

Physical Activity: Cancer Risk and Prognosis

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Physical Activity and Cancer: What do we know?



Presentation Outline

- ❖ Physical Activity and Cancer Risk
- ❖ Mechanisms
- ❖ Physical Activity and Cancer Prognosis
- ❖ Quality of Life in Cancer Patients
- ❖ Interventions – focus on mechanisms
- ❖ Physical Activity Guidance

Physical Activity and Cancer: Status of the Evidence

- ❖ Increasing epidemiologic research on cancer risk
 - IARC report -- *Weight control, physical activity and cancer* -- <http://www.iarc.fr/>
- ❖ Mechanisms: Clinical metabolic and basic research largely examining aerobic exercise
- ❖ Extensive research on physical activity and quality of life
- ❖ Rapidly growing research on physical activity and cancer prognosis
- ❖ Clinical trial evidence: small trials examining mechanisms; No trials on cancer incidence or prognosis
 - Focus shifting from single behavior to combined interventions

Physical Activity & Cancer: Decreased Risk

Cancer	Number of Studies	Decrease risk	Countries involved
Colorectal	50	Yes	N Amer, Eu, Asia, Aus, NZ
Breast	57	Yes	N Amer, Eu, Asia, Aus
Prostate	36	No	N Amer, Eu, Asia
Endometrial	15	Yes	N Amer, Eu, Asia
Lung	21	Yes	US, Eu

Source: I-Min Lee, Cancer Epid Prev, 2006

Physical Activity & Cancer: Inconclusive

Cancer	Number of Studies
Ovarian	8
Testicular	9
Pancreatic	8
Kidney	10
Bladder	6
Hematopoetic	4

Source: I-Min Lee, Cancer Epid Prev, 2006

Physical Activity and Cancer

- ❖ May be a surrogate measure of
 - BMI or adiposity
 - Other health behaviors that may influence risk
 - Tobacco use
 - Alcohol
 - Use of screening

Physical Activity – Sources of Bias

- ❖ **Most studies rely on self report**
 - Commonly overestimate amount of physical activity
 - Few studies use comprehensive measures of physical activity
 - Early studies focused on activities more commonly done by men than by women
- ❖ **Biases are likely to result in underestimation of risk**

Physical Activity and Colon Cancer

❖ Associations vary for colon and rectal cancer

- Median RR for colon of 0.7 (0.6 for Ca/Co and 0.8 for Cohort)
- Data in consistent for rectal with most showing no association

❖ Associations may vary by

- Location of colon cancer
- BMI
- Diet

Interaction of BMI and Physical Activity Colon Cancer

MEN			High Activity	Low Activity
	BMI	Low (<23)	1.0	1.7 (0.7-4.2)
		High (>30)	1.9 (1.1-3.5)	3.6 (2.0-6.8)
WOMEN				
ES+	BMI	Low (<23)	1.0	1.0 (0.4-2.5)
		High (>30)	1.9 (0.9-6.8)	3.2 (1.5-7.0)
ES-	BMI	Low (<23)	1.0	1.1 (0.5-2.2)
		High (>30)	0.6 (0.3-1.2)	1.3 (0.7-2.4)

Physical Activity, Menopause and Breast Cancer Risk

Risk Association

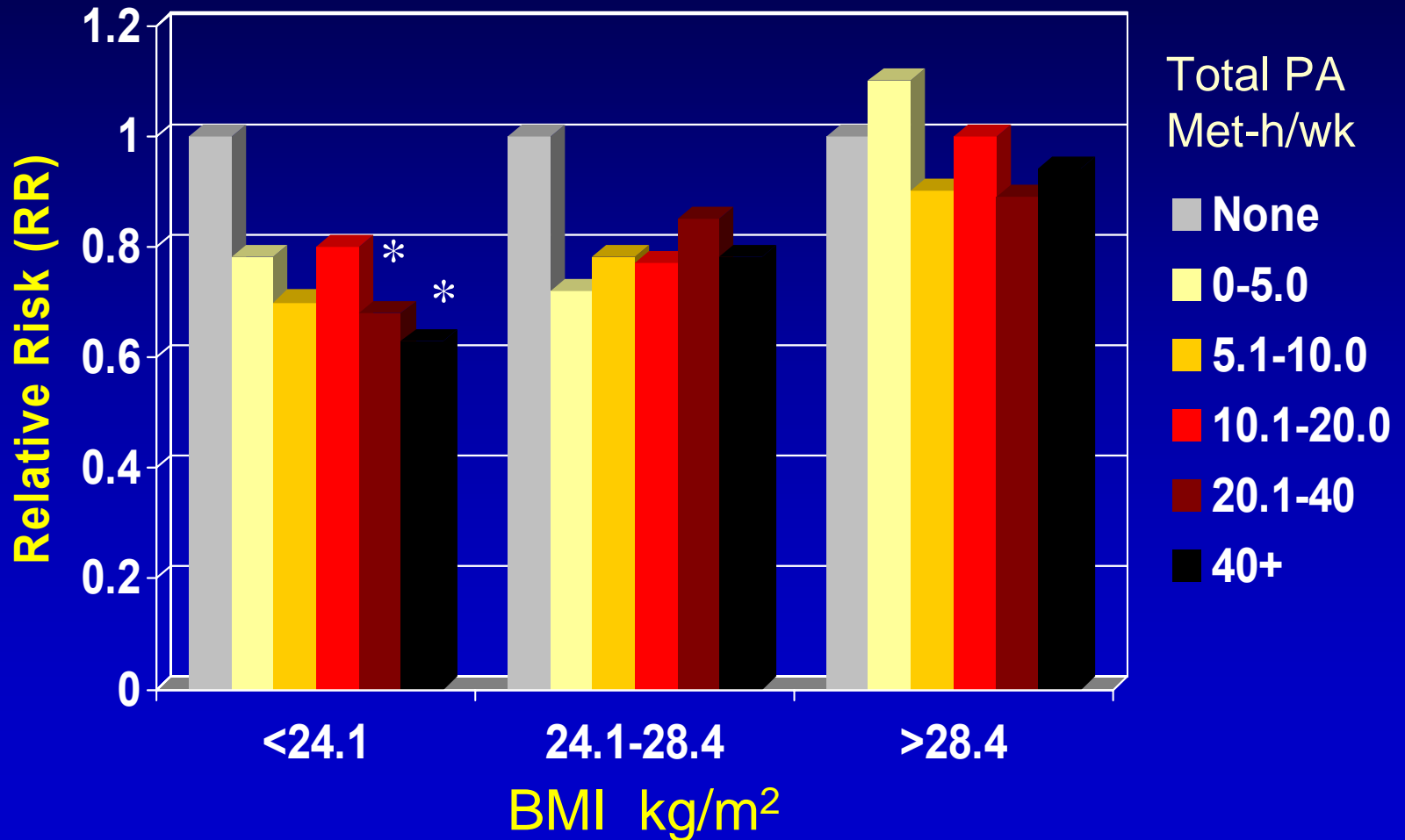
Study Design	Decrease Total (sig ¹)	No effect Total	Increase Total
Pre- & Postmenopausal			
Pre	17 (4)	3	0
Post	17 (9)	3	0
Pre-Only	13 (7)	12	1
Post-Only	22 (16)	5	0

