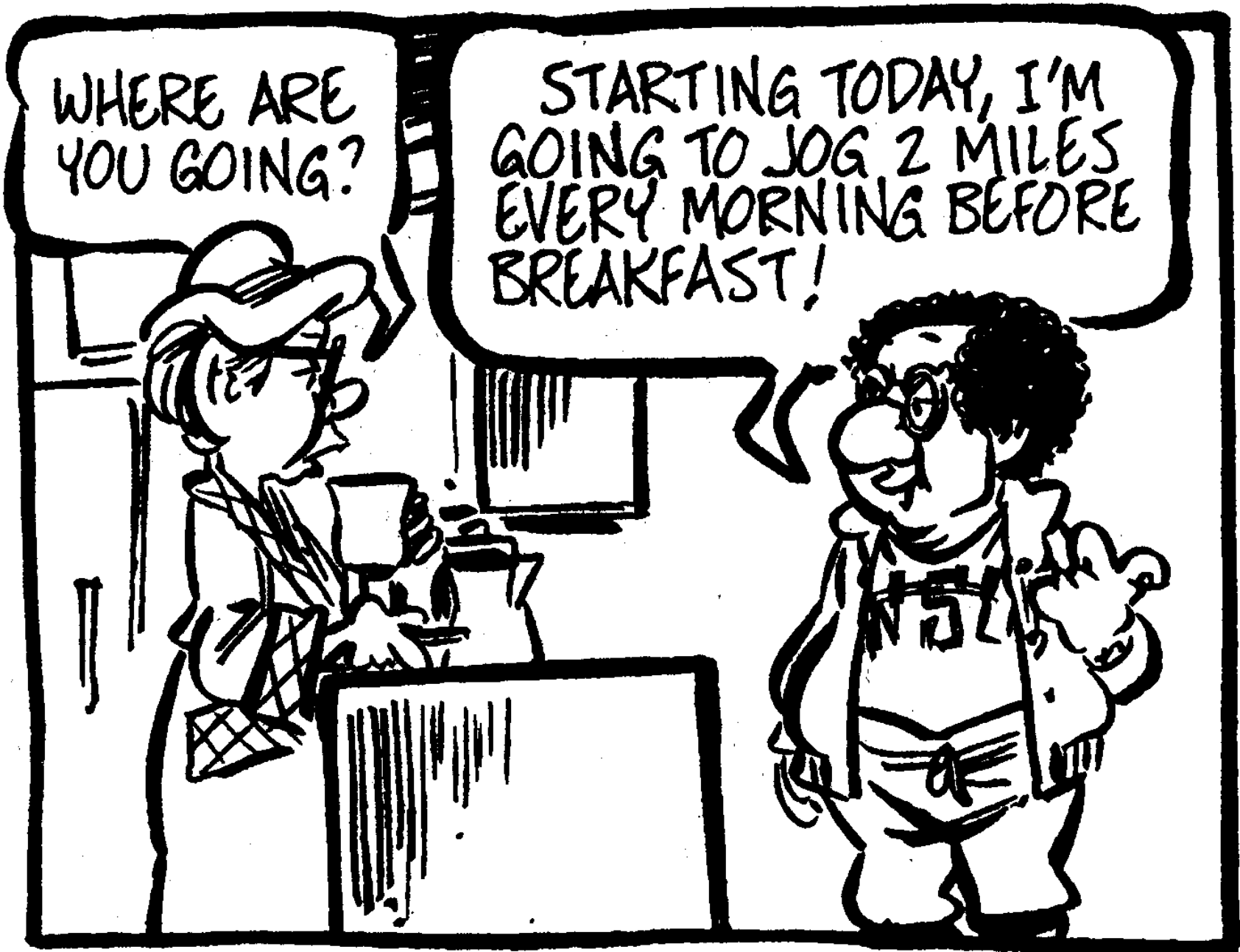
- **Knows the negative consequences**
- **Doesn’t know how to get started**
- **Cons > Pros**
- **Externally motivated**
- **Self-confidence**

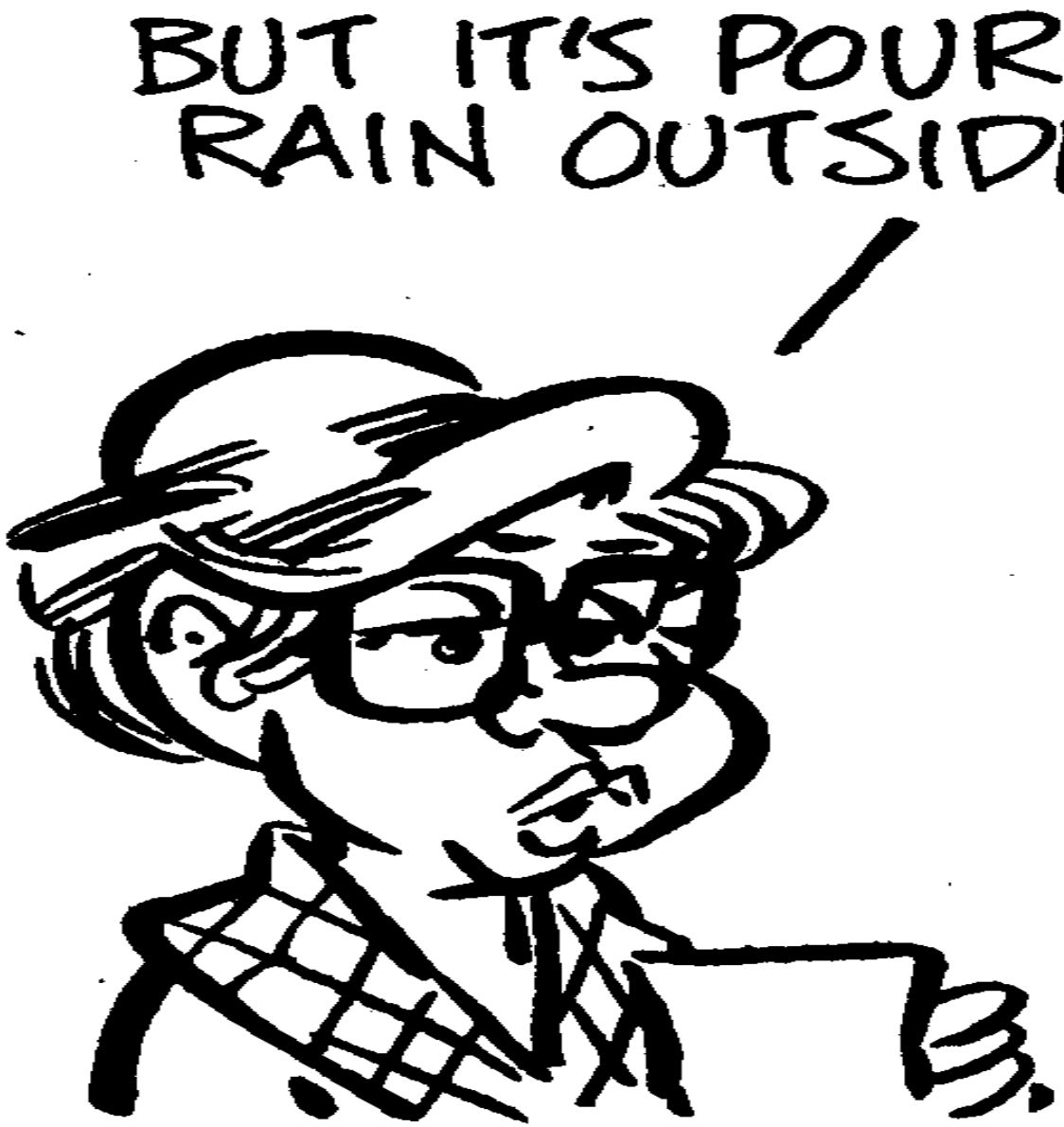
Preparation Stage

Making small/inconsistent changes

- **Know a little about how to get started**
- **Don't know how to stay with it; need a plan**
- **Cons = Pros**
- **Externally motivated**
- **Typically the people who participate in "action" programs**
- **Self-confidence**

