

***The relationship between
Physical Activity and Mental Health:
Capitalizing on it for Cardiac Patients***

Dr. George Kaoukis

**Assistant Professor,
Faculty of Medicine
University of Manitoba
Director,
Cardiac Psychology Clinic
St. Boniface General Hospital**

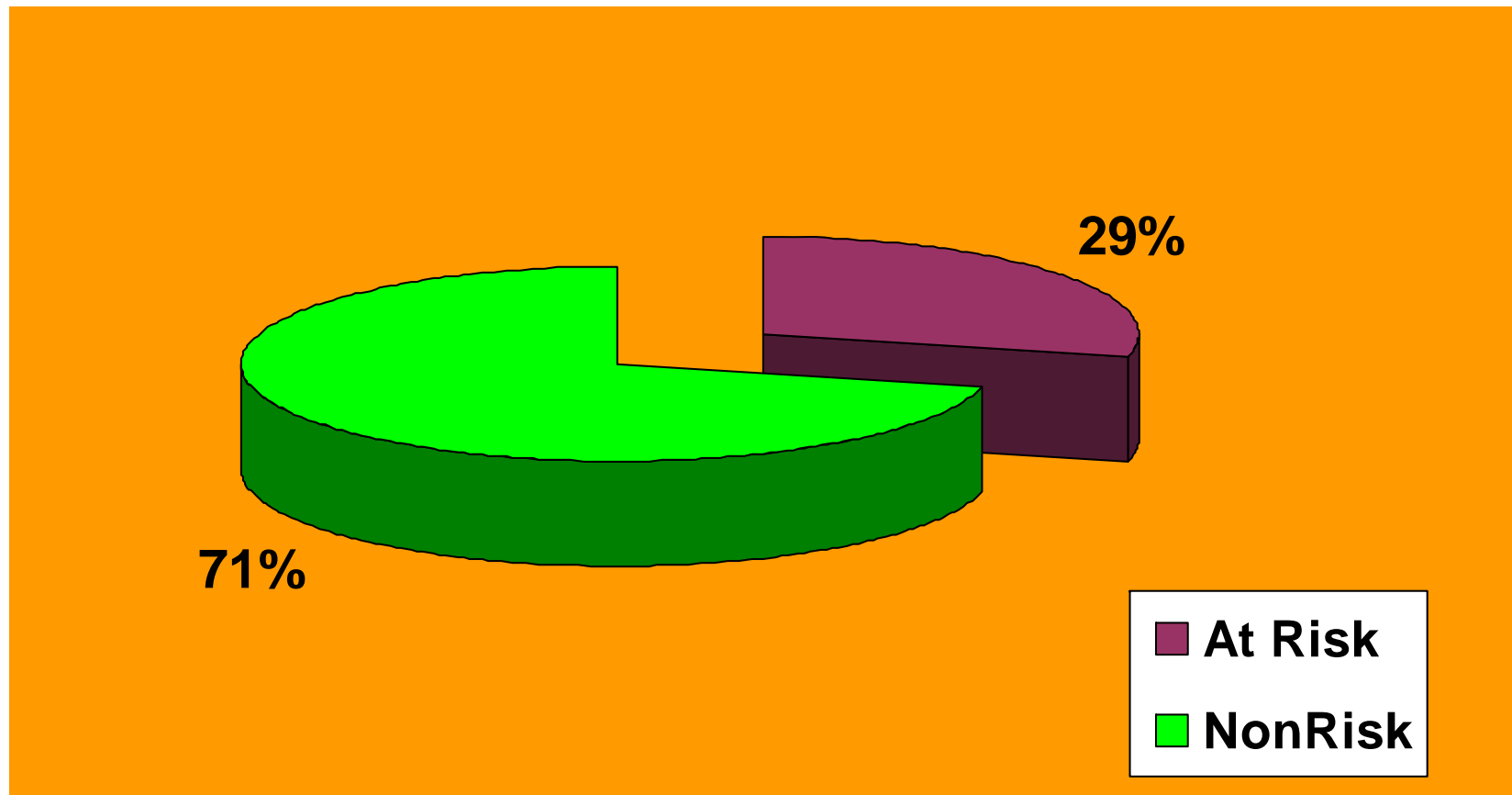
Dr. Todd Duhamel

**Assistant Professor,
Faculty of Kinesiology & Recreation
Management, University of Manitoba
Principal Investigator,
Institute of Cardiovascular Sciences,
St. Boniface General Hospital**

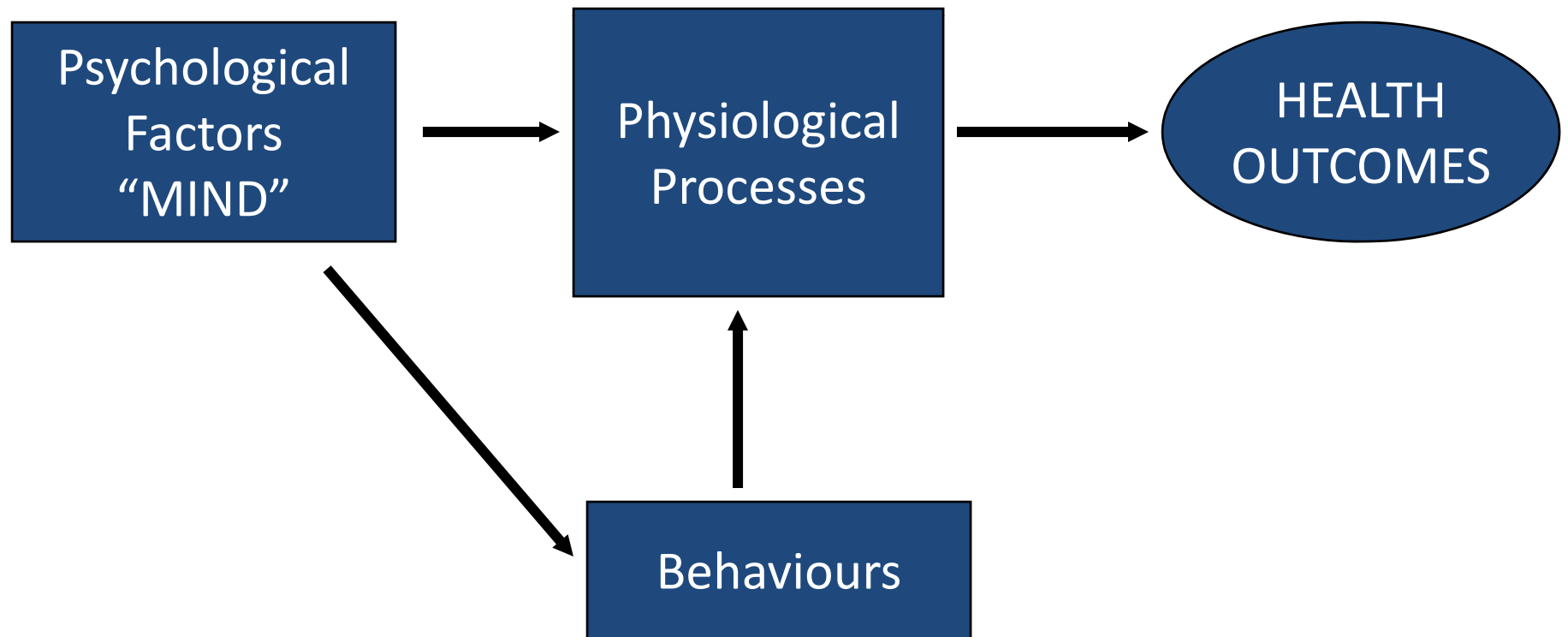
Emotional Impact of A Cardiac Event

- **Roughly 70% of patients get an acute stress reaction to their event.**
- **This is a normative adjustment reaction that usually resolves within 8 weeks post event.**
- **Up to 25% of cardiac patients experience clinical depression , many remain depressed at 1 year .**
- **17% to 40% suffer from subclinical depression, up to 40% of this group develop major depression later.**
- **Approx. 33% experience severe anxiety post event; up to 25 % have Panic Disorder.**
- **Up to 50% experience marked irritability.**

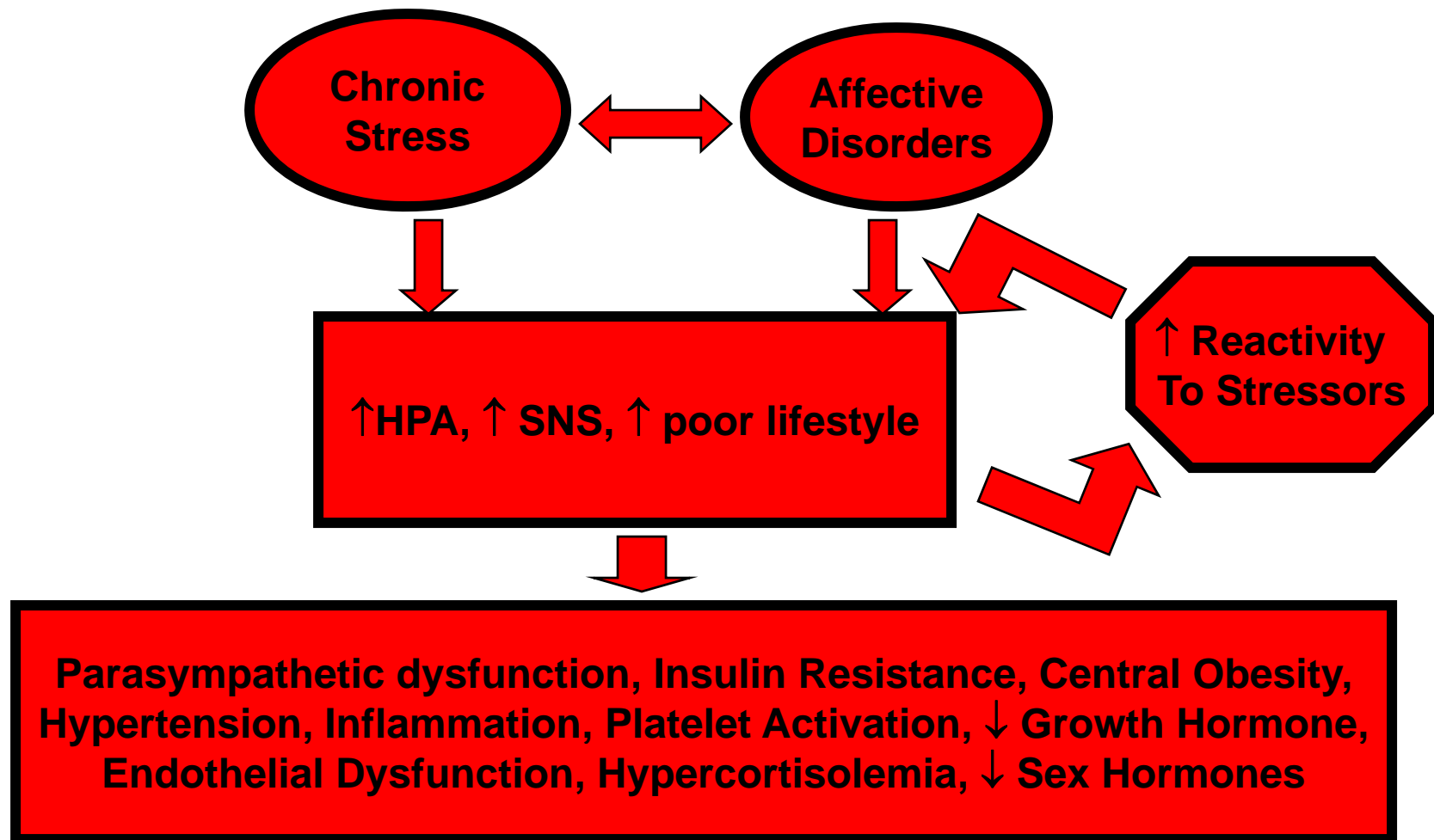
CVD Rehabilitation Patients At Psychological Risk