¹number of studies that reached statistical significance

Source: Friedenreich, Exerc Sport Sci Rev, 32(4), 2004.180-184

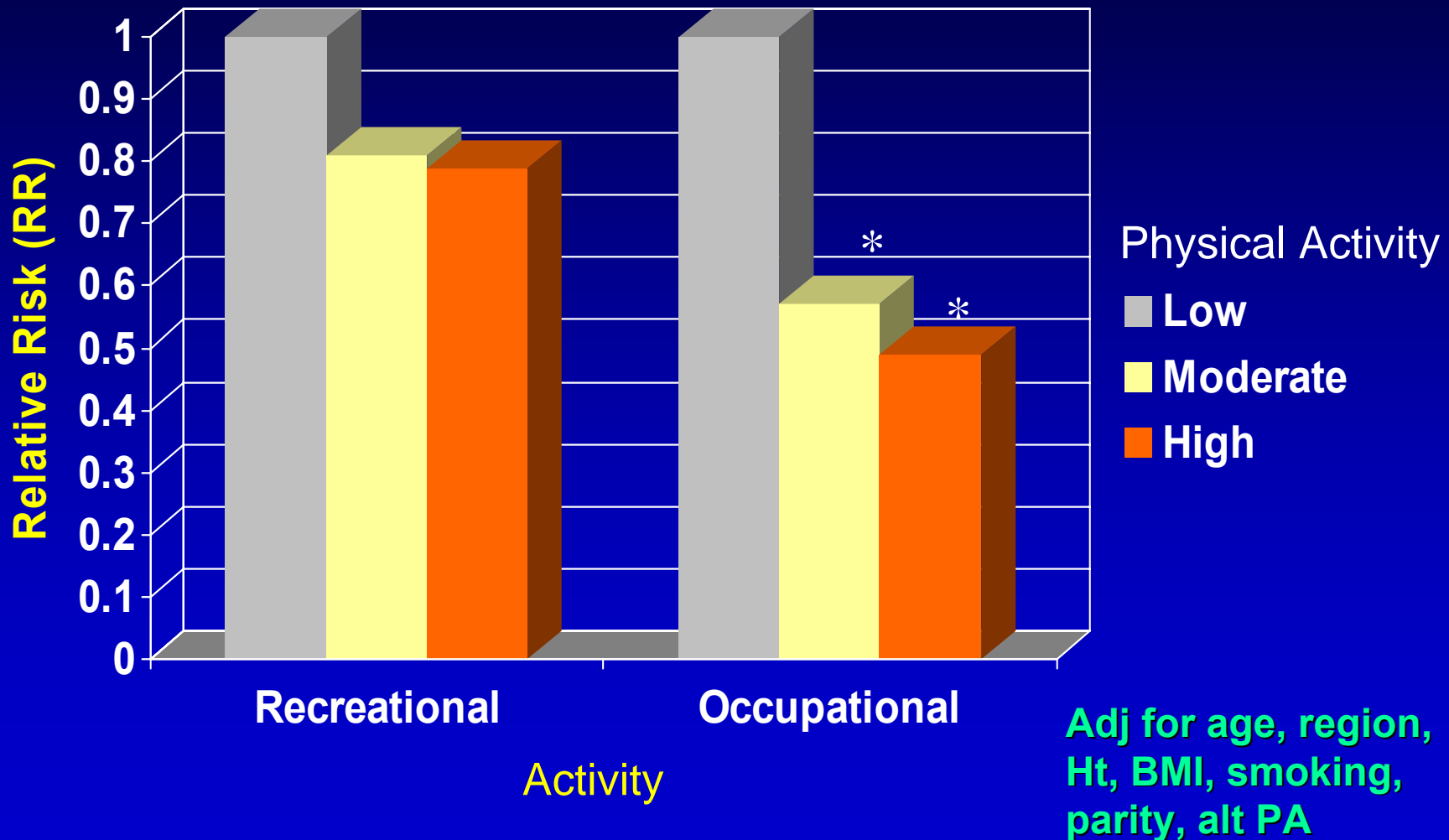
Physical Activity and BMI

Postmenopausal Breast Cancer



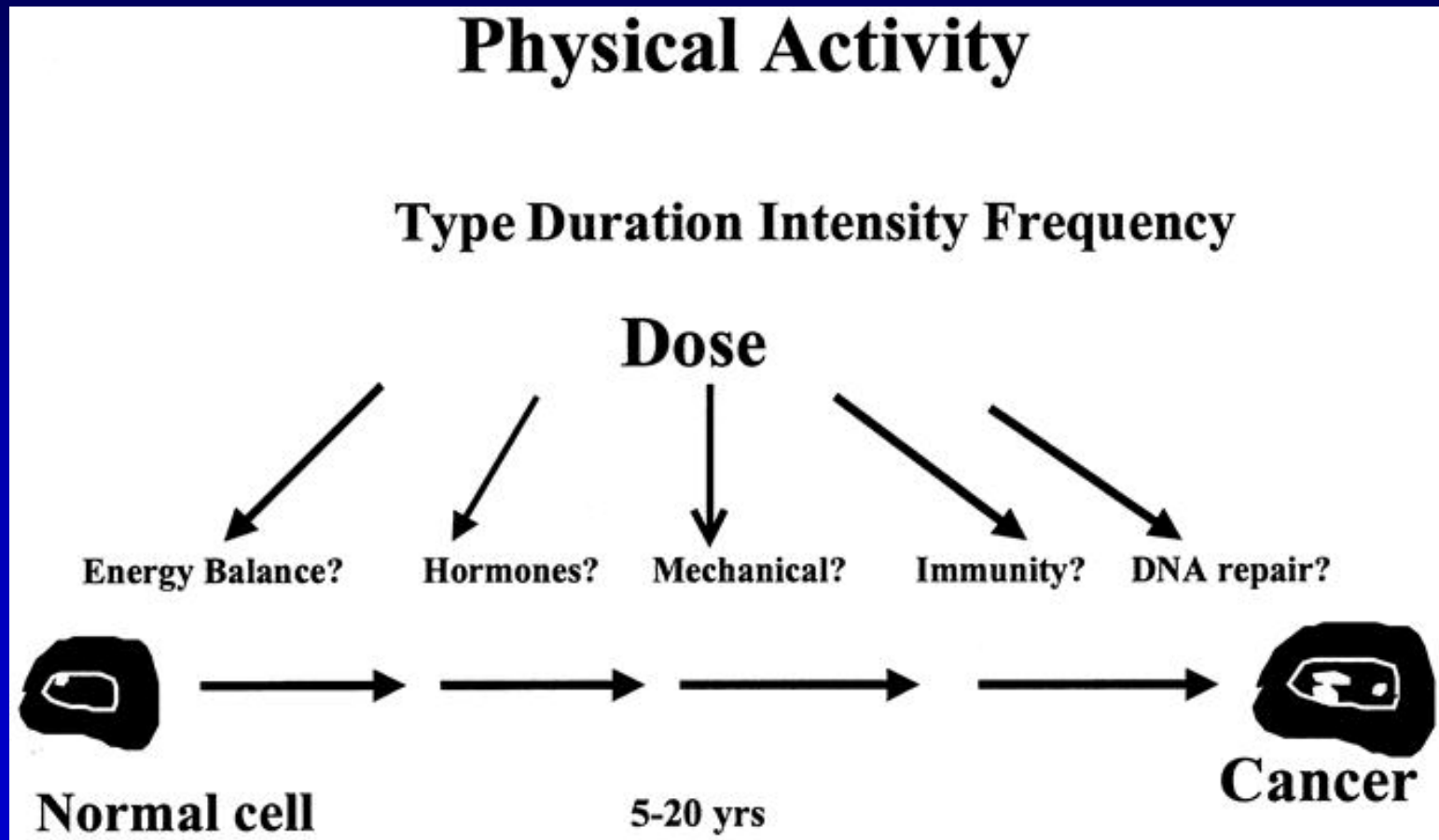
Source: McTiernan, JAMA 2003: 290:1331-1336; WHI, 74,171 women, age 50-79