GEECH


WHERE ARE YOU GOING?
STARTING TODAY, I'M GOING TO JOG 2 MILES EVERY MORNING BEFORE BREAKFAST!


BUT IT'S POURING RAIN OUTSIDE!


THANK GOODNESS!
© 1984 Universal Press Syndicate 9-5

Action Stage

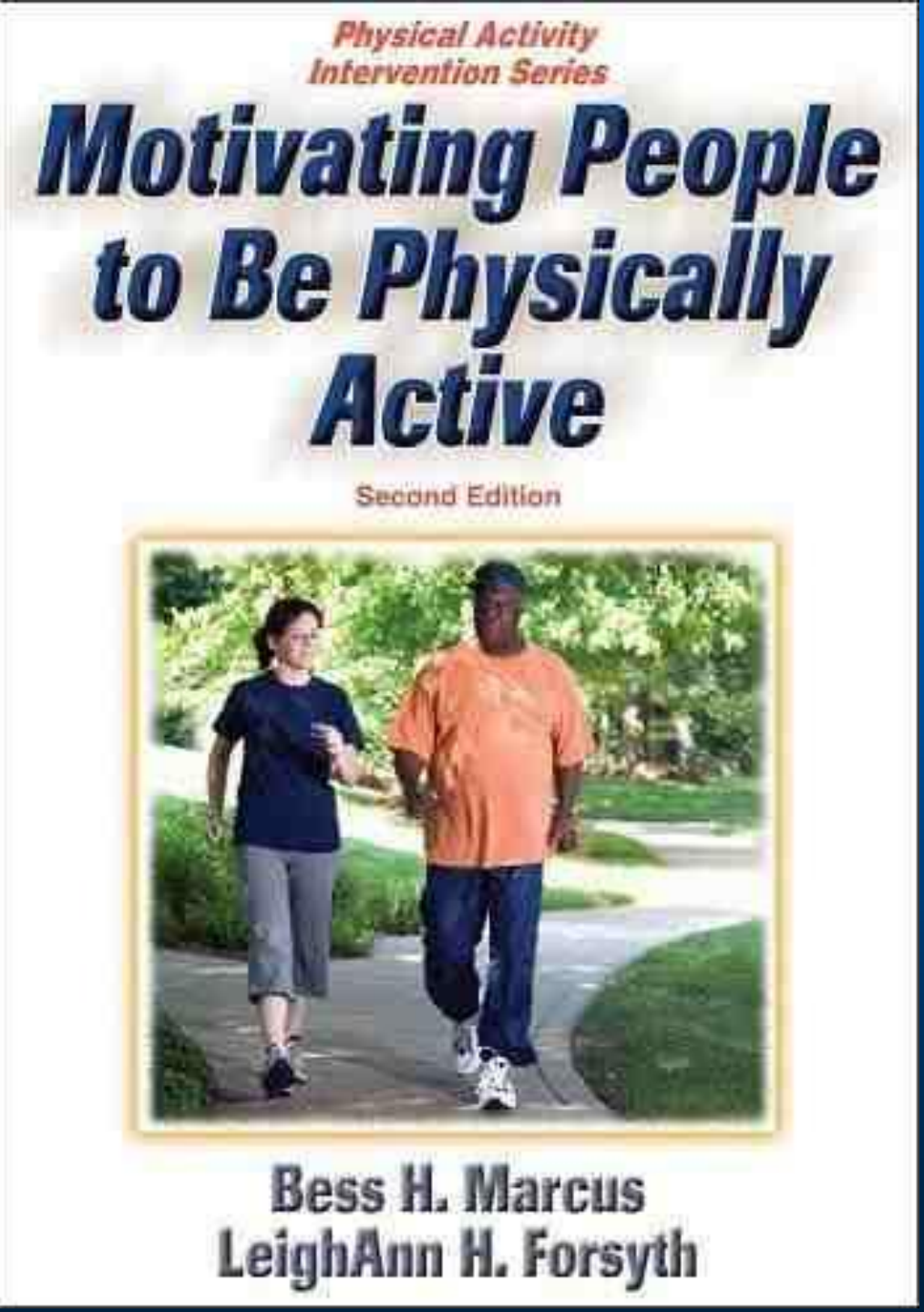
Doing the behavior regularly but for < 6 mos.

- **Greatest risk for relapse**
- **Most use of the processes of change**
- **Cons < Pros**
- **Externally (and internally) motivated**
- **Most likely to participate in "action" programs**
- **Self-confidence**

Maintenance Stage

Sustaining the change

- **Continue to do the behavior no matter what**
- **The processes of change are now <u>skills</u>**
- **Cons < < Pros**
- **Internally motivated; part of value system**
- **Self-confidence**



Available from Human Kinetics (www.hkusa.com)