Impact of Psychological Factors on Health



Pathophysiologic Correlates



IMPACT ON HEALTH: HEART

Stress/negative emotional states linked to:

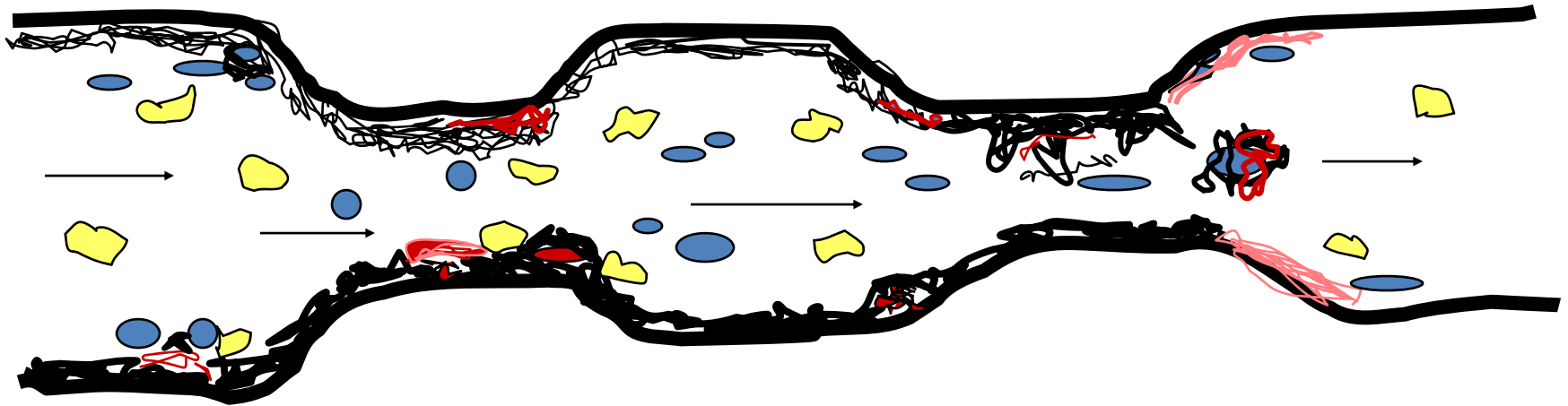
- **Dysregulation of the autonomic nervous system which can affect exercise stress testing → false negatives.***
- **↑ heart rate and high blood pressure.**
- **↑ blood fats and sugars → high cholesterol, diabetes.**
- **↑ stress hormones; cortisol → abdominal adiposity.**
- **Heart vessel dysfunction, pumping irregularities (↓ EF).**
- **↑ platelet activity.**

* Pelletier et al. 2011; *J of Cardio. Pulmonary Rehabilitation & Prevention*; 31:60-66.

IMPACT ON HEALTH: HEART AND IMMUNE SYSTEM

- **Heart vessel inflammation and ↑ proinflammatory responses.**
- **Development and progression of clogged arteries.**
- **Vasoconstriction of arteries → ↓ blood supply to heart. Greater in clogged vs. nonclogged vessels.**
- **↓ immune-cell activity → ↑ susceptibility to common cold viruses in a dose-response relationship.**
- **↑ healing time (24%), ↑ duration of infectious illness.**
- **Accelerated age-related decline in immune system.**

Endothelial Dysfunction and Damage



IMPACT ON HEALTH OUTCOMES

- **Psychological factors in top 4 contributors to CVD worldwide; 2x risk for heart events (INTERHEART).**
- **People unaware of their stress levels but have hyper-reactive cardiovascular response (\uparrow HR , \uparrow BP) to stress have \uparrow risk of developing cardiac disease.**
- **Lower antibody responses also seen in people unaware of the extent of their stress .**
- **Stress has an even greater impact on persons with heart disease: doubles risk of another heart attack, 6X risk of sudden cardiac death, \uparrow arrhythmias.**
- **Impact follows a dose-response relationship.**

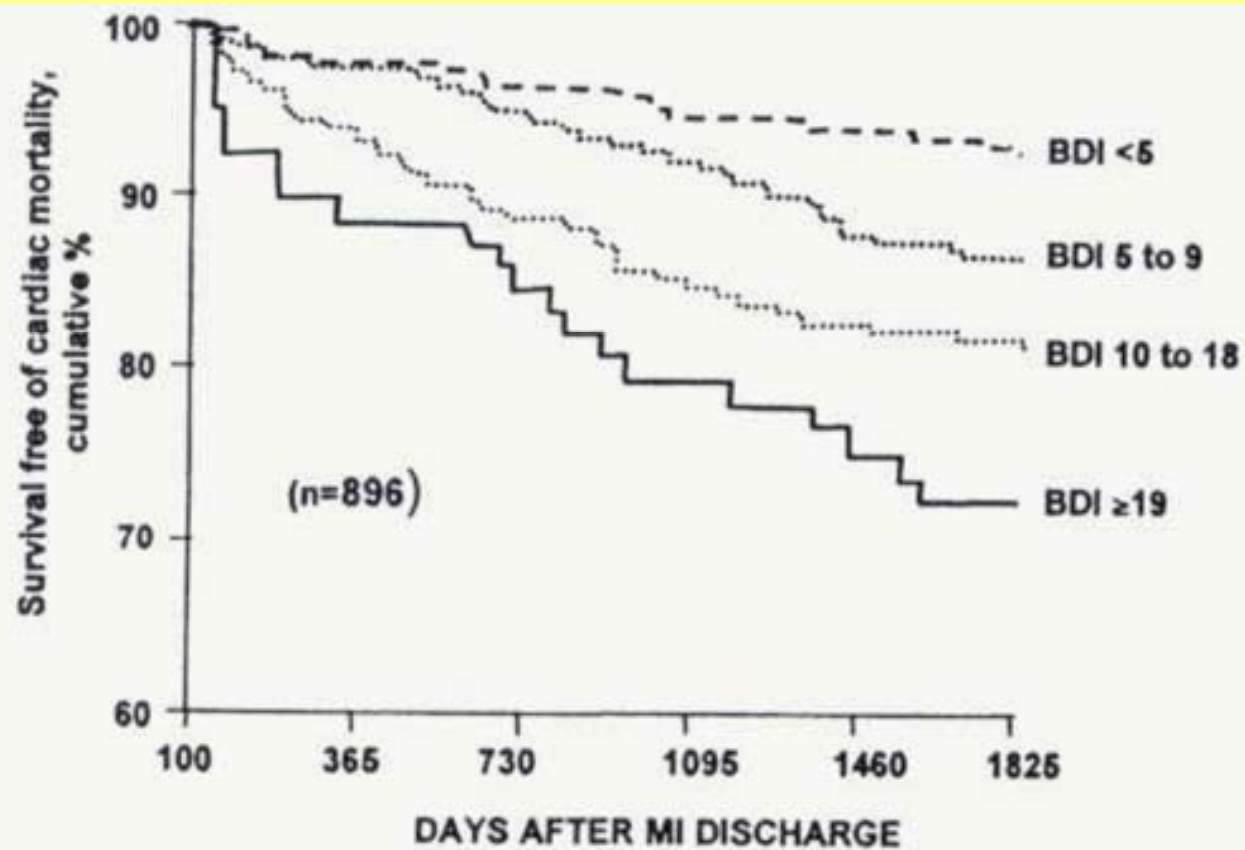


Figure 1. Post-myocardial infarction (MI) patients were recruited and assigned to one of four categories based on the Beck Depression Inventory (BDI), ranging from no depressive symptoms (BDI <5) to moderate to severe depressive symptoms (BDI ≥ 19). During the five-year follow-up period, a gradient relationship was observed between the magnitude of depressive symptoms and the frequency of deaths, with increased events occurring even in patients with mild depressive symptoms (BDI 5 to 9) (2).

COMPLIANCE WITH HEALTH BEHAVIOURS

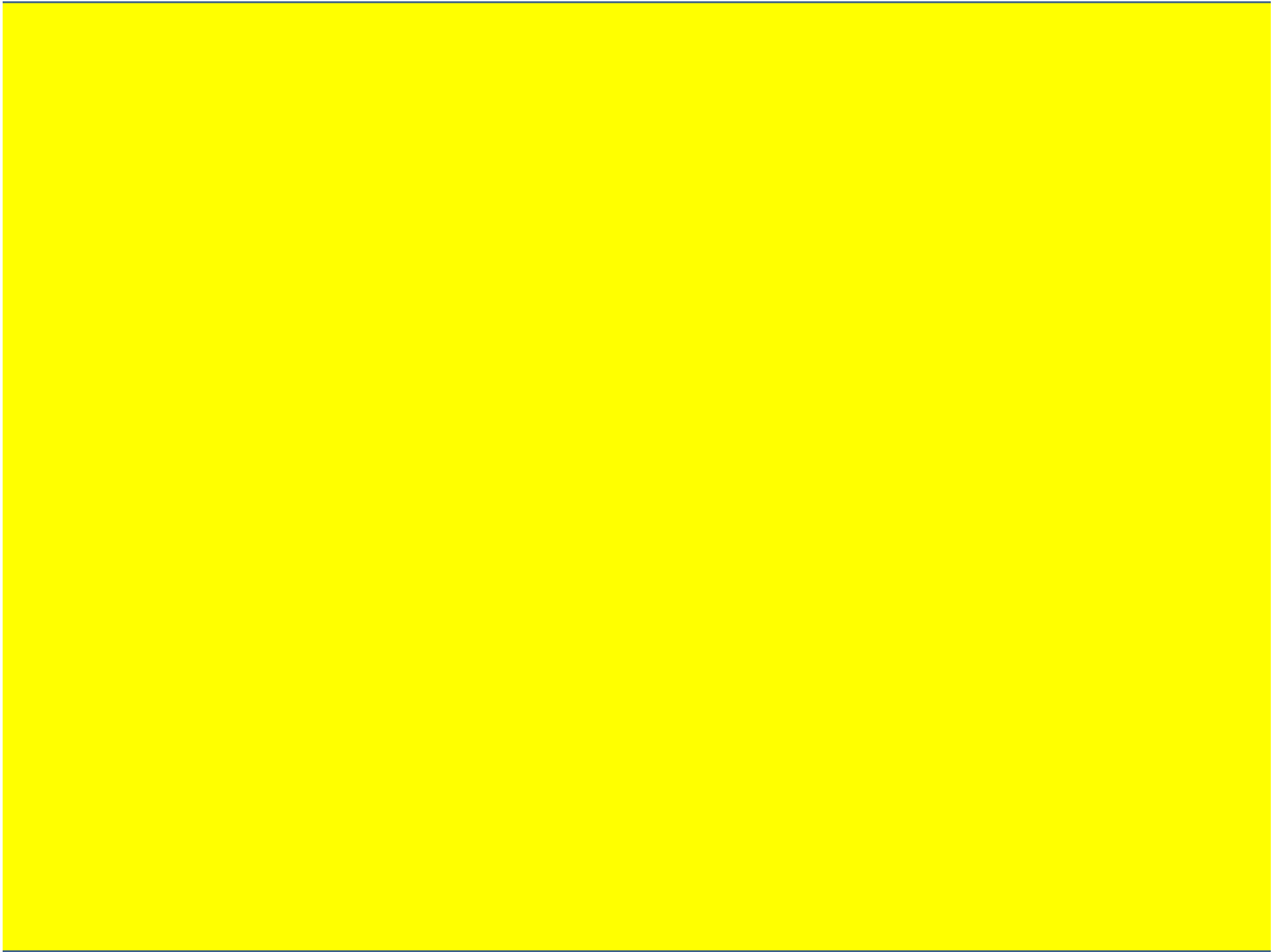
- **Depression, hostility, anxiety, and poor social supports linked to poor compliance.**
- **Compliance is generally poor in cardiac patients. Stress, emotional conflict, and social support issues shown to be the main barriers to adherence.**
- **Depression is a major predictor of poor adherence to healthy lifestyle changes in CAD patients.**