Physical Activity Endometrial Cancer

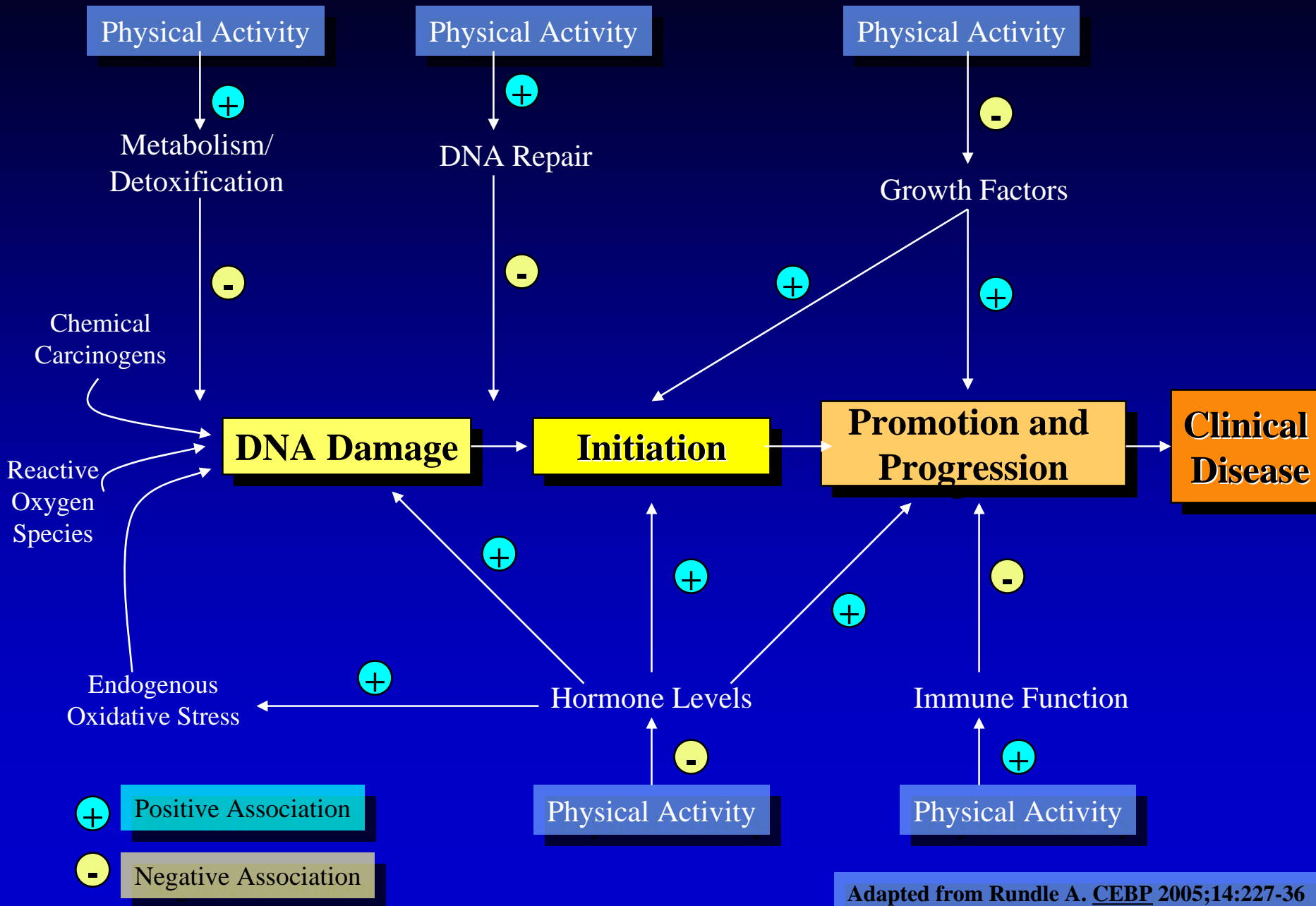


Source: Furberg and Thune Int J Cancer 2003; 104:669-676

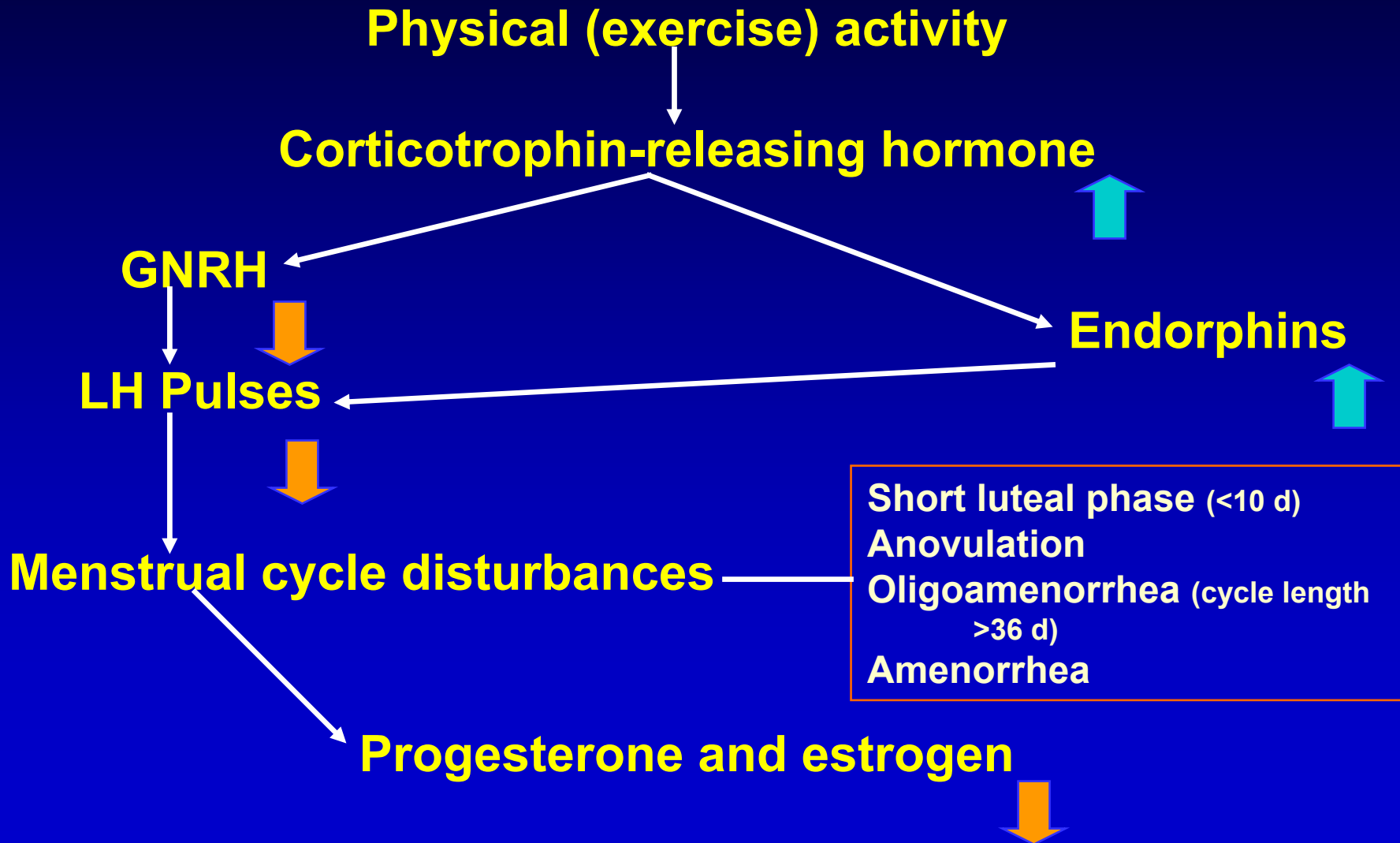
Mechanistic Questions



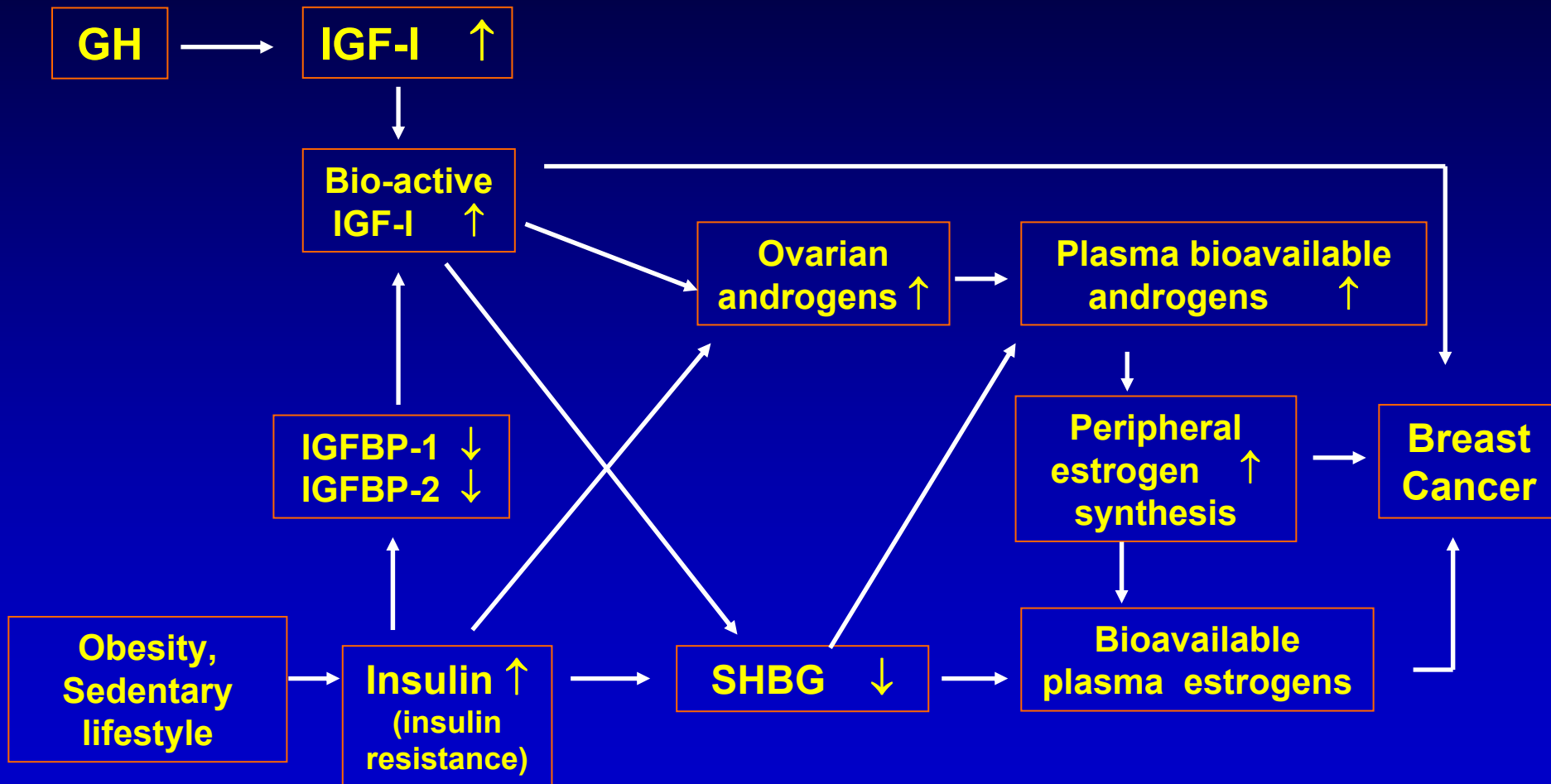
Interaction of physical activity with carcinogenesis



Menstrual Cycle Effects of Physical Activity



Insulin, IGF-I, Sex Steroids, and Breast Cancer



Physical Activity and Prognosis: Colon Cancer

	Physical Activity Category After Diagnosis, MET-h/wk					<i>P</i> trend
	<3	3-8.9	9-17.9	18-26.9	≥27	
Overall Mortality	1.00	0.85 (0.49-1.49)	0.71 (0.36-1.41)	0.71 (0.32-1.59)	0.37 (0.16-0.82)	.01
Colon Cancer DFS	1.00	0.87 (0.58-1.29)	0.90 (0.57-1.40)	0.51 (0.26-0.97)	0.55 (0.33-0.91)	.01
Colon Cancer Recurrence	1.00	0.86 (0.57-1.30)	0.89 (0.55-1.42)	0.51 (0.26-1.01)	0.60 (0.36-1.01)	.03

*Adjusted for age, screening, risk factors, stage at diagnosis, and treatment

Physical Activity and Prognosis: Breast Cancer

	Physical Activity Category After Diagnosis, MET-h/wk					<i>P</i> trend
	<3 (n=959)	3-8.9 (n=862)	9-14.9 (n=335)	15-23.9 (n=428)	≥24 (n=403)	
Total Deaths	1.00	0.71 (0.56-0.89)	0.59 (0.41-0.84)	0.56 (0.41-0.77)	0.65 (0.48-0.88)	.003
Breast Cancer Deaths	1.00	0.80 (0.60-1.06)	0.50 (0.31-0.82)	0.56 (0.38-0.84)	0.60 (0.40-0.89)	.004
Recurrence	1.00	0.83 (0.64-1.08)	0.57 (0.38-0.85)	0.66 (0.47-0.93)	0.74 (0.53-1.04)	.05