Processes of Change

Cognitive Strategies

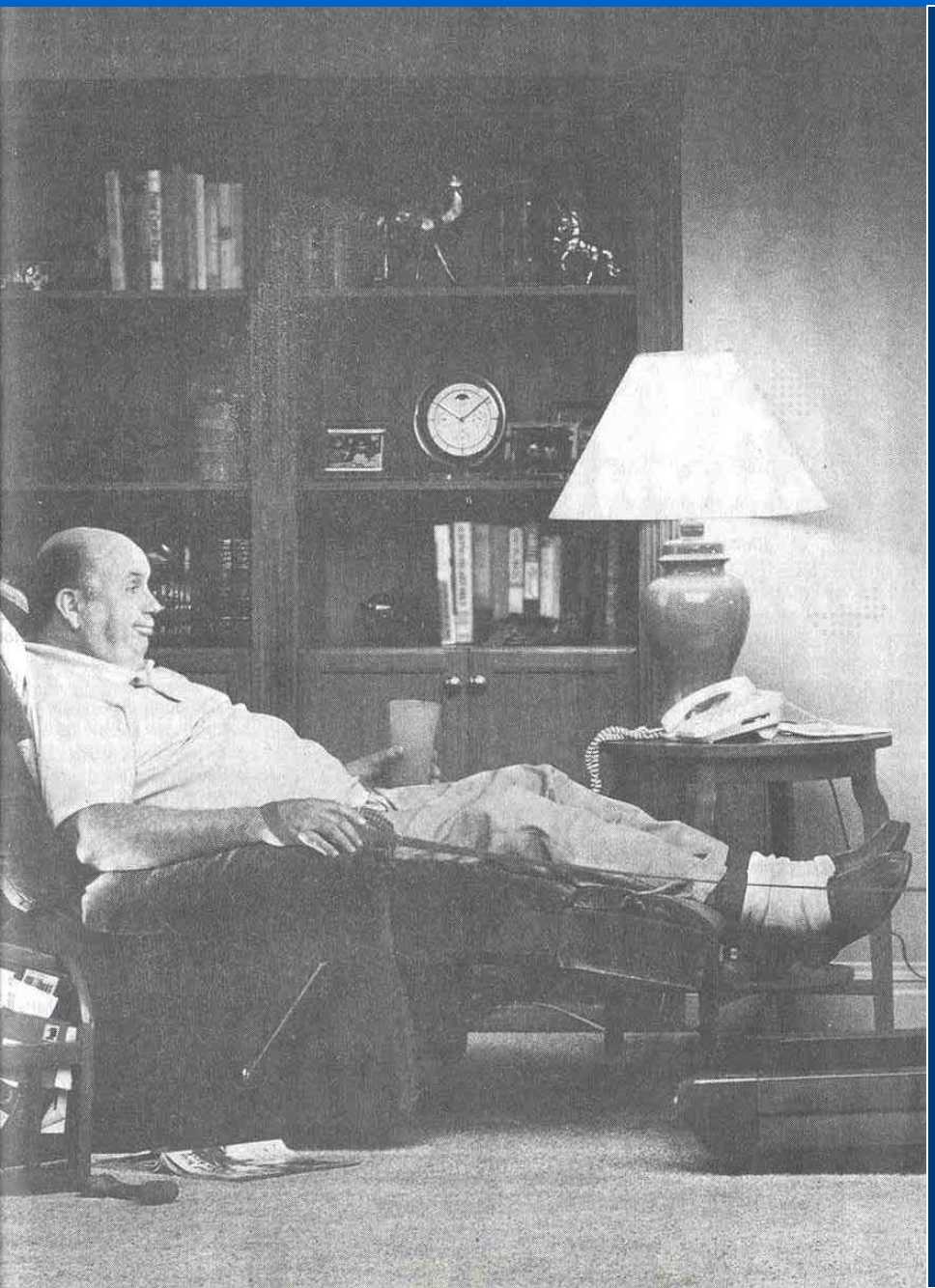
- Increasing Knowledge
- Comprehending Benefits
- Warning of Risks
- Caring About Consequences
- Increasing Healthy Opportunities

Behavioral Strategies

- Making a Commitment
- Enlisting Social Support
- Substituting Alternatives
- Rewarding Yourself
- Reminding Yourself

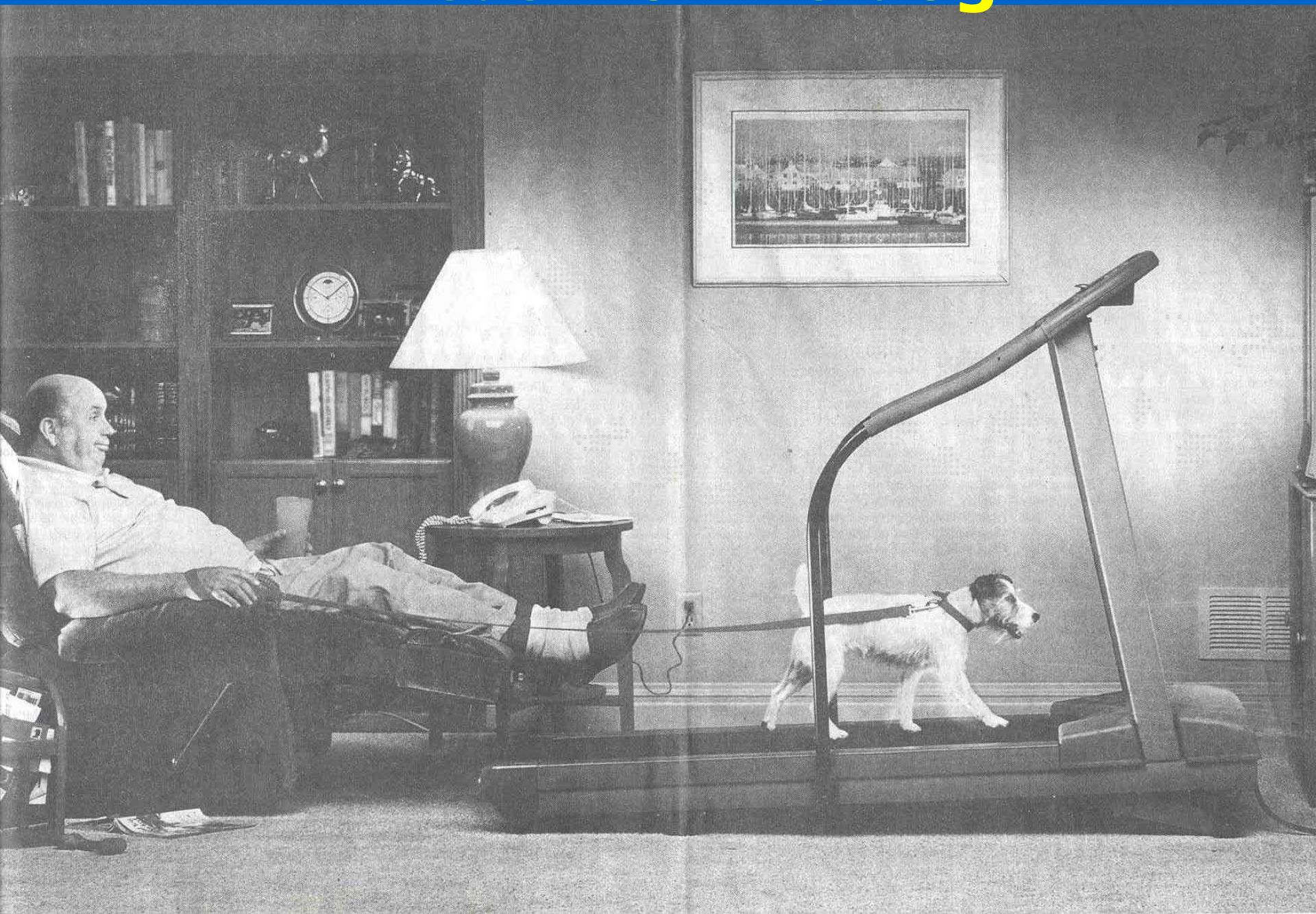
Enlisting social support

- **Seeking out others to provide support for and encourage participation in physical activity**
  - **I have a healthy friend that encourages me to be physically active when I don't feel up to it**
  - **I have someone on whom I can depend when I am having problems with being physically active**



Here is a man firmly committed to regular physical activity. Walking is his favorite activity.

At least for his dog!