ADHERENCE RATES FOR CAD PATIENTS

- **High BP and Fat Lowering Medications: 50%-80%**
- **Diets for fat, cholesterol, or reduction: 13%-76%**
- **Diets for weight loss /obesity: < 50% long-term**
- **Exercise programs: 50% drop out at 6 months.**
- **Cardiac Rehabilitation programs: 25% drop out at 3 months, up to 50% at 6 months.**

Physical Activity – Mental Health Relationship (PA –MH)

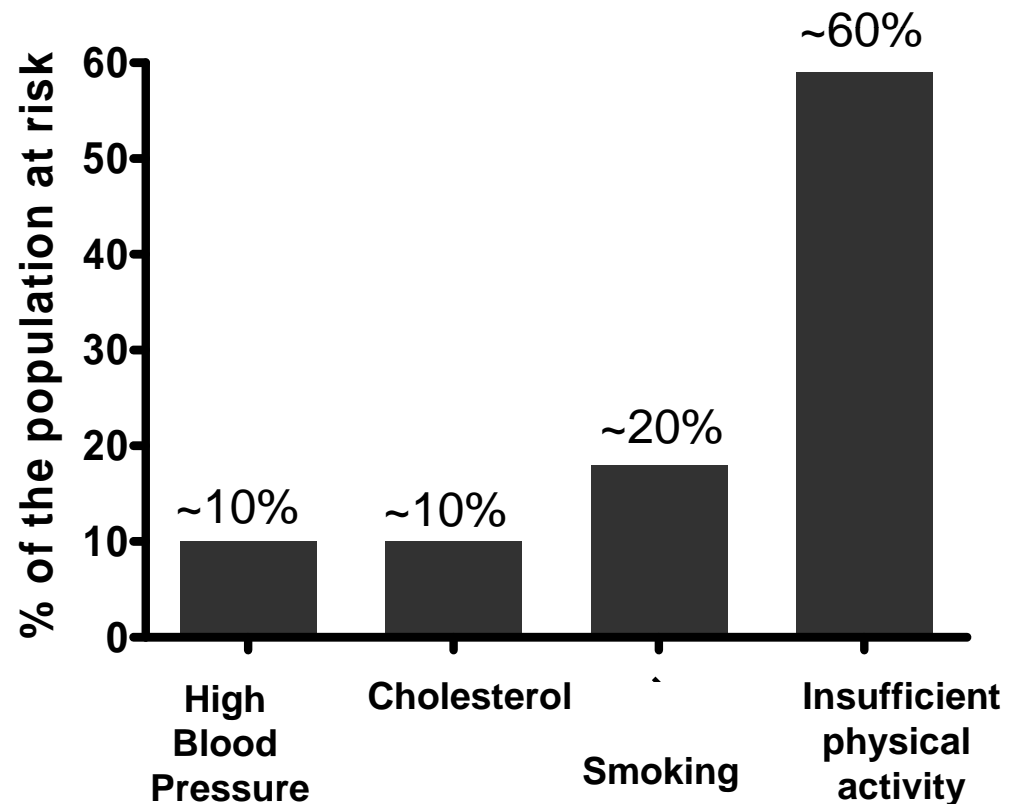




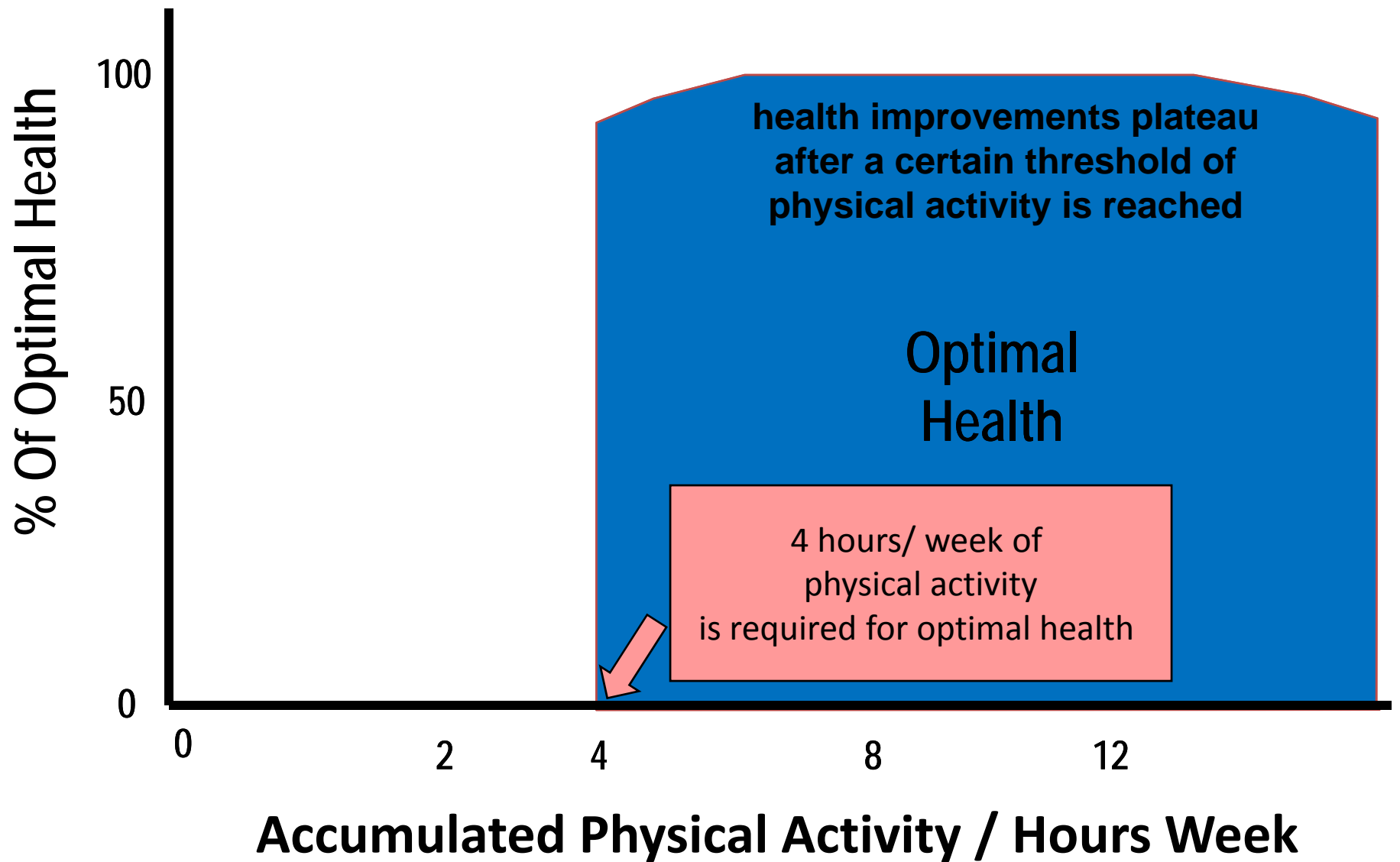
What is the single largest risk factor contributing to the increased prevalence of chronic disease today?

- Insufficient physical activity

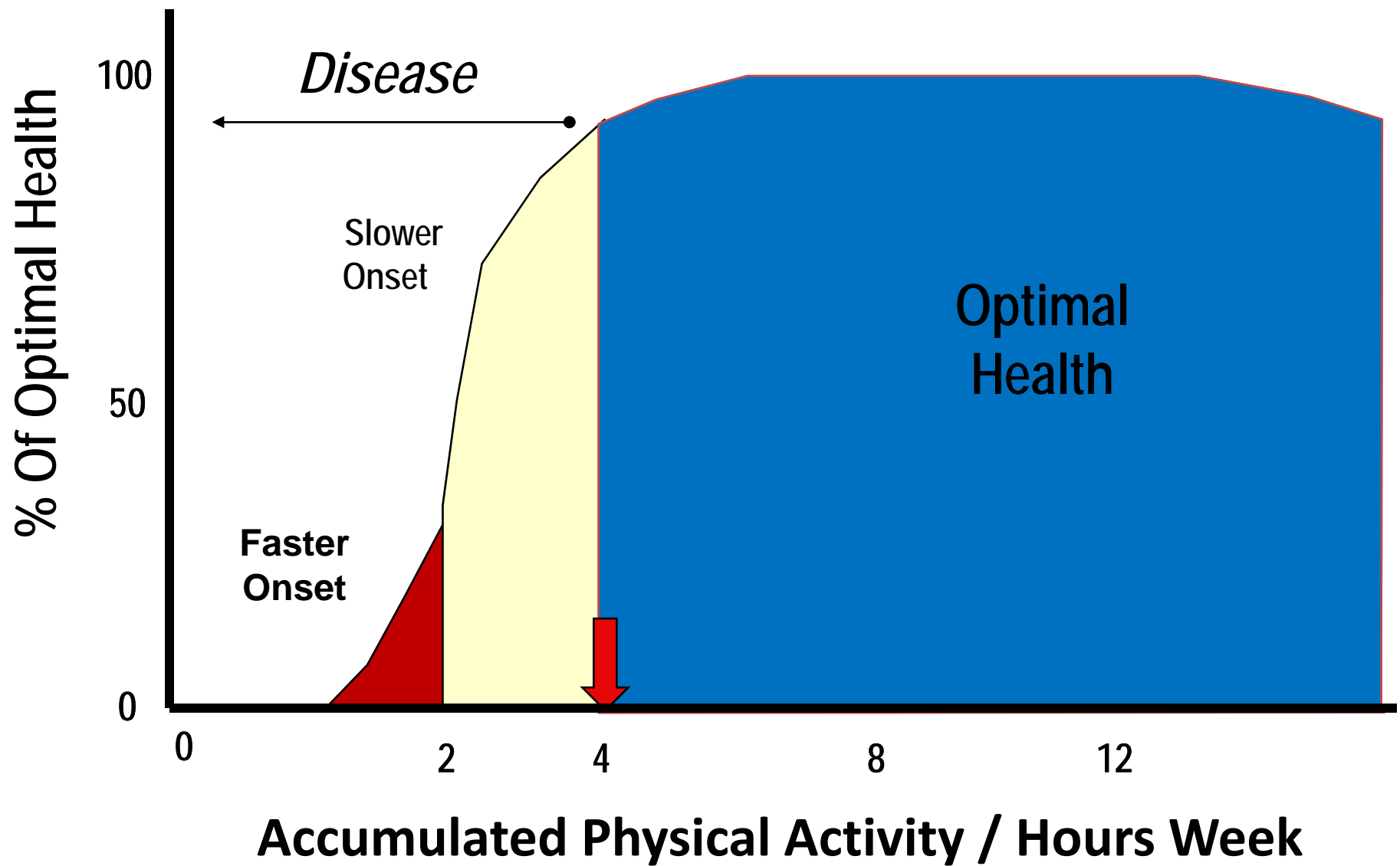
- Insulin resistance
- Obesity
- High blood pressure
- Dyslipidemia
- Inadequate or poor nutrition
- Stress
- Depression
- Smoking