*Adjusted for age, screening, risk factors, and treatment

WHEL: Diet and Exercise and Breast Cancer Prognosis

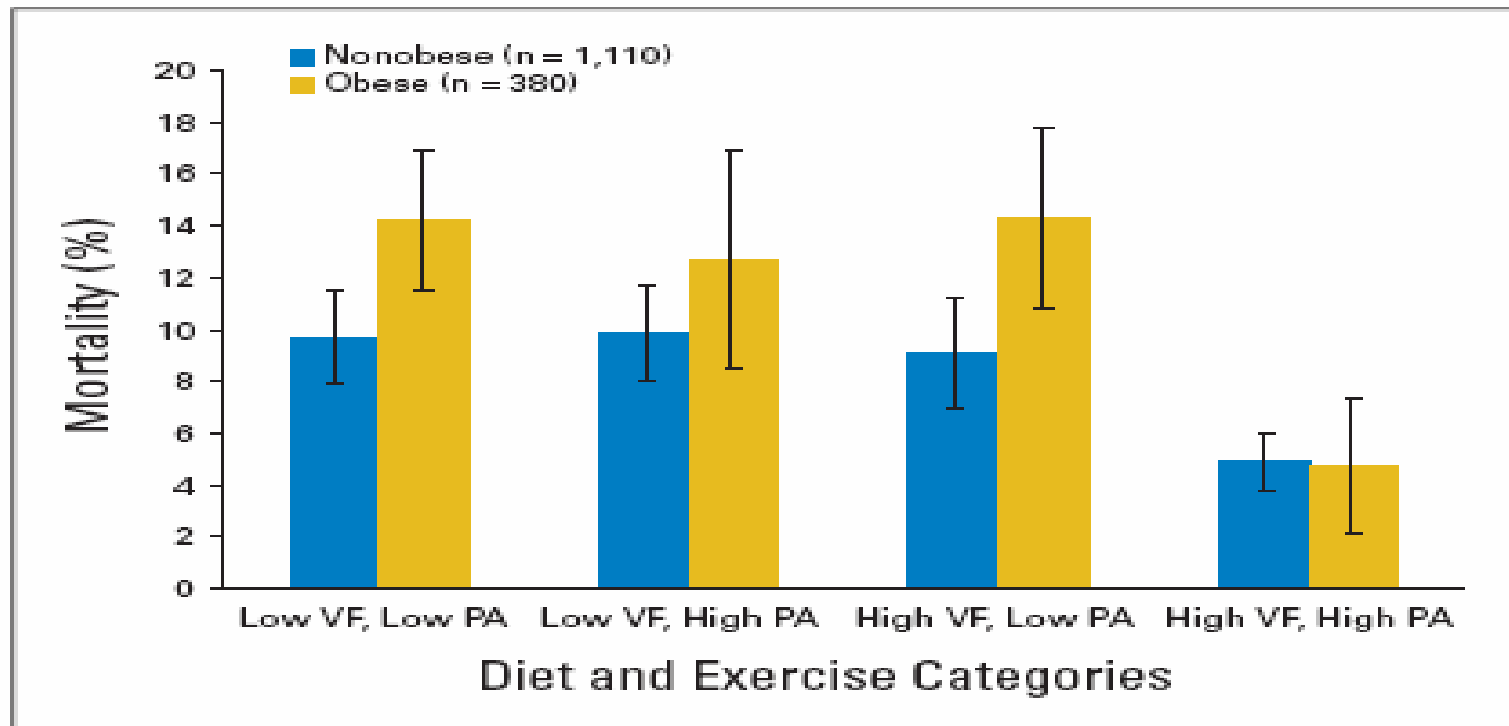
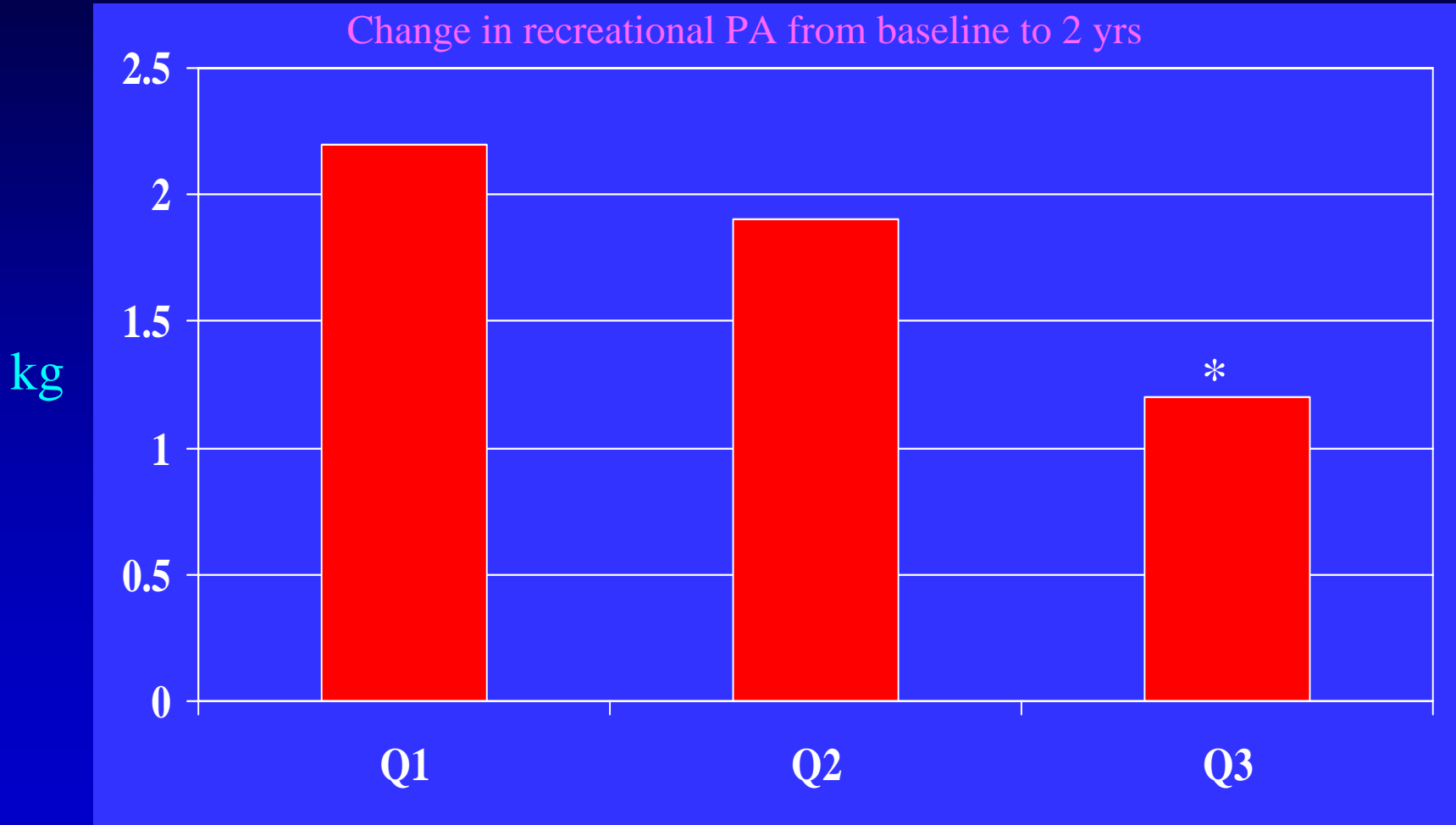


Fig 2. Mortality by diet and physical activity (PA) in Women's Healthy Eating and Living Study comparison group: body mass index (BMI) categories. Bars show proportion (SE) for all-cause mortality by baseline BMI category. Low vegetables-fruits (VF), less than 5 servings/d; high VF, \geq 5 servings/d; low PA, less than 540 metabolic equivalent task (MET)-min/wk; high PA, \geq 540 MET-min/wk. BMI was calculated as weight in kilograms/height in square meters.