Dog Ownership and PA

- **27% of adult dog owners walk their dog >150 mins/wk**
  - Reeves et al. J Phys Act Health. 2011 Mar;8(3):436-44
- **Adolescent LTPA sig. associated with dog ownership**
  - Sirard et al, Am J Prev Med. 2011 Mar;40(3):334-7
- **Canadian dog owners walked 133 min/wk more than non-owners in 2005**
  - Brown & Rhodes, Am J Prev Med. 2006 Feb;30(2):131-6

Substituting alternatives

- **Replacing sedentary pursuits with more active behaviors**
  - **Instead of remaining inactive, I engage in some physical activity**
  - **When I'm feeling tense, I find that being physically active helps relieve my worries**

What to Do Next in Order to Increase Physical Activity in the Population?

How to Achieve Lifestyle Change

- Counseling by a PhD level behavioral psychologist
- Counseling by B.A. level health educators
- Counseling by mail and telephone
- Counseling by electronic communications

Review of Electronic Computer Interventions to Increase Activity

- Search of PubMed or Web of Science yields <25 studies on electronic interventions for physical activity and <15 of these focus exclusively on activity
- Conclusions
  - Using the internet can reach large populations
  - Research is still in infancy but
    - Results are promising with beneficial changes in physiological and psychological factors reported
    - Appears that response is similar to established interventions

Marcus BH et al. *Br J Sports Med* Feb 2009

But What about the Obesity Epidemic?

There Is an Enormous Amount of Confusion about Obesity and Public Health

Imbalance in Energy Balance

- Google search January 1, 2015
  - Physical inactivity and obesity
    - 966,000 hits
  - Diet and obesity
    - 70,300,000 hits
- PubMed search January 1, 2015
  - Physical inactivity and obesity
    - 2,176 manuscripts
  - Diet and obesity
    - 44,584 manuscripts

Blair SN, Hand GA, Hill JO. Energy Balance: A Crucial Issue for Exercise and Sports Medicine *BJSM 2015.*

What Is the Cause of the Obesity Epidemic?

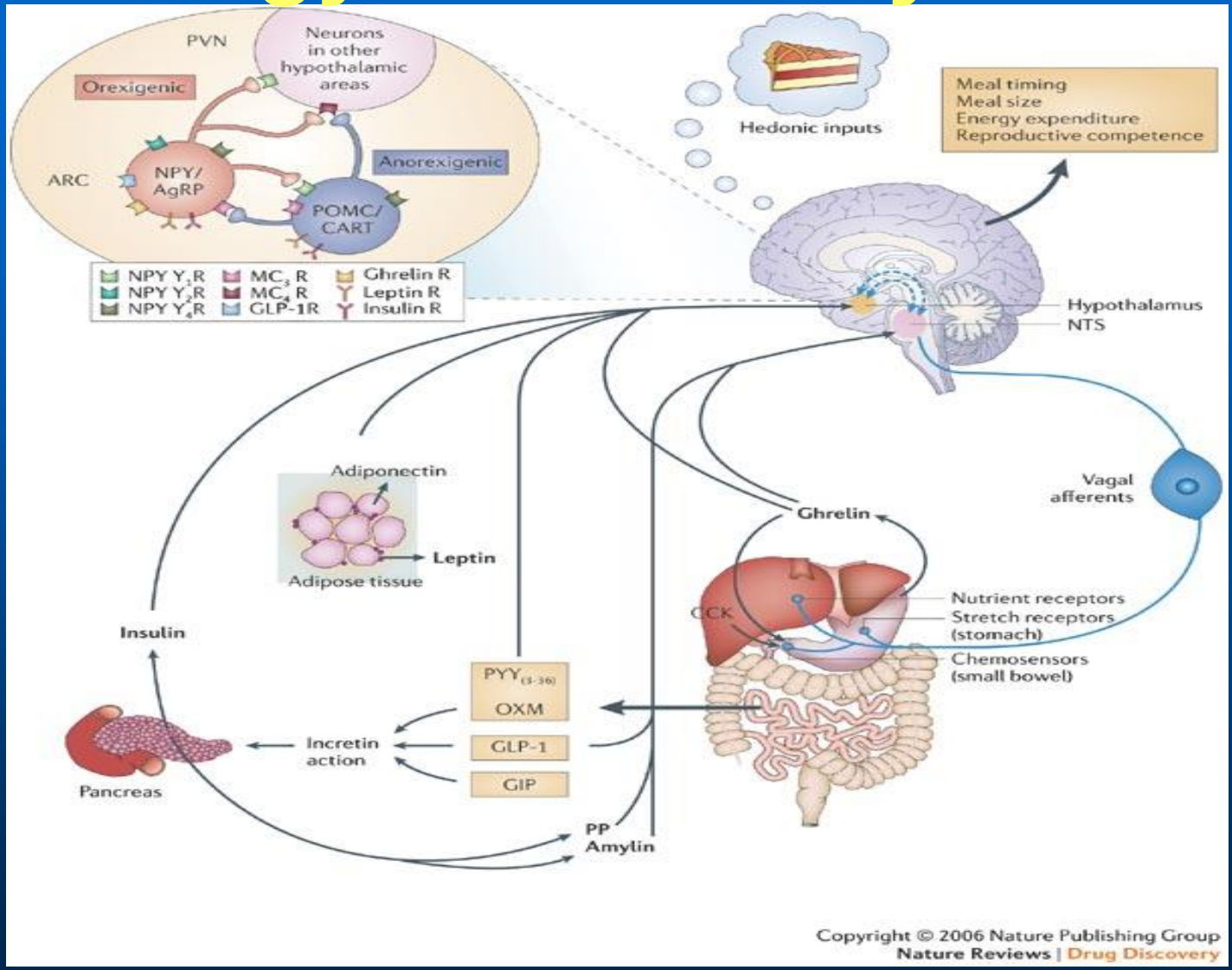
Energy Balance- Simple Model

Calories Consumed

Calories Burned

Slide courtesy of Robin Shook

Energy Balance System



Cooke D; *Nature Reviews Drug Discovery* 5, 919-931
Slide courtesy of Jim Hill

We Need More Balance in the Discussion of Energy Balance

Obesity Epidemic Caused by Eating too Much, Claims Academic

- Average caloric expenditure in 1980
  - Women=950 kcal/day
  - Men=1380 kcal/day
- Average caloric intake is now 3,500 kcal/day
- "Over the past 25 years…there has been no change in our levels of physical activity" "there has been no change in energy expenditure"

Article on British Science Festival in the September 16, 2010 Daily Telegraph

World Health Organization

Collaborating Centre for Obesity Prevention

- **" Increased energy intake alone virtually explains all the increase in body weight in the United States from the 1970s to the 2000s."**

Swinburn B. European Congress on Obesity; May 6-9, 2009; Amsterdam, the Netherlands.

THE LANCET

Volume 385 · Number 9985 · Pages 2323-2432 · June 13-19, 2015 www.thelancet.com

"An urgent rethinking of the causes, enablers, and barriers to change is needed to begin to make a difference in the global obesity pandemic. The second *Lancet* Obesity Series...examines false dichotomies and proposes a reframing of obesity as a consequence of the 'reciprocal nature of the interaction between the environment and the individual', where feedback loops perpetuate food choices and behaviours."