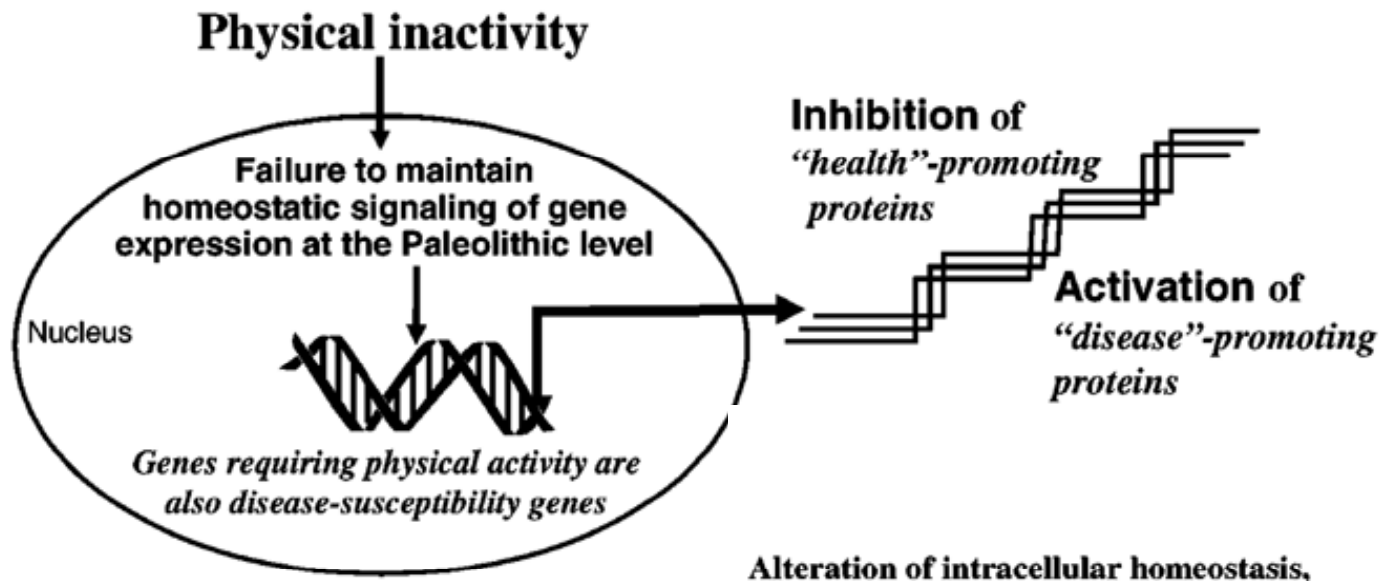
Optimal health and physical activity



**A lack of physical activity
contributes to the onset of disease**

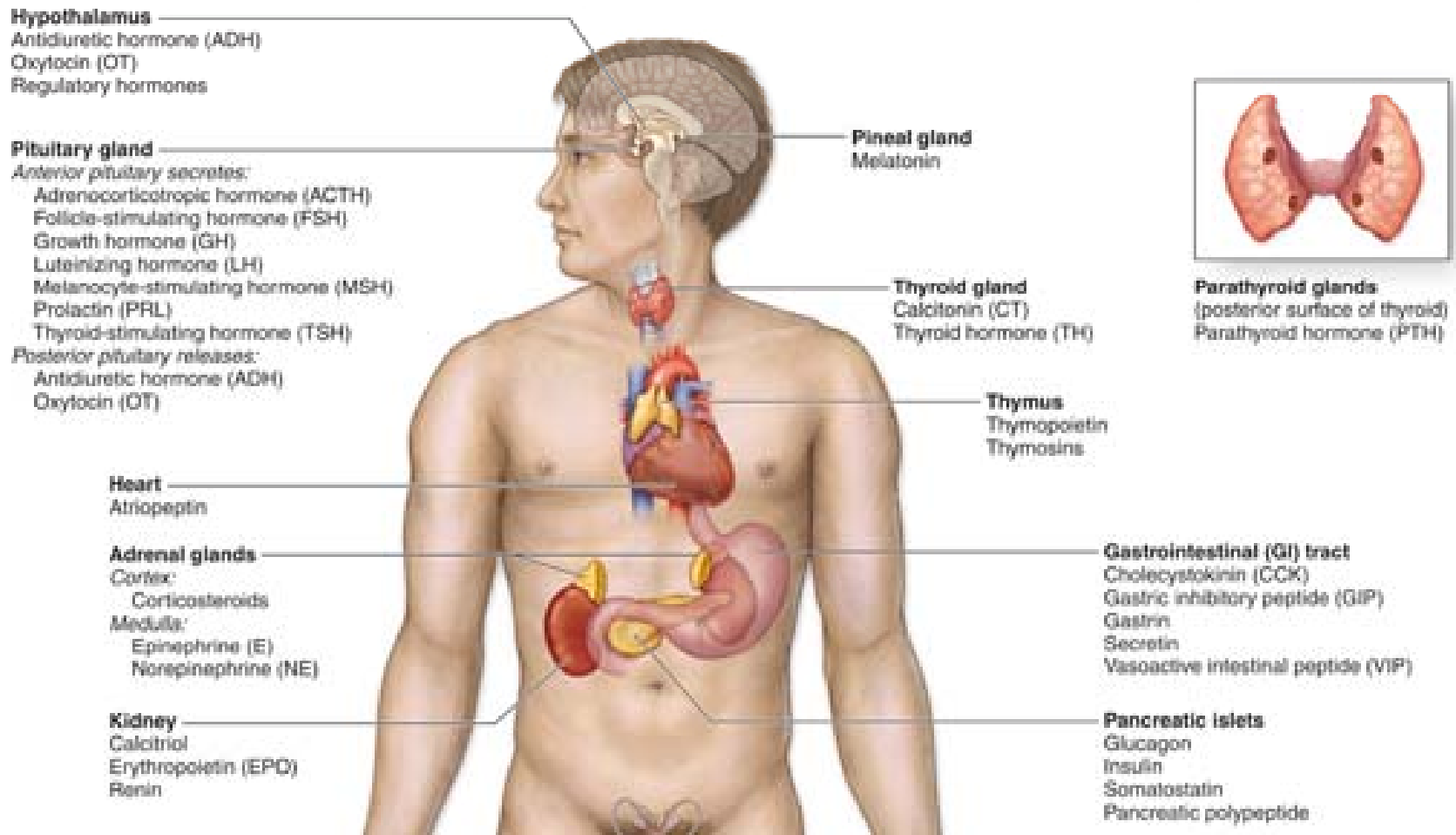


Physical activity influences the regulation of 385 different genes in our body.



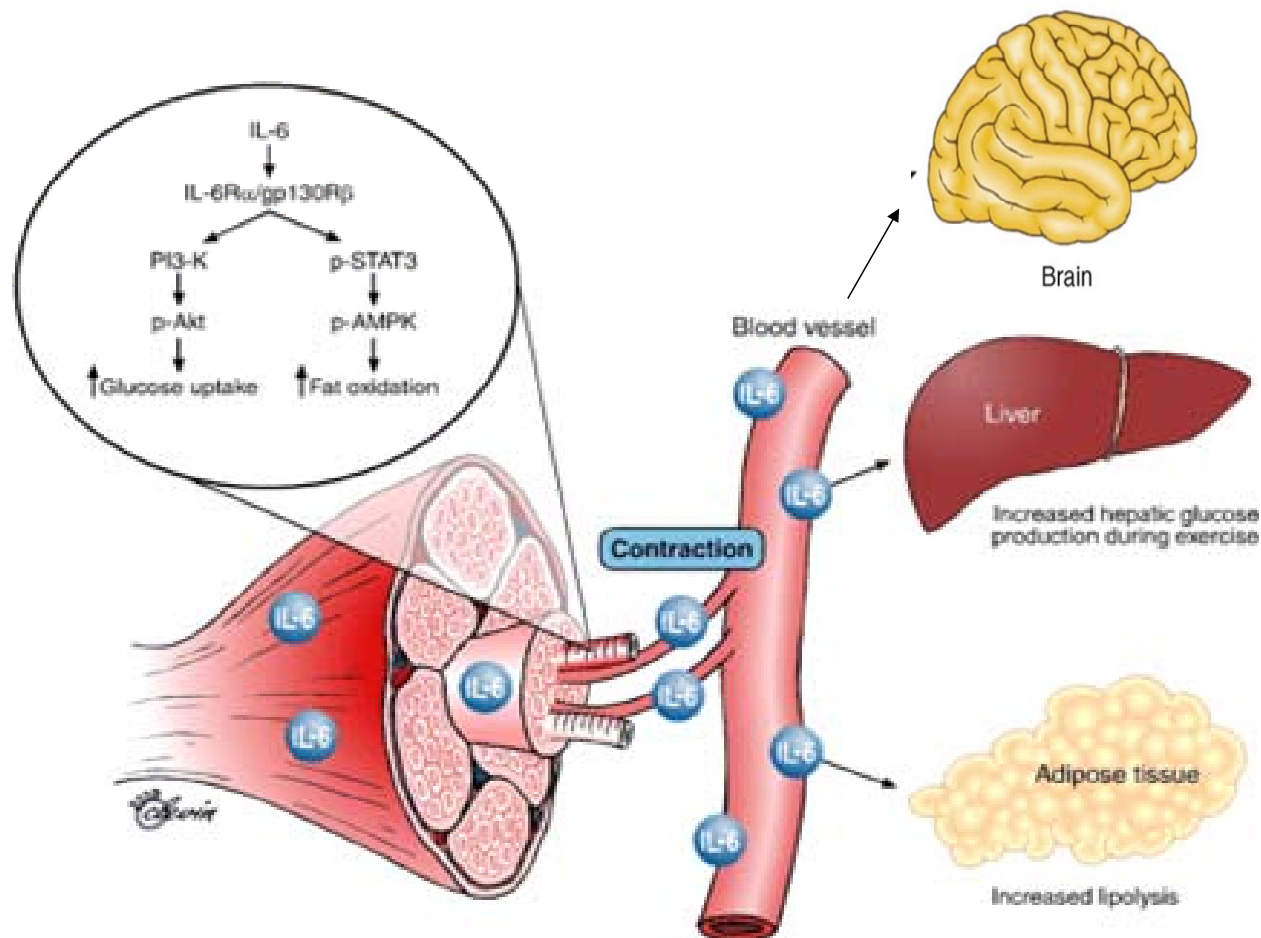
Hormones play an important role in the regulation of health.

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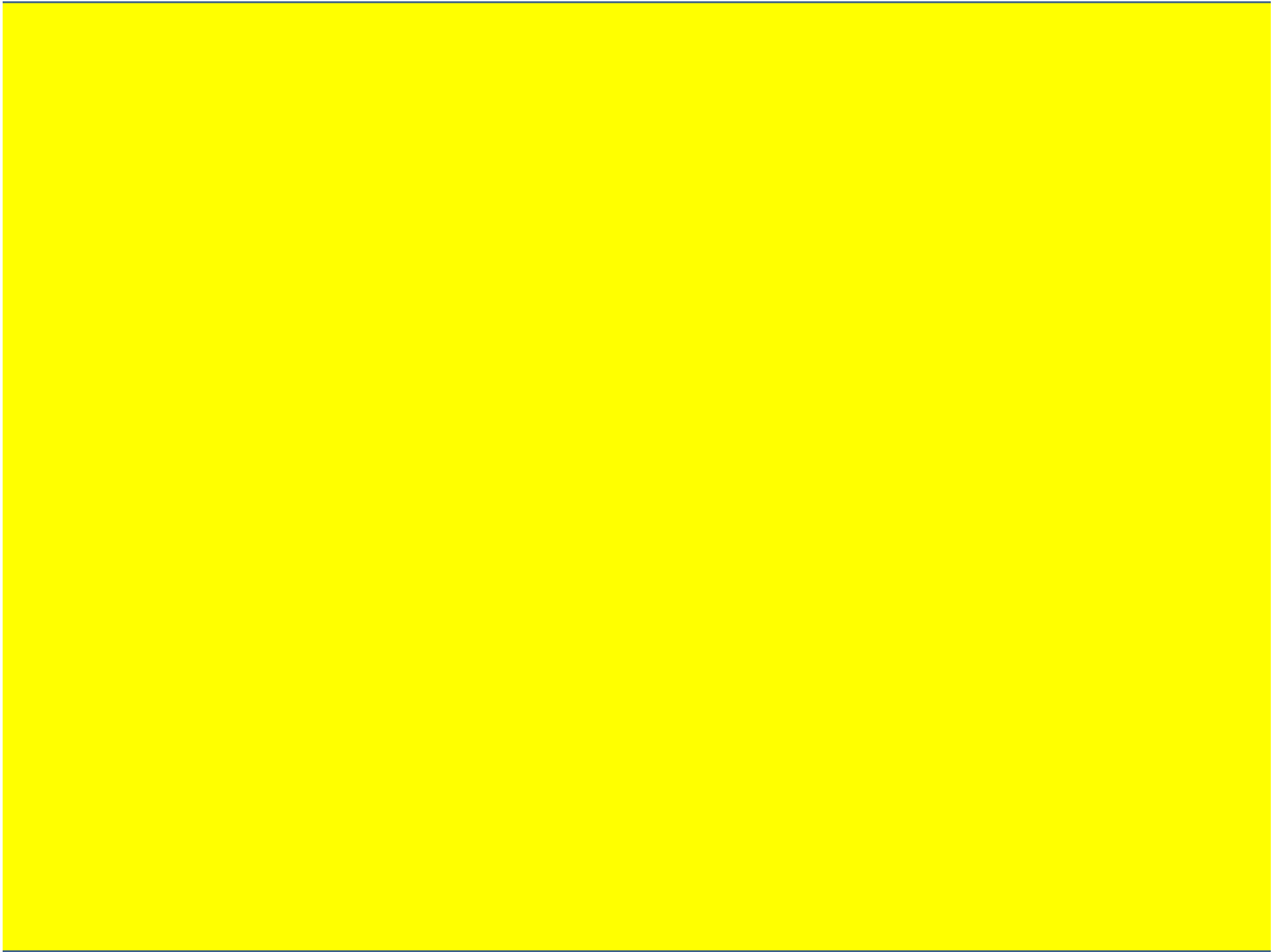