Weight Change from 6 months to 2 yrs post Dx Women with Postmenopausal Breast Cancer

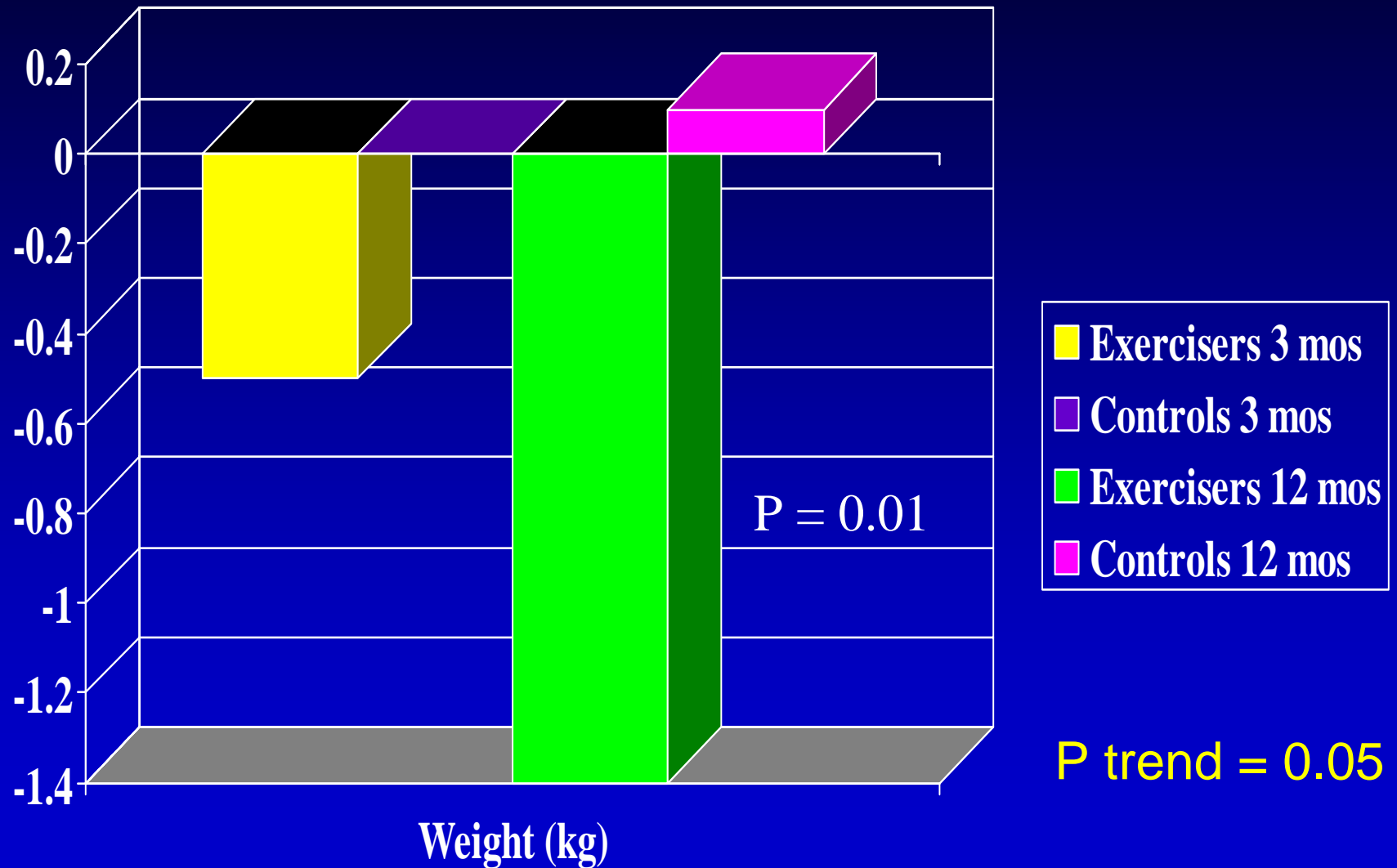


Adjusted for demographics, family hx cancer, stage, treatment, tamoxifen, baseline weight, smoking status

Physical Activity Interventions

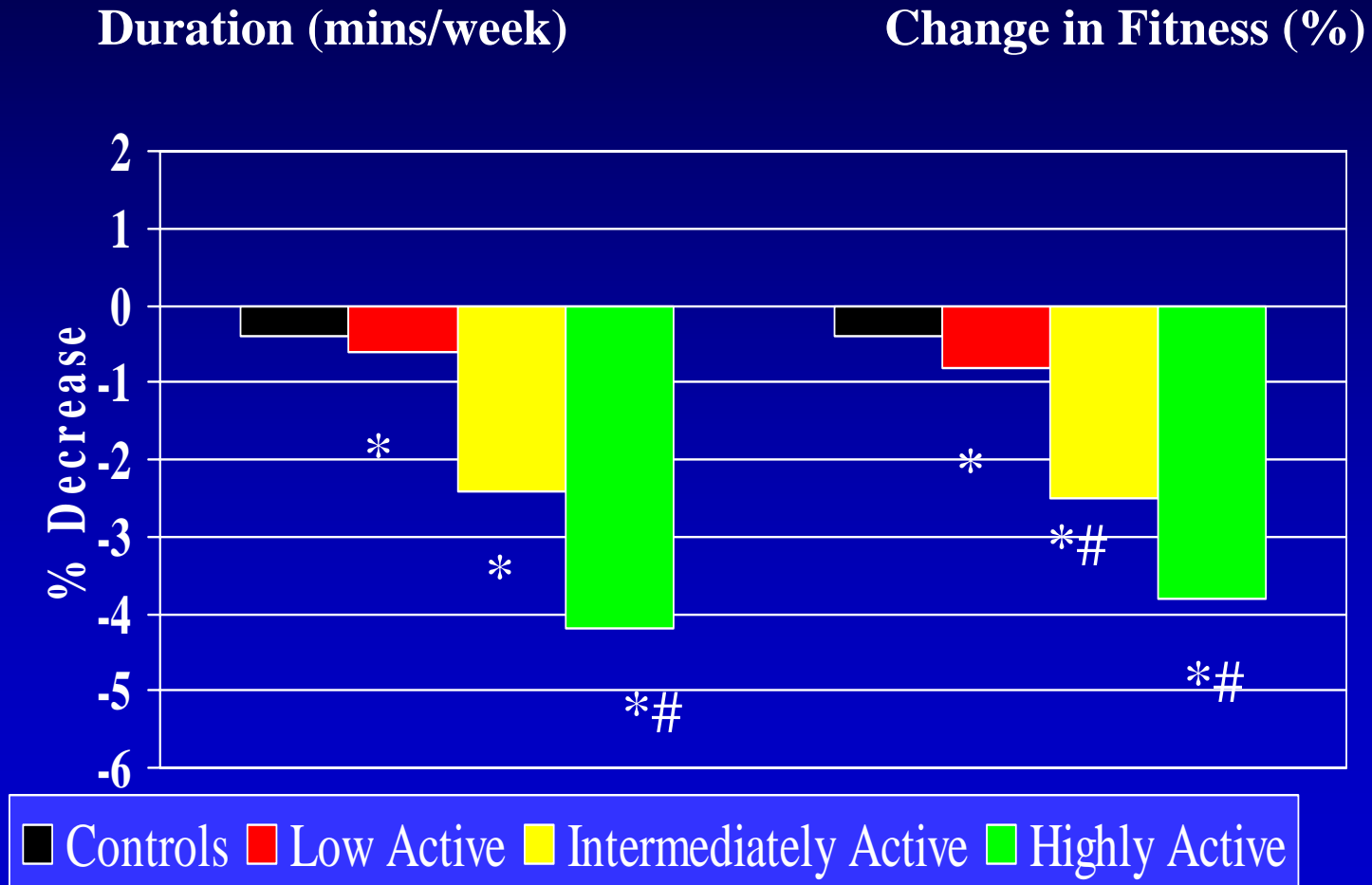
- ❖ Most designed to examine possible mechanisms with focus on sex steroids
- ❖ One example
 - Year long exercise intervention in 173 sedentary, overweight postmenopausal women
 - Moderate intensity program
 - 45 minutes of walking/day for 5+ days/week; strength training recommended but not required
 - 3 month supervised; 9 months at home
 - Allowed weight loss
 - Examined effects on sex steroids and body fat