See **Comment** page 2326

£5.00 Registered as a newspaper · ISSN 0140-6736
Founded 1823 · Published weekly

Analysis of Lancet 2015 Obesity series

- An almost exclusive *nutritional focus* in obesogenesis
- limited mention of physical activity and active living
- series authors had strong nutrition credentials

- This is not new – previous NCD prevention summary reports have shown a predilection for nutrition
- Attention to this disparity would allow a "balance" to obesity prevention discussions

Slide courtesy of Prof Adrian Bauman

Under-representation of Physical Activity in Obesity reviews: Lancet 2015

- **Solutions to obesity require consideration of:**
  - **balance between energy *expenditure* and *intake***
  - **at clinical and community levels**
- **Physical activity is one side of the energy balance equation**
- **Obesity cannot be adequately addressed by a *singular focus on nutritional aspects alone***

Slide courtesy of Prof Adrian Bauman

Curbing the Diabetes Pandemic: The Need for Global Policy Solutions

Hu FB et al. *JAMA* June 16, 2015

- **Examples of Policy Strategies for Obesity and Diabetes Prevention**
  - **Food, Nutrition, Agricultural, and Public Policies—10 recommendations**
  - **Physical Activity Policies—4 recommendations**

Trends in Intake of Energy and Macronutrients in U.S. Adults from 1999-2000 through 2007-2008

- There were no statistically significant linear increases or decreases of total energy intake over this period
- In both women and men over this period
  - Average carbohydrate intake decreased
  - Average fat intake did not change
  - Average protein intake increased

NCHS Data Brief. No.49, November 2010

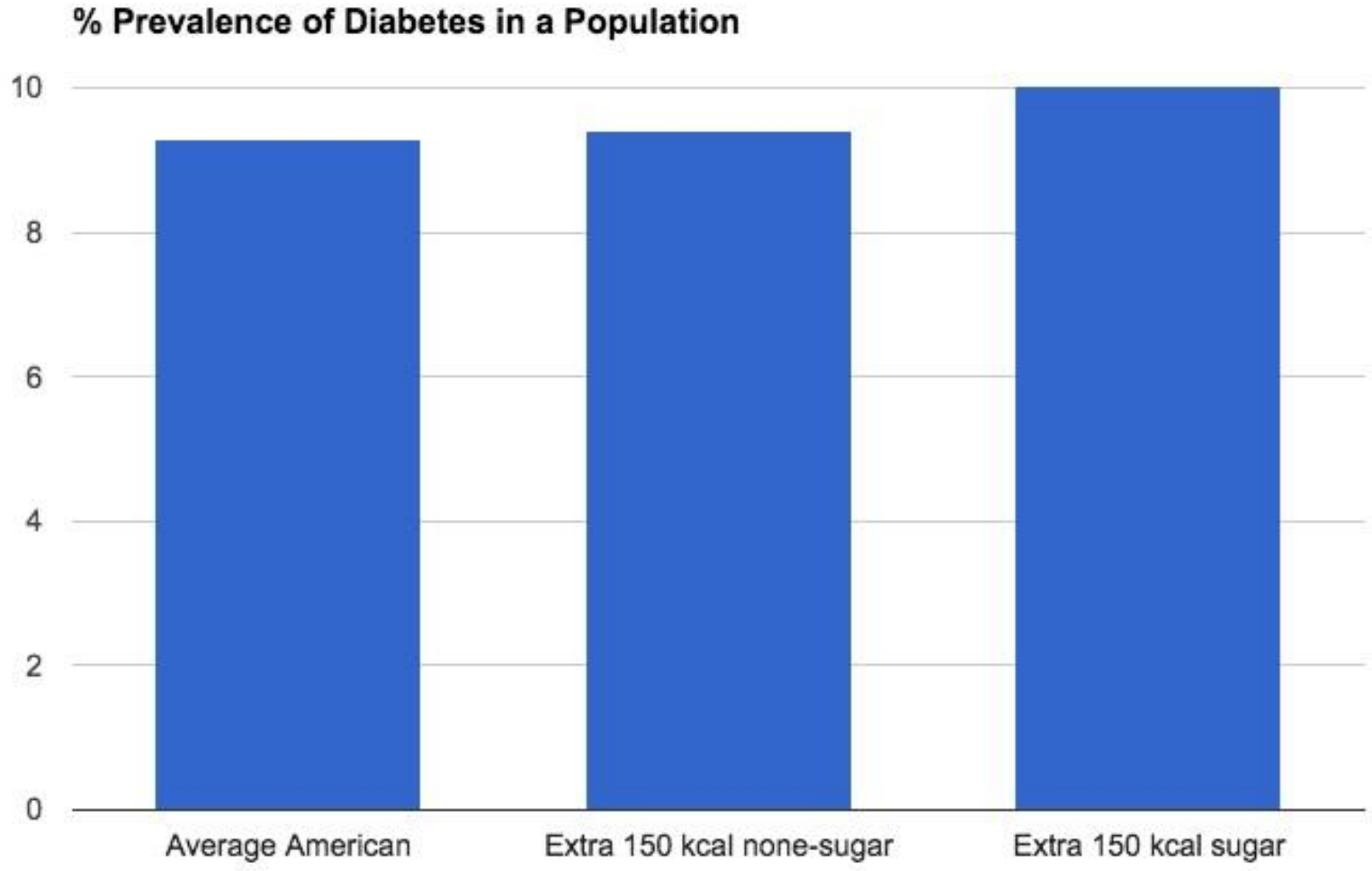
Is sugar the new tobacco, and is it the cause of all the world's problems?

It is time to bust the myth of physical inactivity and obesity: you cannot outrun a bad diet

Molhatra A et al. *BJSM* 2015

- **"A large econometric analysis of worldwide sugar availability, revealed that for every excess 150 calories of sugar, there was an 11-fold increase in the prevalence of type 2 diabetes, in comparison to an identical 150 calories obtained from fat or protein."**

Basu S et al. Population-Level The Relationship of Sugar to Diabetes Prevalence: An Econometric Analysis of Repeated Cross-Sectional Data. PLOS One 2013



Basu, Sanjay et al. "The Relationship of Sugar to Population-Level Diabetes Prevalence: An Econometric Analysis of Repeated Cross-Sectional Data." Ed. Bridget Wagner. PLoS ONE 8.2 (2013): e57873. PMC. Web. 25 Apr. 2015.

Sugar Intake and Health: A Need for a Comprehensive Review of the Science

Carden TJ, Carr TP. Food availability of glucose and fat, but not fructose, increased in the US between 1970 and 2009: analysis of the USDA food availability data system. *Nutr J, 2013;* 12:130-7.

These data suggest that total fructose availability in the US did not increase between 1970 and 2009 and, thus, was unlikely to have been a unique causal factor in the increased obesity prevalence.