Hormones are released from muscle during physical activity.

Interleukin-6 is released from muscle during exercise and influences whole-body glucose regulation.



What is the neurological basis linking depression and physical activity?



Neurological basis for a relationship between depression and physical activity.

- **Exercise has similar effects to antidepressants.**
- **↑ serotonin levels/availability.**
- **↑ norepinephrine levels (mostly animal studies).**
- **↑ dopamine activity; could address the motivational and anhedonic symptoms of depression.**
- **Addresses the dysfunctional hypothalamic-pituitary-adrenal axis (HPA) issues of stress and depression.**
- **Impact on neurotrophic factors and neurogenesis, especially in the hippocampal region.**

***Helmich et al. 2010; *Clin. Pract. & Epidemio. in Ment. Health*, 6:115-125**

Neurobiological Basis cont'd

- **Brain health in general may be dependent on PA.**
- **↑ β endorphins.**
- **↑ insulin growth factor IGF-1. Implications for neurogenesis and inflammation response ↓. Inactivity → low grade inflammation.**
- **Twin studies suggest that relationship between voluntary leisure exercise and anxiety and depression may be genetic.***

*DeMoor et al. 2010; *Arch. Gen. Psychiat.*, 65: 897-903.

Psychological Basis of PA- MH Relationship

- **Provides immediate behavioural feedback for accomplishing tasks.**
- **↑ self-efficacy and sense of mastery.**
- **↑ opportunities for social reinforcement**
- **Social support context accounts for significant part of the PA-MH relationship.**
- **Distraction from distress-inducing thoughts.**

PA – Depression Relationship*

- **Studies are mostly epidemiological and cross sectional. Few longitudinal prospective studies and RCTs, especially on clinical populations.**
- **Many methodological problems ranging from measurement and compliance issues to selection bias and inadequate control and blinding procedures.**
- **Nevertheless, regular exercise consistently associated with ↓ levels of depression and ↓ prevalence of mood disorders in community samples.**
- **The link between depressive symptoms and adverse cardiovascular events in cardiac patients associated with inactivity.****

* Krogh et al. 2010; *J. Clin. Psychiat.*, e1-e10; Mead et al. 2009; *Cochrane Database*; 3

** Whooley et al. 2008; *JAMA*; 300: 2379-2388

Impact of PA for Depression

- **Appears present across the lifespan.**
- **Seen in patients with major depression but effect sizes are moderately low in rigorous studies.**
- **Often doesn't last beyond the exercise period.**
- **A few studies suggest it may be as effective as medication in highly motivated patients with mild-moderate depression*.**
- **PA added to medication may help patients with major depression who don't respond adequately. Remission rates with medication roughly 50%.****

* Blumenthal et al. 2007; *Psychosomatic Medicine*; 69:587-596.

** Thase et al. 2005; *J. Clin. Psychiatry*; 66:974-981.

MH Benefits of Exercise for the Elderly

- 61% of elderly do not meet Rx PA levels.
- Regular walking can ↓ depression scores 50%.
- PA protective for depression in elderly.
- Elderly with MDD may be helped with PA.
- PA improves their cognitive function.



PA – Depression Relationship: Tentative Conclusions

- **APA position* : PA is a useful adjunct to standard treatments for depression (medication, CBT) with low risk of side effects and good health benefits.**
- **Supervised exercise appears more effective.**
- **Moderate intensity exercise appears more effective for a broader range of patients than vigorous PA.**
- **Dose-dependent aspect of PA and depression related to overall time of PA not intensity so much.**
- **Improvement in mood linked to PA not always accompanied by improved physiological indices.****

* Freeman et al. 2010; *J. Clin Psychiatry*; 71:669-681.

** See Conn et a. 2009; *International J. of Cardiology*; 133:307-320.

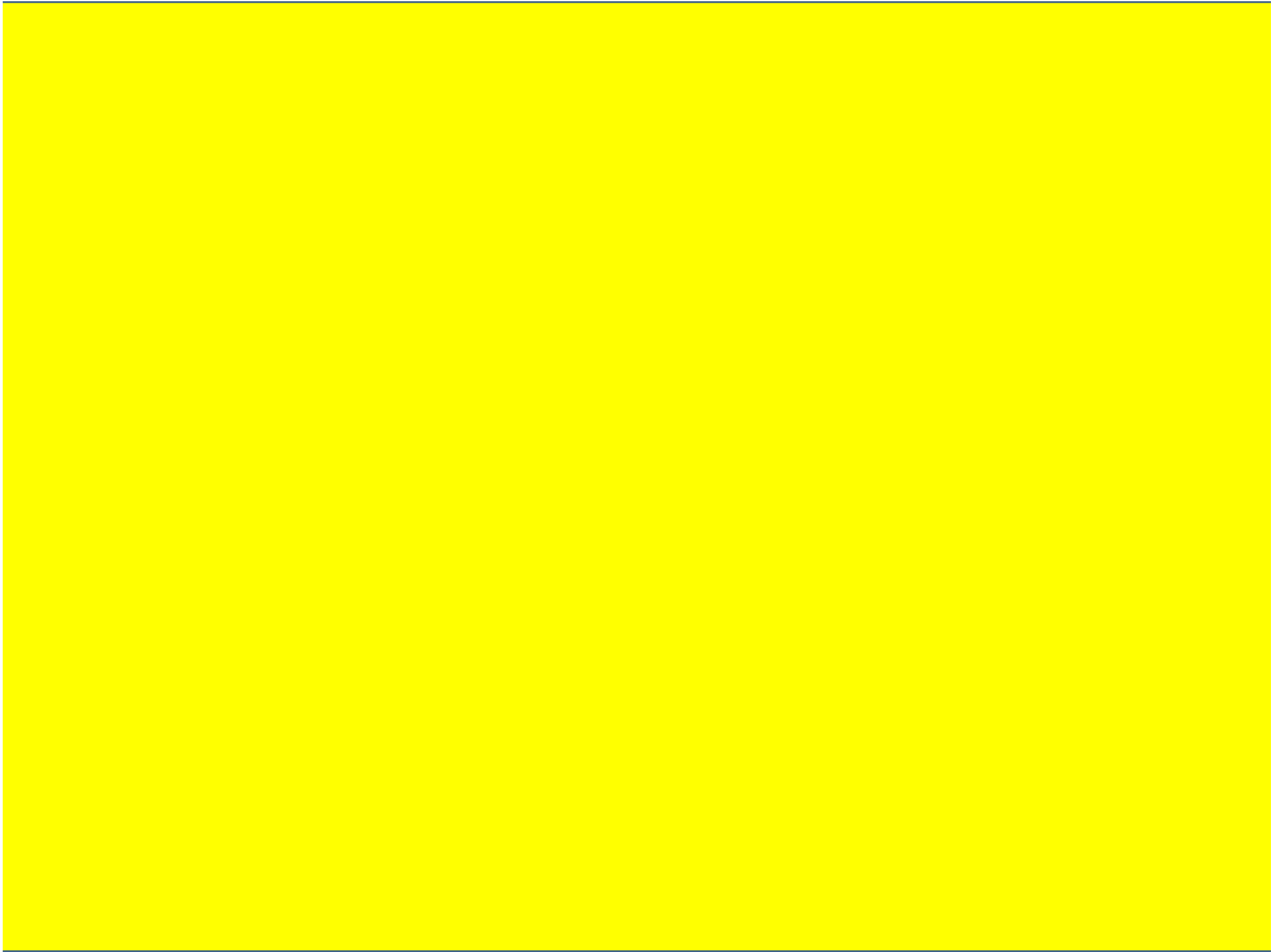
PA – Anxiety Relationship*

- **Not as well researched as for depression and have similar methodological flaws, including varying anxiety report times, poor anxiety measures (state vs. trait).**
- **Mostly survey studies on healthy community populations. Paucity on patients with anxiety disorders.**
- **Panic Disorder is most often investigated.**
- **Regular PA ↓ anxiety symptoms in healthy population but with a small effect size relative to control groups .**

* Herring et al. 2010; *Archives of Internal Medicine*; 170:321-331; Conn 2010; *Nursing Research*; 59:224-231; Strohle 2009; *J Neural Transmission*; 116:777-784.