Change in Weight from Baseline to 3 and 12 Months



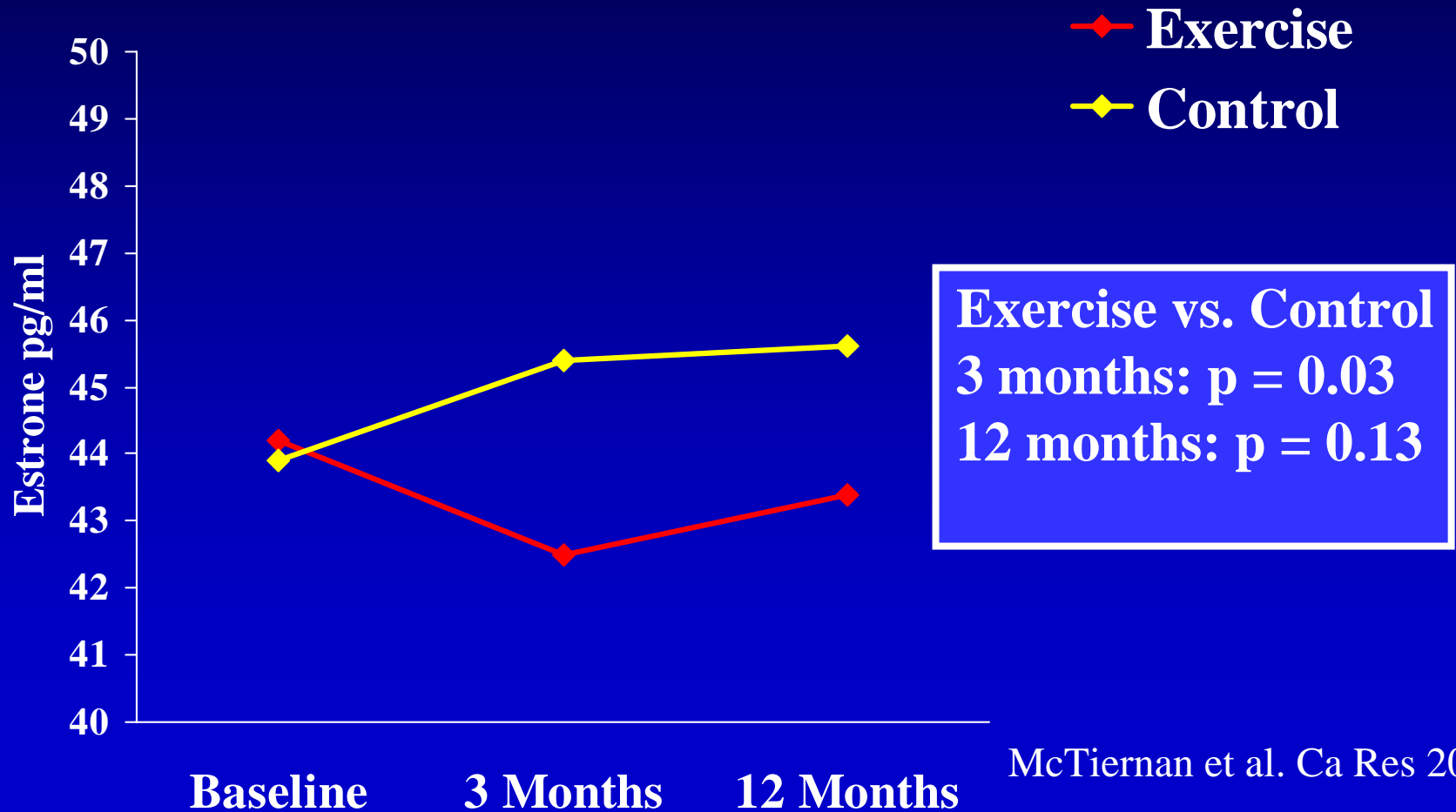
Source: Irwin et al. JAMA 2003;289:323-330.