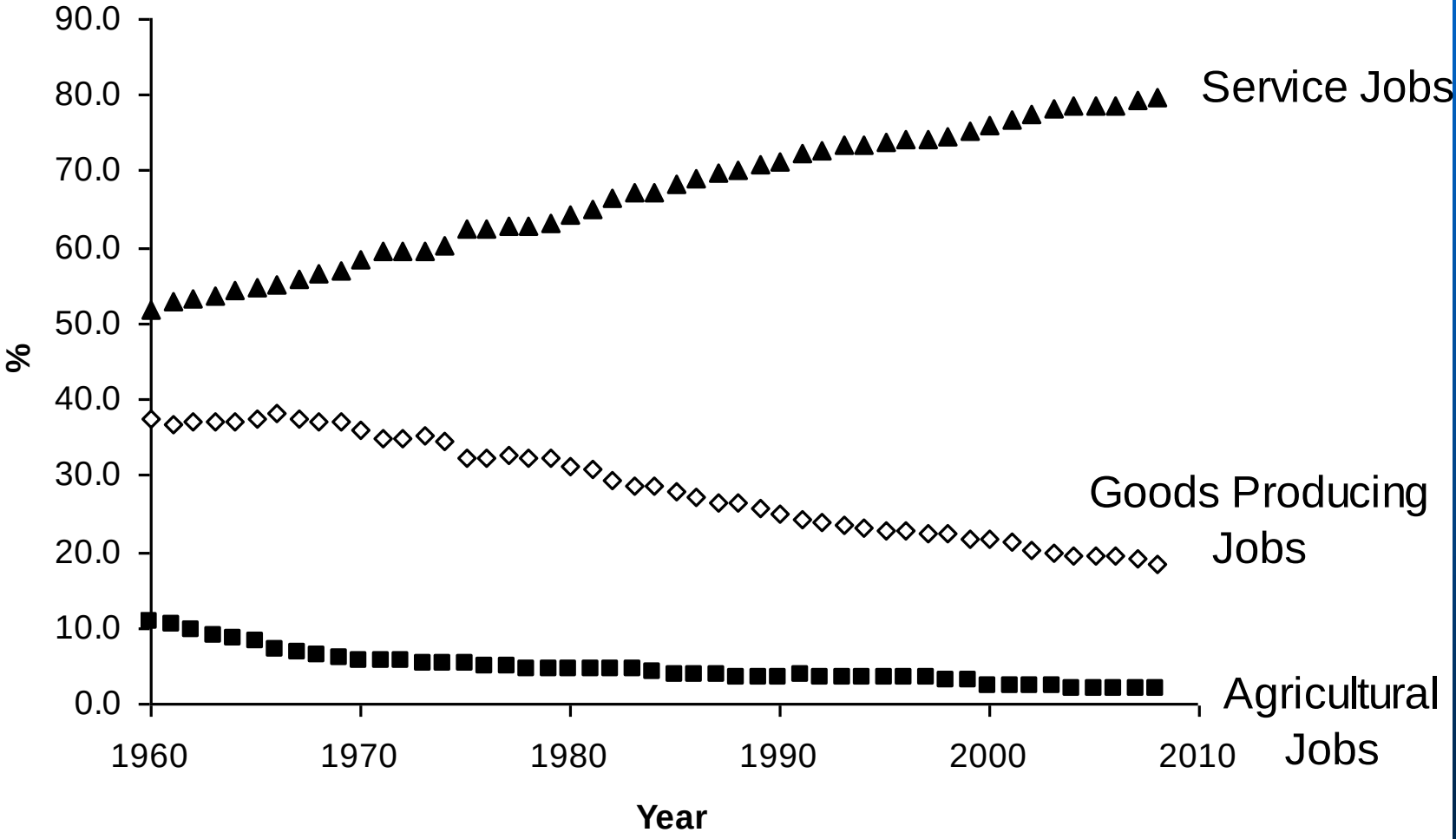
It is time to bust the myth of physical inactivity and obesity: you cannot outrun a bad diet

Molhatra A et al. *BJSM* 2015

- **"In the past 30 years, as obesity has rocketed, there has been little change in physical activity levels in the Western population.[2] This places the blame for our expanding waist lines directly on the type and amount of calories consumed."**

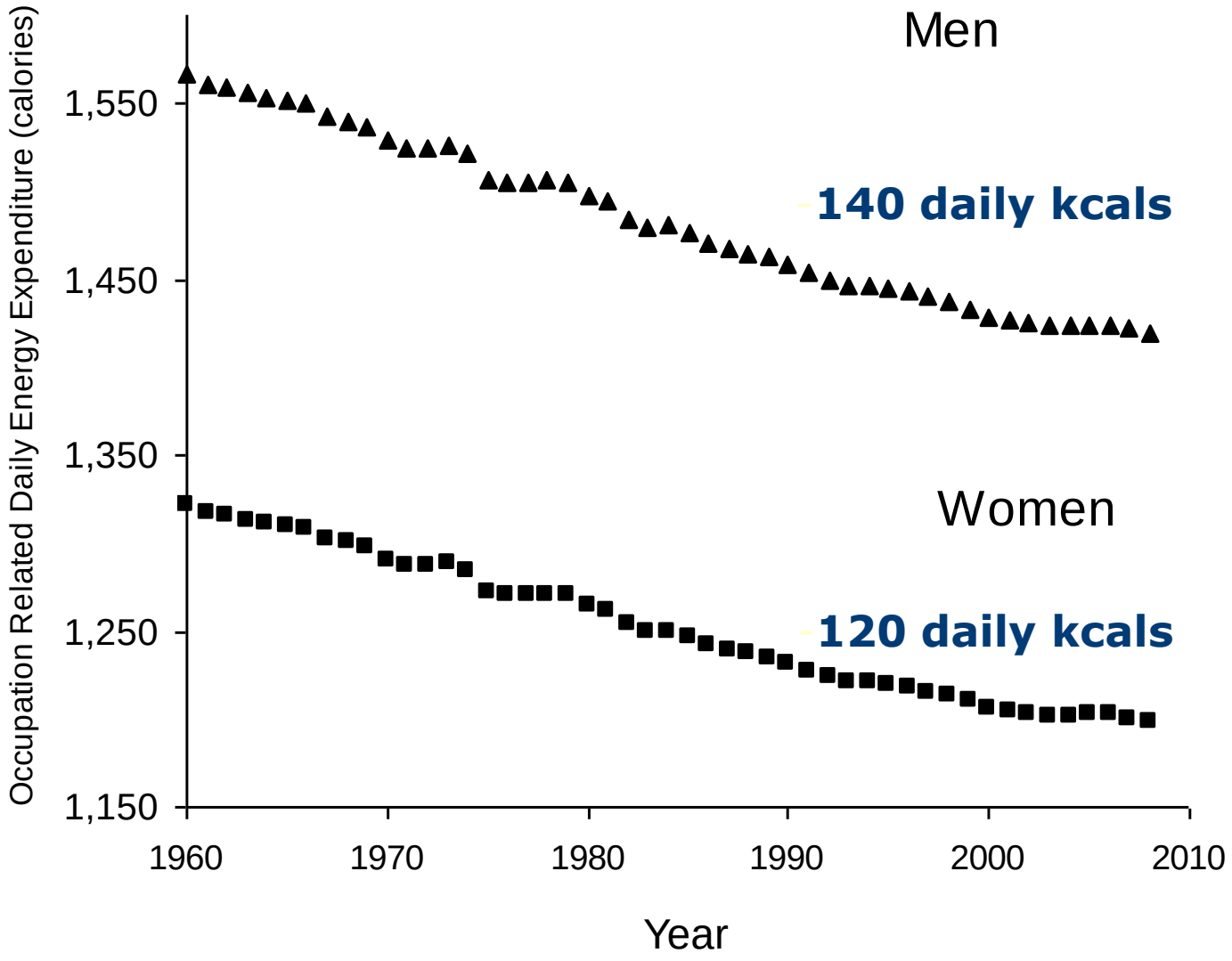
We have spent decades engineering human energy expenditure out of daily life.