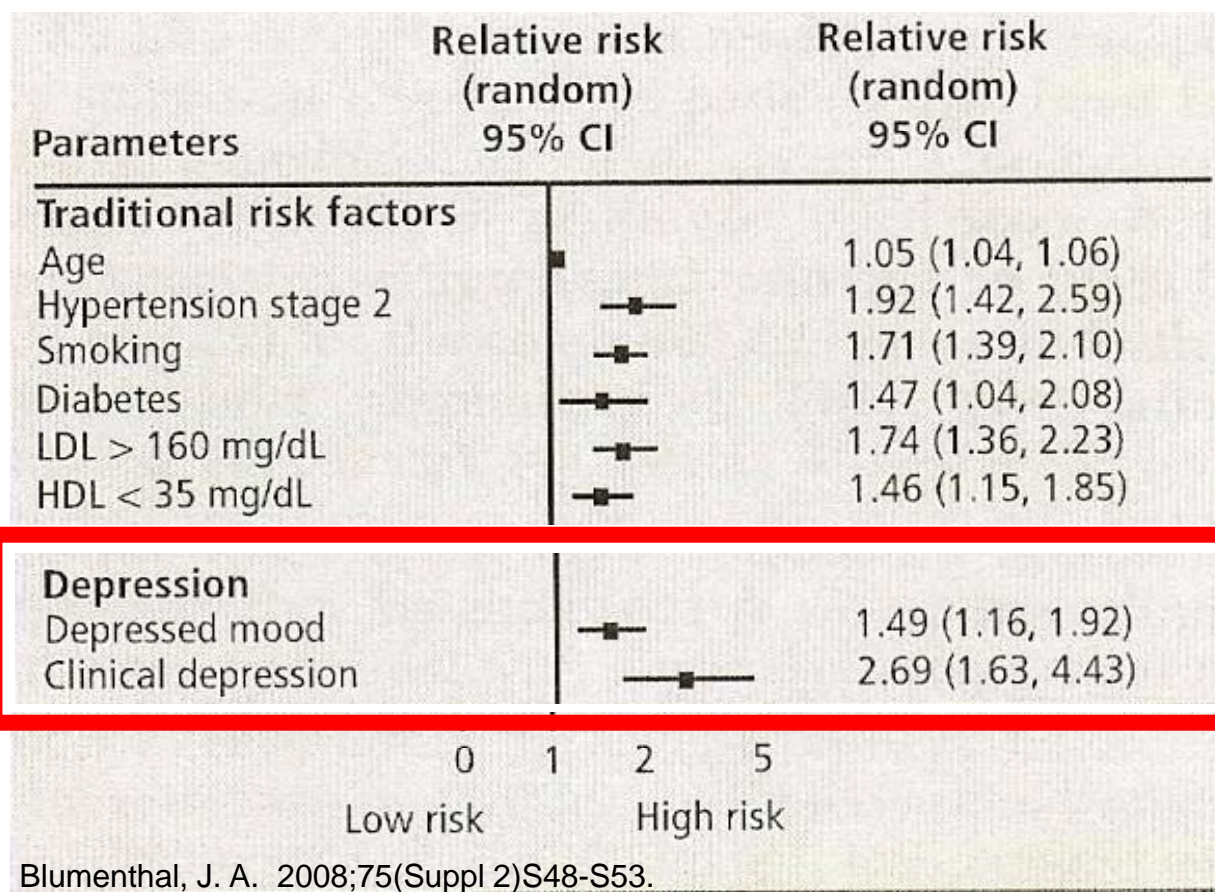
PA – Anxiety Relationship: Conclusions

- **Yoga as PA may be useful in ↓ clinical anxiety levels.**
- **PA may be useful for anxiety in people with chronic illnesses – especially CVD.**
- **PA with Panic Disorder (PD) may be a form of exposure treatment . PD patients more susceptible to somatic symptoms after exercise; can → panic attack.**
- **Suggestion that mild-moderate intensity exercise better than vigorous for anxiety.**



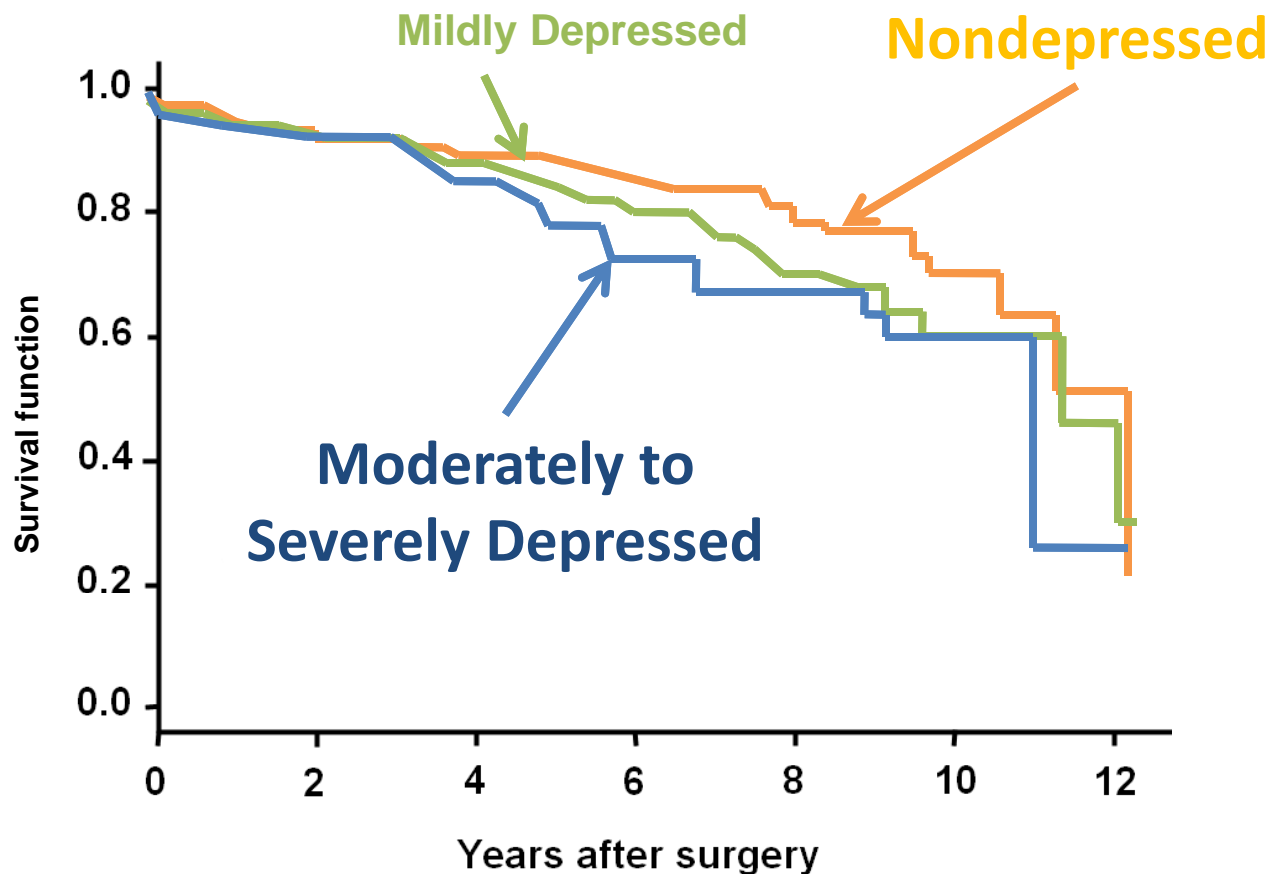
**So people are depressed,
how much of an effect does depression really
have on health outcomes?**

Depression is an independent risk factor for heart disease.



Depression negatively influences survival after cardiac surgery.

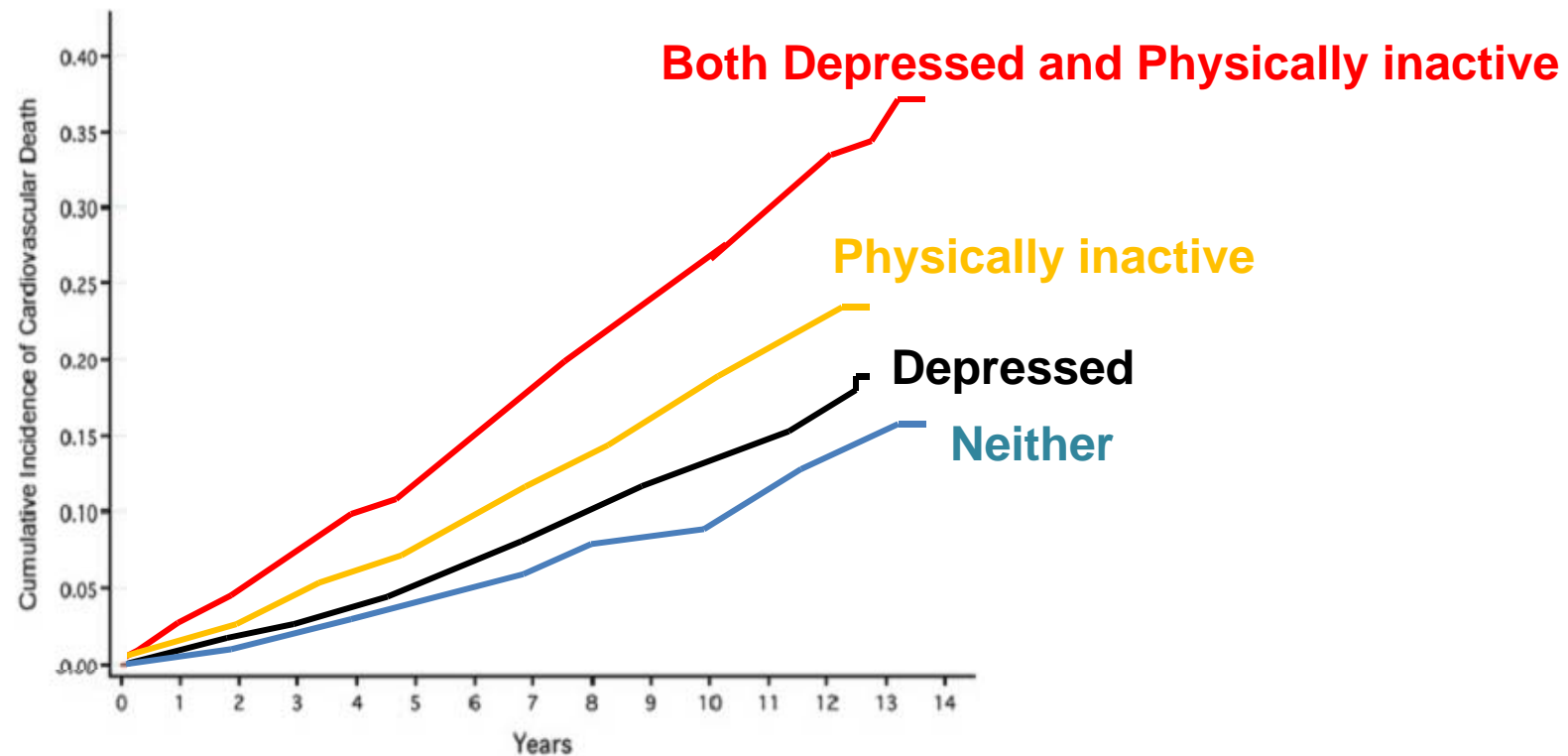
Survival rates for cardiac patients



Blumenthal, J. A. 2008;75 (Suppl 2)S48-S53.

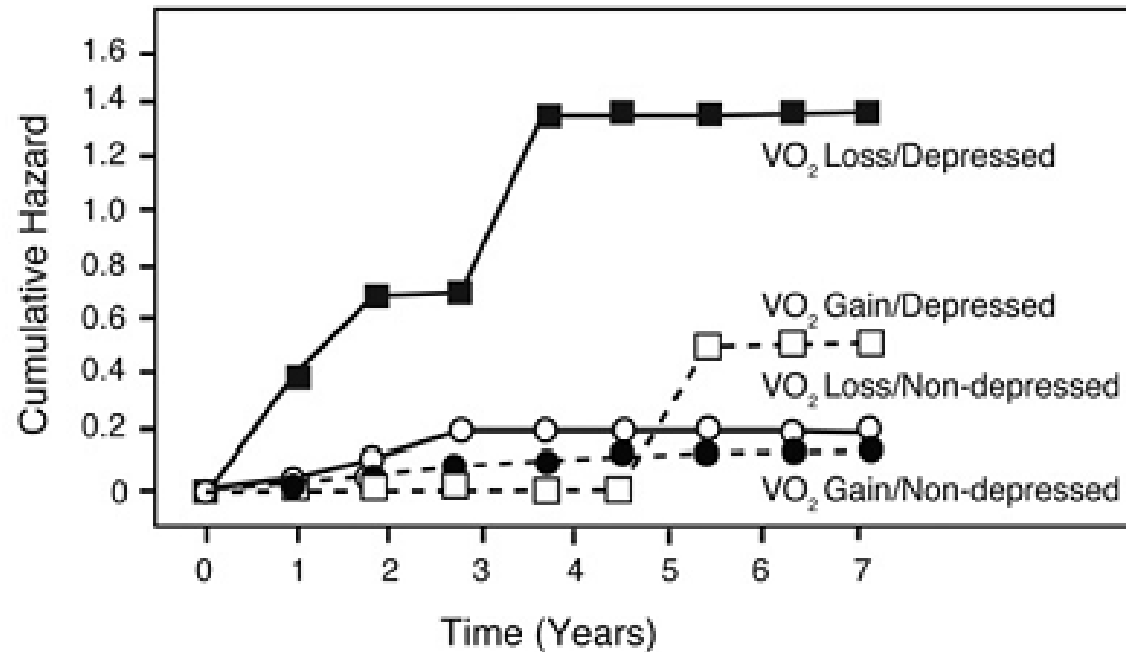
The combination of depression and sedentary behaviour is even more deadly.