% Change in Body Fat from Baseline to 12 Months by Duration and Fitness

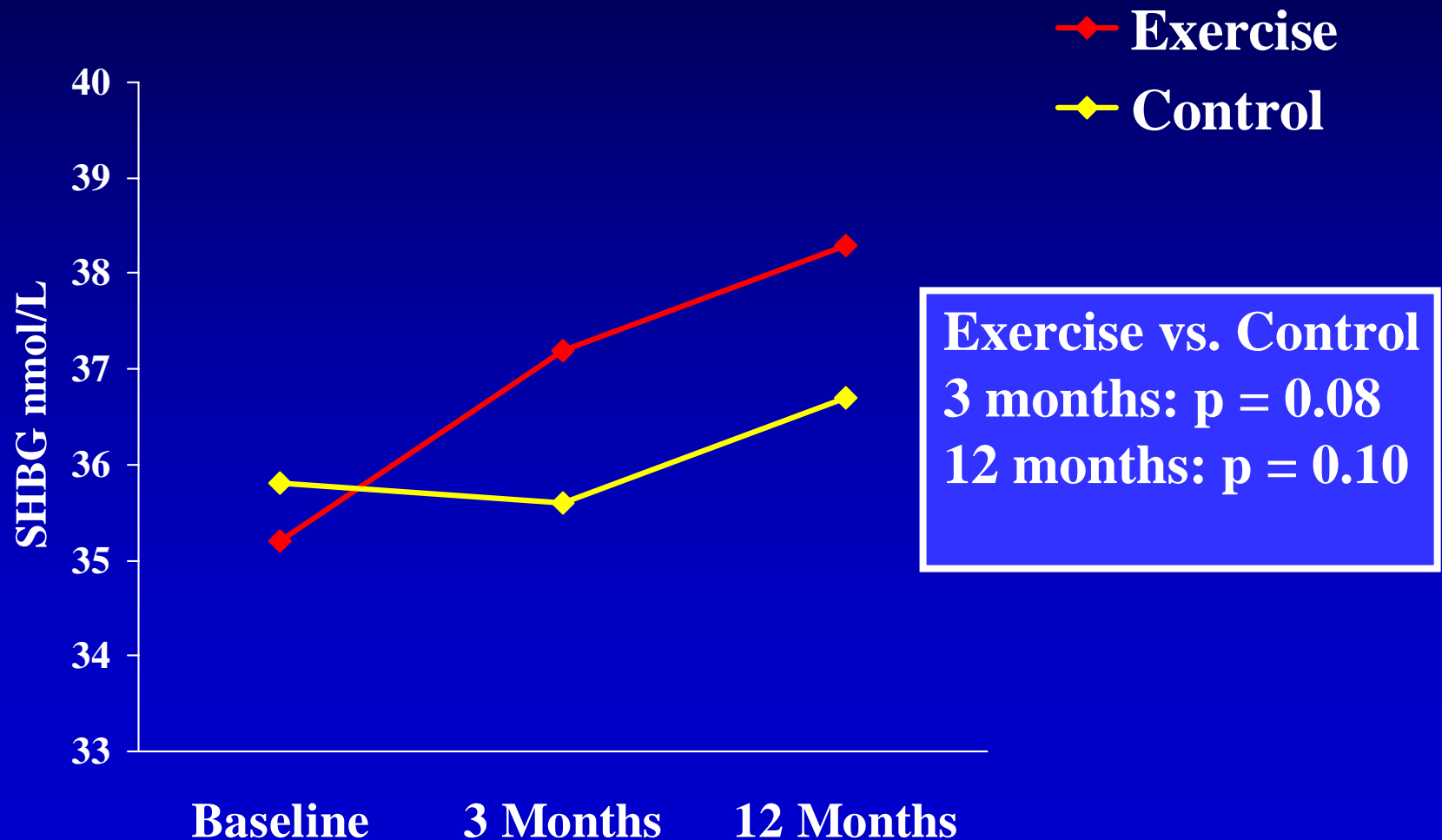


* Compared w/controls $p < 0.05$; # compared w/low active, $p < 0.05$

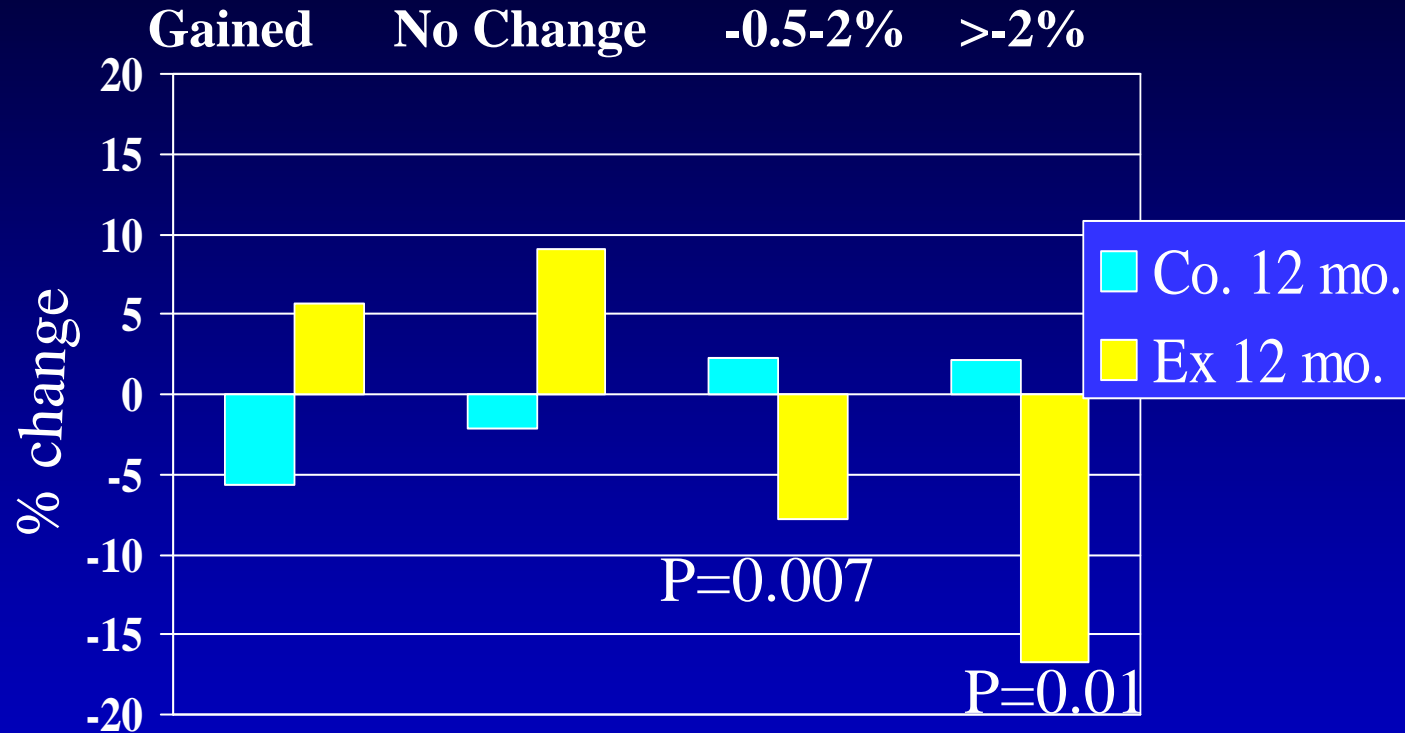
Estrone



Sex Hormone Binding Globulin



% Change in Free E2 by % Fat Change



PA and Cancer Patients: QOL

- ❖ Extensive area of research with both observational and interventions
- ❖ Most studies have focused on women with breast cancer receiving adjuvant therapy (chemo or radiotherapy)
- ❖ Evidence suggests activity is
 - Safe and feasible during initial treatment
 - Results in significant improvement in cardiorespiratory fitness, physical functioning, fatigue, lymphedema, QOL
 - Nonsignificant changes in body weight
 - May help counter osteopenia and sarcopenia that may occur with some cancer chemotherapies

Guidance: Physical Activity and Cancer Risk

- ❖ **Standard Guidance: “Accumulate 60 minutes or more of moderate intensity physical activity most days”**
 - 60-90 minutes/day for children
 - Perhaps one hour/day for cancer protection effect
 - Physical Activity Guidelines are now in development with several cancer experts included in the committee
- ❖ **Questions**
 - Type: aerobic, strength training, flexibility
 - Intensity/duration: exhaustive training -- immune function
 - Timing in life

Guidance: Physical Activity and Cancer Prognosis

❖ Guidance in development: ACSM, ACS

- 30-60 minutes/day at least 5 days/week
- Clear benefits in managing co-morbid conditions of heart disease, diabetes mellitus, hypertension, obesity

❖ ACS Dec 2006 Physical Activity Guidance

- Areas for caution
 - Potential cardiac effects with cardiotoxic chemotherapy (adriamycin)
 - If severe anemia, postpone until it is resolved
 - If immuno-compromised avoid public gyms and pools until WBCs improve and for 1 year post bone marrow transplant
 - Avoid chlorine and water if irradiated skin or indwelling catheter
 - Peripheral neuropathy or ataxia may influence type of activity selected

NCI Initiatives relevant to Physical Activity

❖ RFAs:

- TREC – Transdisciplinary Research on Energetics and Cancer
- Bioengineering Approaches for Prevention and Treatment of Overweight and Obesity
- Mechanisms of Physical Activity Behavior Change

❖ Program Announcements:

- Economics of Diet, Activity, and Energy Balance
- Improving Diet and Physical Activity Assessment
- Long-term cancer survivors
- Studies of Energy Balance and Cancer in Humans

❖ Workshops and other efforts

- Real Time Capture of Physical Activity and Diet
- Development of policy research resources
- 2009 International Conference on Diet and Activity Methods
- Incorporation of objective measures of physical activity to NHANES
- Enhanced measures of physical activity in national and regional monitoring systems

END