Jobs in U.S. Over Last 50 Years



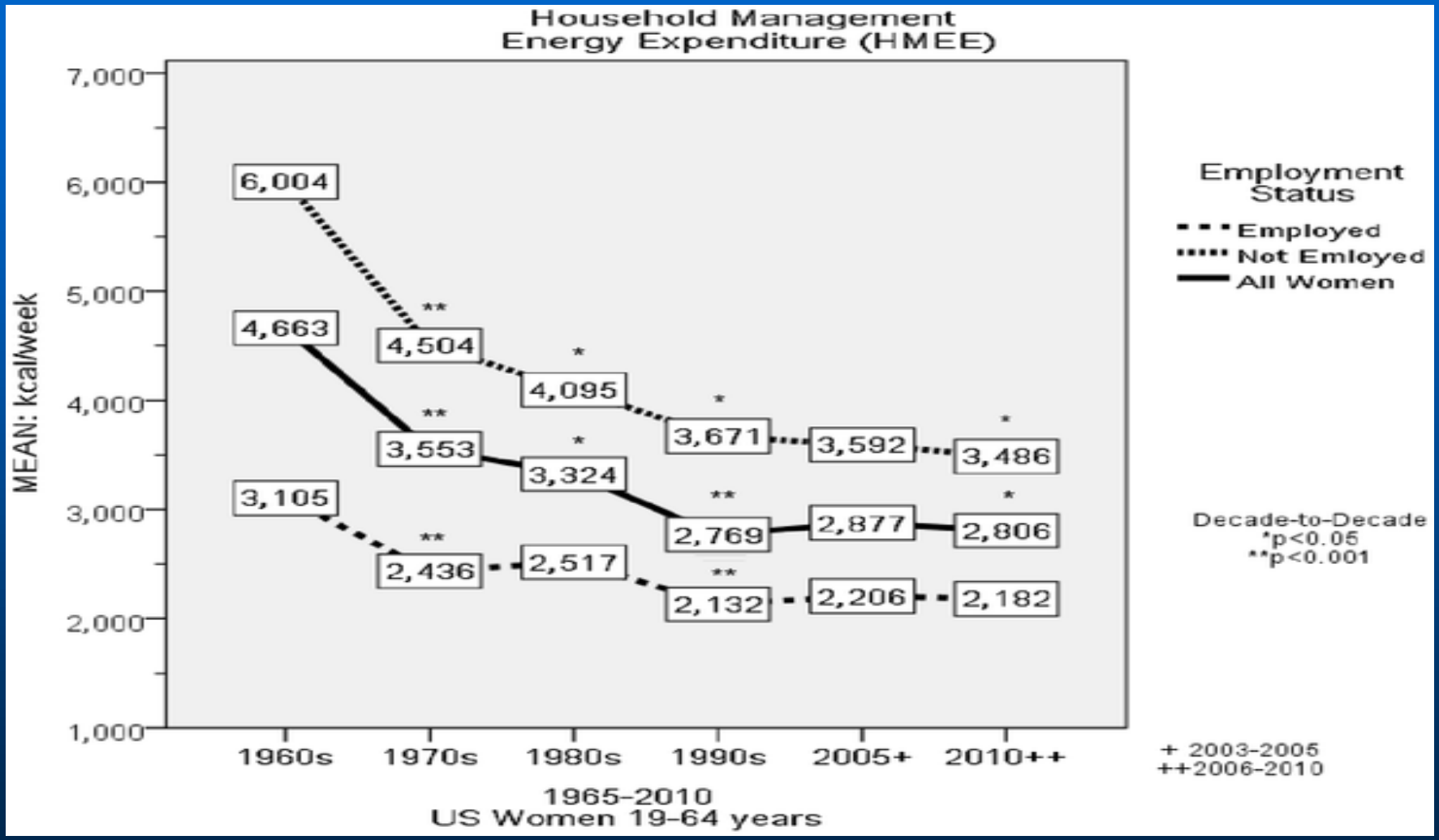
Church TS et al. PLoS 2011

Daily Occupational Caloric Expenditure



Church TS et al. PLoS 2011

Household Management Energy Expenditure/Week



Archer E, Shook RP, Thomas DM, Church TS, et al. (2013) 45-Year Trends in Women's Use of Time and Household Management Energy Expenditure. PLoS ONE 8(2): e56620. doi:10.1371/journal.pone.0056620