Incidence of cardiac deaths



Win et al. Heart. 2011;97, 500-505

Depressed patients who fail to improve their physical fitness during cardiac rehab have a higher risk of death.



No. at Risk	0	1	2	3	4	5	6	7
VO ₂ loss/Depressed	6	4	3	2	1	1	1	1
VO ₂ gain/Depressed	8	7	6	4	3	3	1	1
VO ₂ loss/Non-Depressed	24	21	18	13	11	9	7	5
VO ₂ gain/Non-Depressed	90	86	78	67	60	52	41	33

Figure 6. Actuarial hazard for death comparing patients with heart failure with and without depression stratified by change in oxygen uptake after exercise training ($p < 0.01$ between oxygen uptake loss/depressed and all others).

Wow! I didn't realize that mental health contributed to poor health outcomes.

What can we do to get more cardiac patients physically active?

Manitoba fact:

Less than 30% of cardiac surgery patients in Manitoba attend a centre-based cardiac rehabilitation program.

Research question

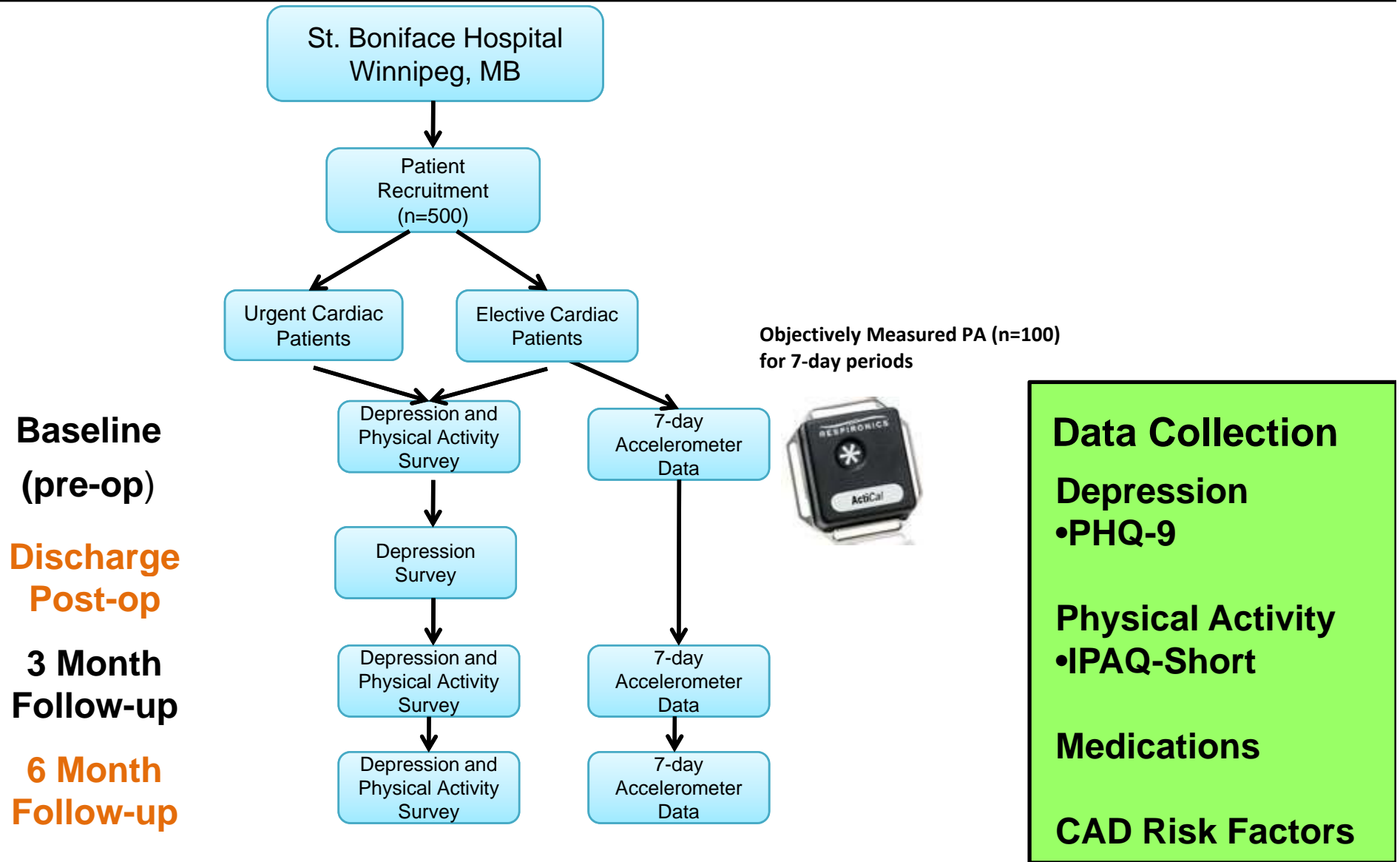
Why are 70% of the cardiac surgery patients not attending cardiac rehab?

Research question

Are the 70% of the cardiac surgery patients physically active on their own?

If they are active, does their activity level influence the prevalence of depression amongst this group?

Clinical study: Impact of Physical Activity on Depression after Cardiac Surgery (IPAD-CS)



IPAD-CS preliminary data: 309 patients so far.

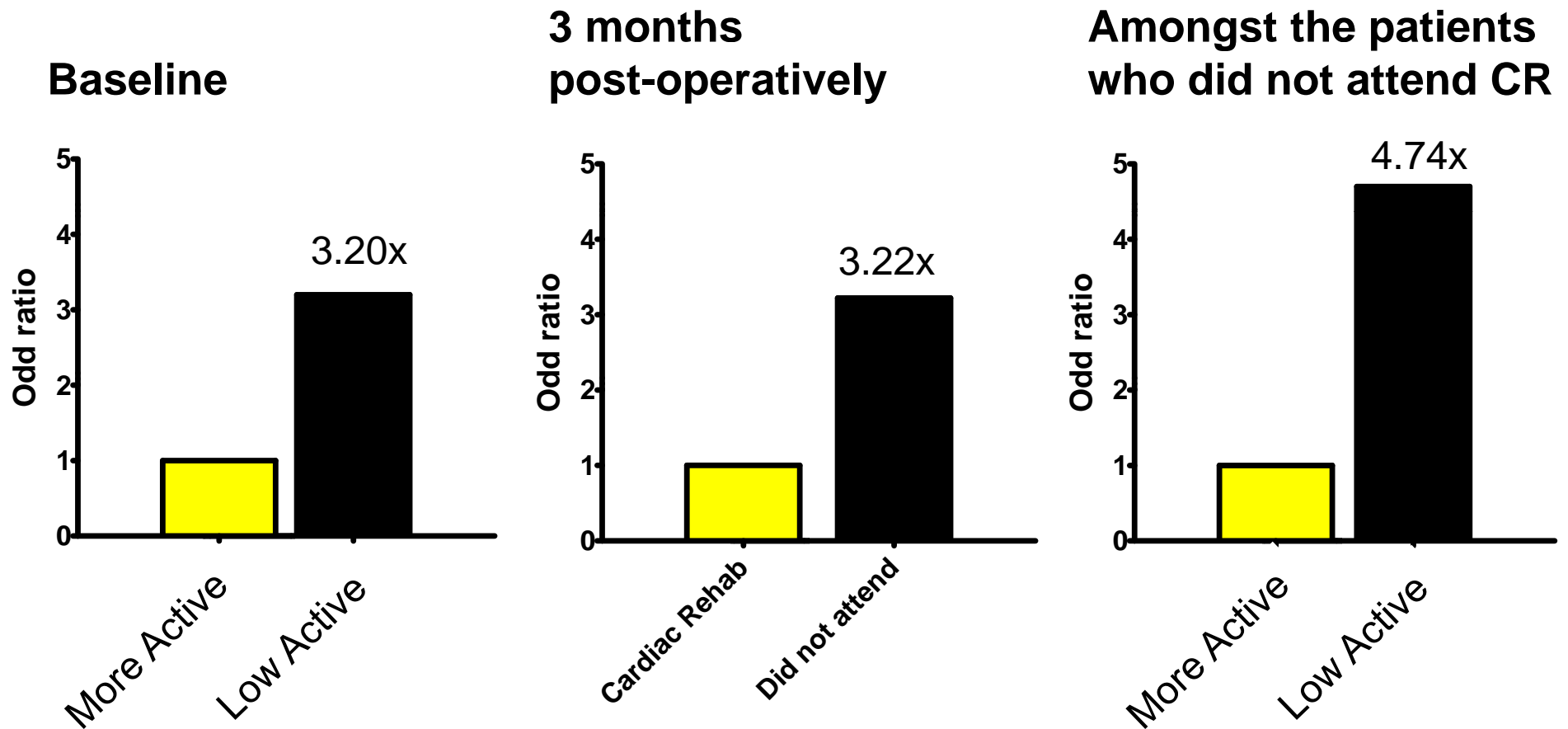
Prevalence of Depression at baseline

- 42% of patients indicated symptoms of mild depression
- 2% of patients indicated symptoms of moderate depression
- 3% of patients indicated symptoms of severe depression

Prevalence of physical inactivity.

- 69% of patients were not physically active enough to meet Canada's Physical Activity Guidelines.

IPAD-CS preliminary data: A more physically active lifestyle reduces the prevalence of depression in Manitoba.

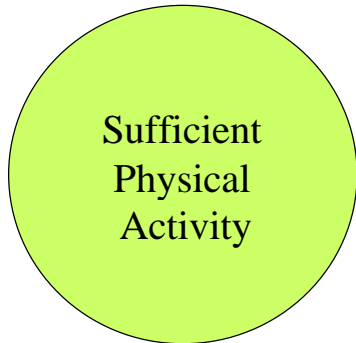


**How much physical activity
does someone need to improve their health?**

Accumulate at least 150 minutes of moderate-intensity aerobic exercise each week, spread over at least 3 nonconsecutive days of the week. Also perform resistance exercise (3 sets of 8 repetitions) 3 times per week.

Aerobic exercise training

Definition	Intensity	Examples
Rhythmic, repeated and continuous movements of the same large muscle groups for at least 10 minutes at a time	Moderate effort: 50–70% of person's maximum heart rate	Brisk walking Biking Continuous swimming Dancing Water aerobics Raking leaves
	Vigorous effort: >70% of person's maximum heart rate	Brisk walking up an incline Jogging Aerobics Hockey Basketball Fast swimming Fast dancing



- **Canada's Physical Activity Guidelines,**
- **Canadian Society of Exercise Physiology**
- **Canadian Diabetes Association**

Resistance exercise training

Definition	Examples
Activities that use muscular strength to move a weight or work against a resistant load*	Weight lifting Exercise with weight machines Start with 1 set of 10–15 repetitions, progress to 2 sets of 10–15 repetitions, then progress to 3 sets of 8 repetitions, 3 times / week

<http://www.cnn.com/2010/HEALTH/11/23/weights.plus.walking/index.html?hpt=T2>

Accessed November 24, 2010.