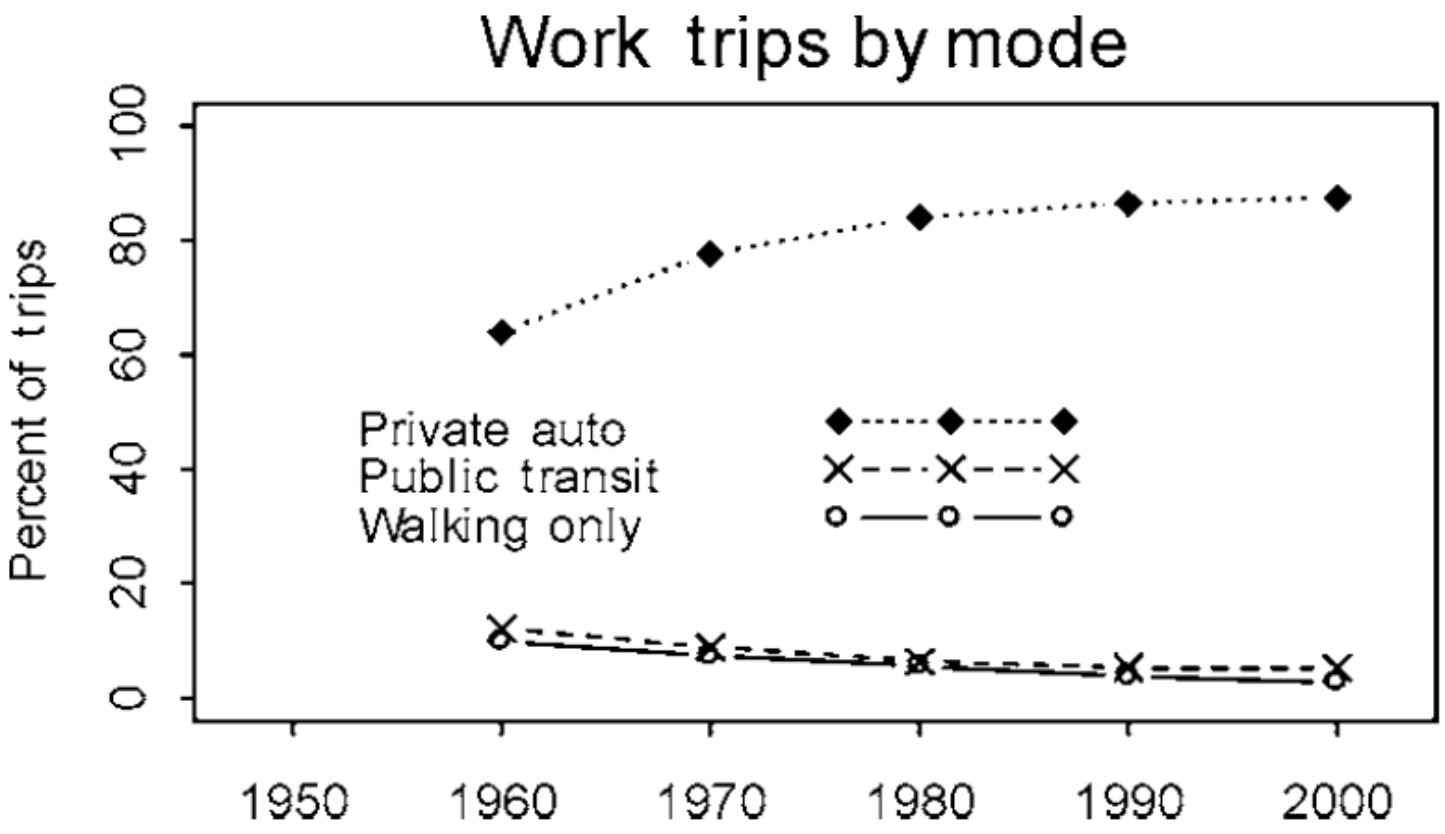


Figure 5 Trends in transportation activity and automobile dependence, 1950–2000.

Brownson, R. C., Boehmer, T. K., & Luke, D. A. (2005). Declining rates of physical activity in the United States: what are the contributors? ***Annual Review of Public Health, 26, 421-443. doi: 10.1146/annurev.publhealth.26.021304.144437***

Slide courtesy of Robin Shook

We have spent decades engineering human energy expenditure out of daily life, and we need to develop creative ways to reverse this trend.

U.S. National Physical Activity Plan

www.physicalactivityplan.org

Sectors

- Mass Media
- Public Health
- Education
- Healthcare
- Volunteer and Non-Profit Organizations
- Transportation, Urban Design, Comm. Plan.
- Business and Industry
- Parks, Recreation, Fitness, and Sports

Develop a Better Understanding of Energy Balance

Global Energy Balance Network

The Birth of a Global Network of Experts to Give Voice to Energy Balance

Disclosures: GEBN has received support from private philanthropy, the University of Colorado, the University of South Carolina, the University of Copenhagen, and an unrestricted education gift from The Coca Cola Company.

GEBN believes that finding workable solutions to correcting energy imbalance will be achieved faster by working with all sectors of society. GEBN seeks support to continue our efforts from both the public and private sectors.

Global Energy Balance Network

Vision:

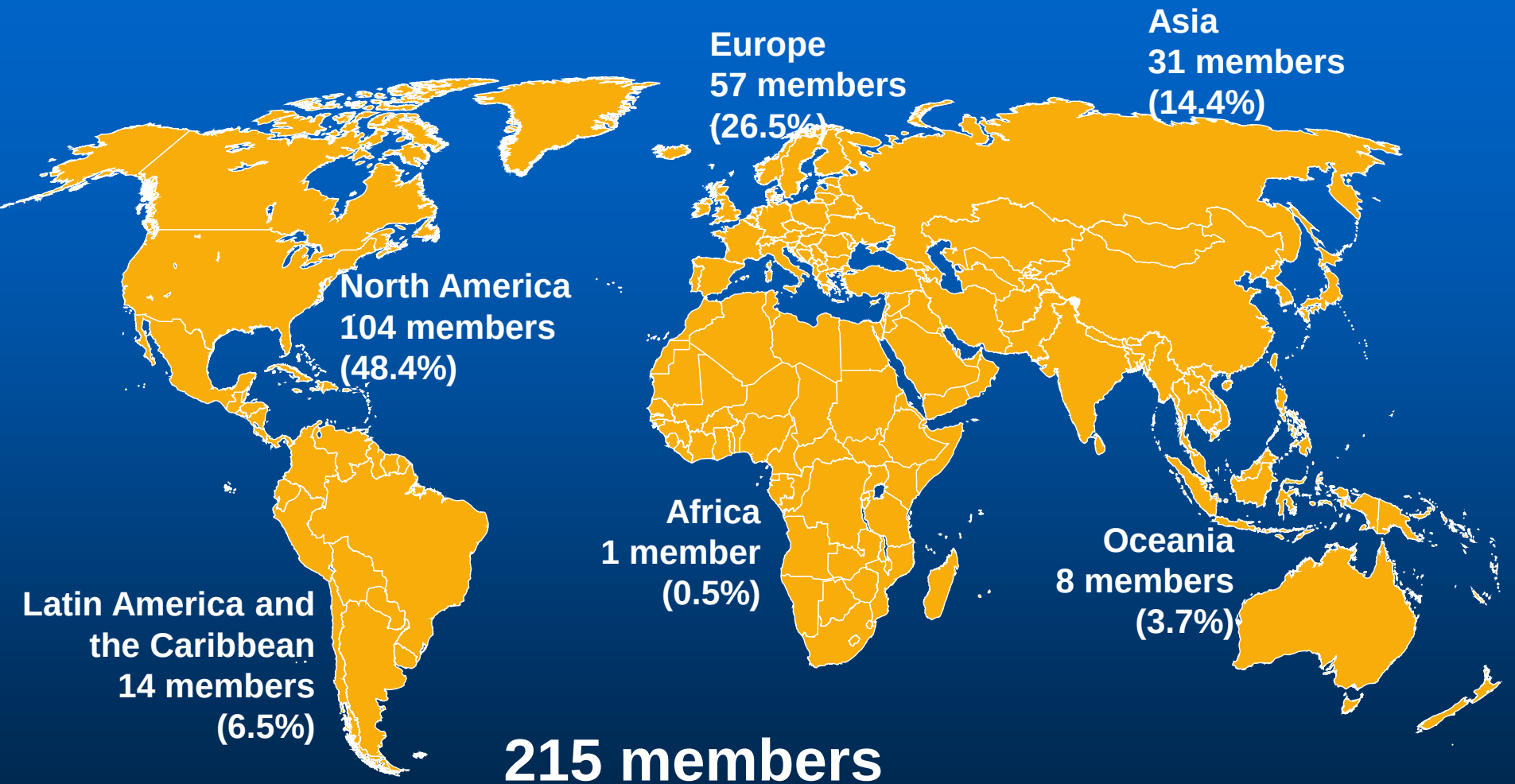
A World in Healthy Energy Balance

Mission:

To connect and engage multi-disciplinary scientists and other experts around the globe dedicated to applying and advancing the science of energy balance to achieve healthier living.

WEBSITE (WWW.GEBN.ORG)

Membership Development—Members



215 members

How to Stay in Energy Balance

THANK YOU FOR YOUR ATTENTION

THE ENERGY BALANCE RESEARCH TEAM