Weights plus walking equals more fit in less time

Health.com

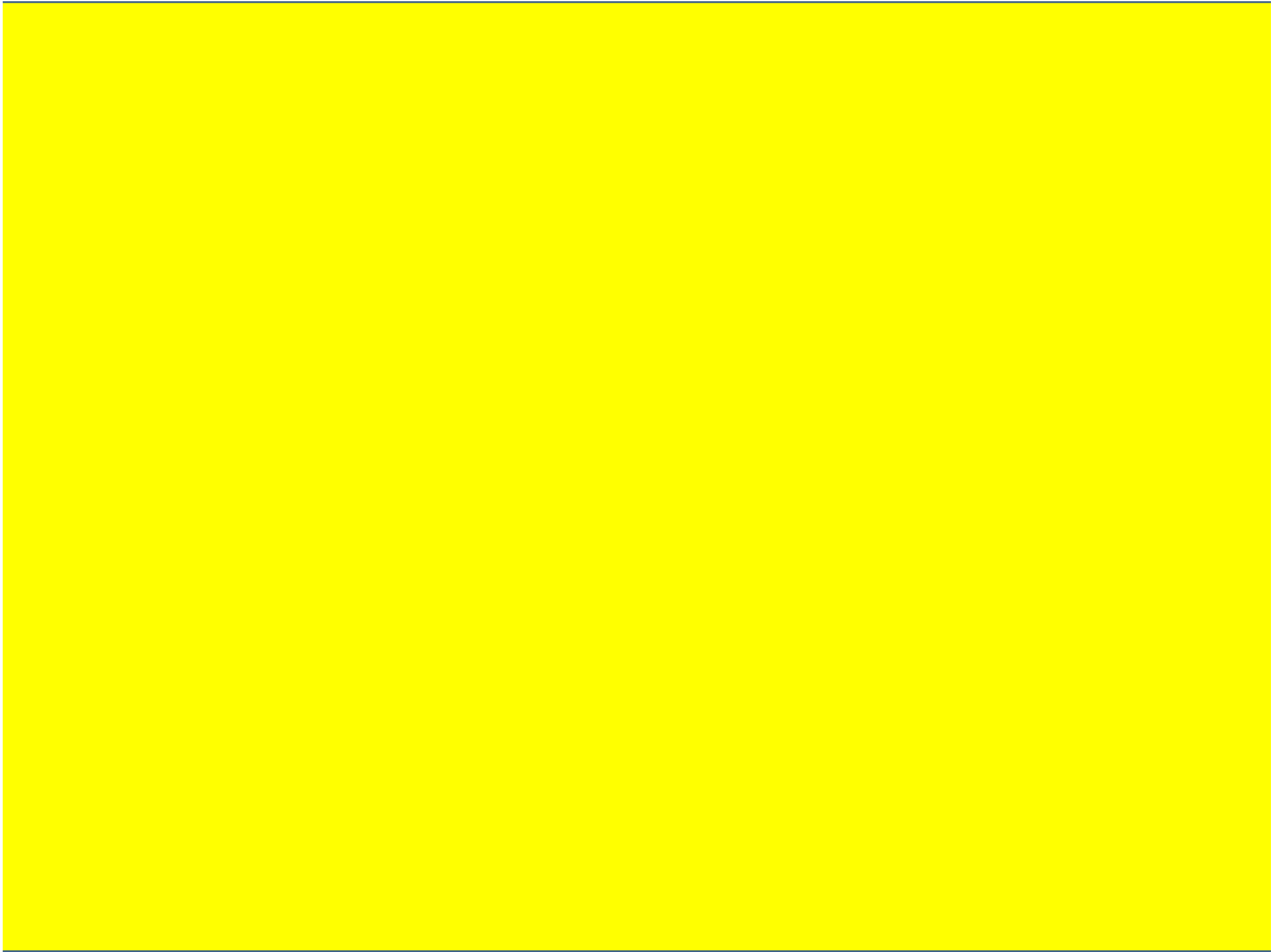
By Anne Harding, Health.com
November 23, 2010 5:02 p.m. EST



After nine months, the researchers estimated that the aerobic group worked out for an average of 140 minutes a week, the resistance group for 141 minutes, and the combination exercise group for 140 to 150 minutes (110 minutes on the treadmill and 30 to 40 minutes lifting weights). Although HbA1c didn't change significantly for people who did aerobic training only or resistance training only, it fell by 0.34 percent in the combination exercise group. The reduction in HbA1c seen in the combination exercisers would translate to a 5 percent to 7 percent reduction in heart disease risk, according to Church and his colleagues.

People in the combination group were also the only ones who showed a significant increase in their maximum oxygen consumption (which measures the capacity for aerobic exercise) compared to the non-exercising control group."

Do present psychological interventions take into account the importance of physical activity?



PA in Cognitive Behavioral Therapy

- **Cognitive Therapy for depression by Beck incorporated activity scheduling to counteract the withdrawal and passivity of depression.**
- **Inactivity = evidence of inadequacy and helplessness.**
- **Lewinsohn's (1979) behavioural treatment for depression emphasized ↑ activities, especially pleasurable and social, to ↑ positive reinforcement.**
- **Behavioural activation therapy emphasizes activity monitoring and scheduling, values assessment and contingency management. PA is included.**

Benefits of Including PA in the Treatment of Cardiac Patients with Psychological Problems

- **Potentially addresses two problems at once providing physical as well as emotional health benefits.**
- **Relatively low cost, especially for patients in CR.**
- **Provides complementary interventions. Improving mood states can improve assessment and adherence to PA regimens. PA can improve mood.**
- **Very few side-effects, especially when conducted appropriately.**
- **Helps with the 3-4 week time lag for antidepressants to kick in.**

Benefits of PA Integration cont'd

- **Provides an another nonpharmacologic option for mildly to moderately depressed cardiac patients who do not want to take more pills.**
- **May be helpful in depression resistant to standard treatment packages.***
- **May boost the effects of CBT with cardiac patients suffering from depression and perhaps anxiety.**
- **Appears beneficial for elderly cardiac patients.**

* Moto Periera et al. 2011; *J Psychiatric Research*; doi:10.1016.

PA-CBT Combination Treatments for Cardiac Patients

- More parallel than integrative in implementation.
- Two RCTs with ICD patients in cardiac rehabilitation (CR) showed the combination resulted in greater improvement in mood and exercise performance.
- Adding CBT to CR superior to adding exercise alone in improving mood and hard medical outcomes.**
- Combination more effective than PA or CBT individually for heart failure patients with moderate-severe depression in improving mood and physical functioning.***
- UPBEAT and READY trials; CABG Prehab.

* Frizelle et al. 2004; *British J of Health Psychology*; 9: 381-392.

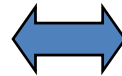
** Blumenthal et al. 1997; *Arch. of Internal Medicine*; 157:2213-2223.

*** Gary et al. 2010; *J of Psychosomatic Research*; 69: 119-131.

Figure 1: Model of an Integrative Approach to PA and Mood in Cardiac Patients

Mental Professional

- Psychological screening
- Value assessment of PA
- Goal setting for emotional, social and behavioral change
- CBT for PA expectations
- ↓ emotional barriers to PA
- Review of activity records for PA-MH links
- Graphs of lifestyle changes
- PA Social support strategies
- Reinforcement for PA and MH changes



Exercise Specialist

- Fitness testing
- Selection of exercise types
- Written exercise prescription based on cardiac and MH factors
- Motivational prompts
- ↓ environmental barriers
- Review of activity records for PA-MH links + PA gains
- Fitness/behavioral reviews
- Arrange for exercise buddy
- Reinforcement for PA and MH changes

Examples of an Integrative Approach with Distressed Cardiac Patients

Psychological Status

Exercise Considerations

Panic Disorder

Less intense to start with presensitization and cognitive restructuring for post-exercise somatic sensations.

Moderately Severe Depression

PA scheduled later in the day (diurnal issue), light intensity PA, home-based, frequent motivational contacts.

More Examples of an Integrative Approach

Psychological Status/ Gender

**Severe Depression
or Anxiety Disorder**

**Females with depression
or problematic Anxiety**

Exercise Considerations

**“ Emotional Prehab” before
the start of PA program**

**Light to moderately intense
PA in a social context**

Clinical Considerations cont'd

- **PA prescription includes exercise parameters that improve mood (Table 1).**
- **Prescriptions include informal as well as formal PA such using stairs instead of elevators.**
- **Prescriptions monitored with face to face contacts and accompanied by ongoing motivational prompts via written notes, e-mail or web portals.**
- **Stimulus control techniques to trigger exercise behaviours and ↓ barriers to PA.**

Table 1: Exercise Parameters to Optimize Mental Health in Cardiac Patients

- **3-4 training sessions per week of at least 30 mins. duration, perhaps more for heart health.**
- **Supervised with at least one face to face contact per week. Optimally in an exercise facility.**
- **Moderate-intensity PA . If vigorous exercise tolerated or preferred (e.g. males) then incorporate it.**
- **PA program should be at least 8-14 weeks.**
- **Booster sessions and informal activities should be included.**

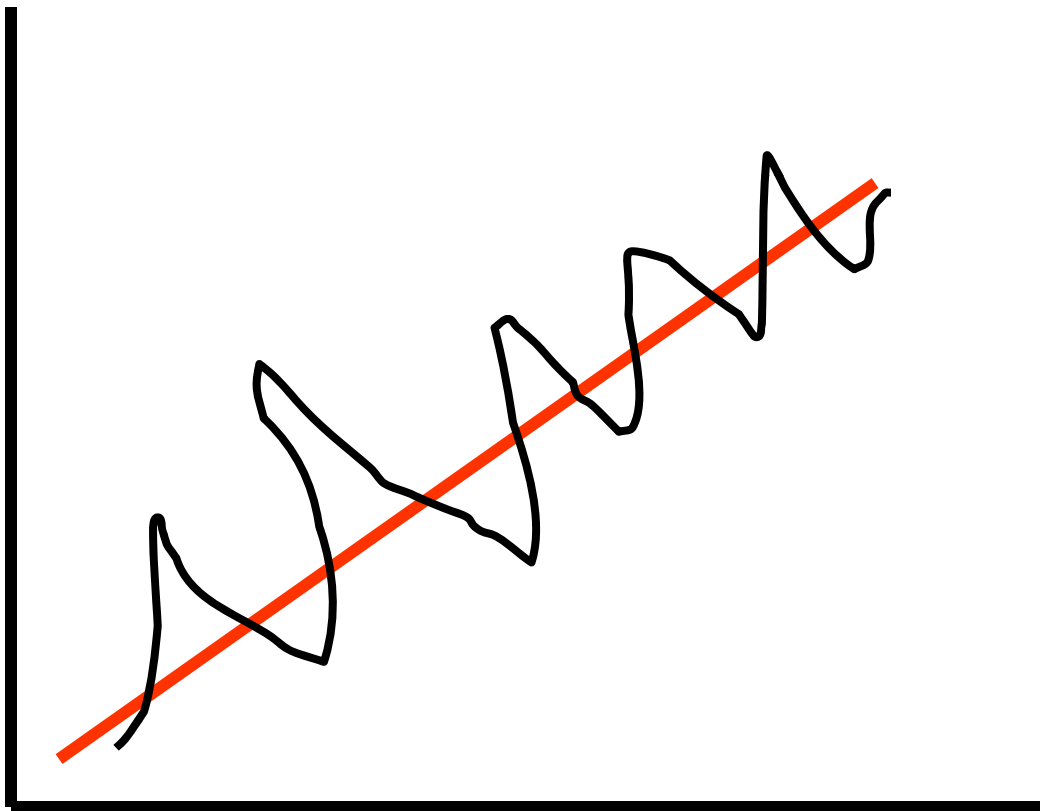
More Clinical Considerations

- **Graduated introduction of PA with stepped increases and in consideration of other lifestyle change demands – “one behaviour at a time”.**
- **Self-monitoring with activity records that make a link between performing PA and emotional state.**
- **Psychoeducation and cognitive restructuring related to patients’ expectations regarding the success of PA for emotional and physical health.**

Clinical Considerations

- **Graphical representation of progress of PA using measurable goals – e.g. minutes, distance etc.**
- **Social support development strategies- exercise buddies, CAD patients with similar challenges.**
- **Relapse prevention strategies.**

Ignore Daily Variation: Focus on the Trend!



Future Challenges

Exercise parameters that optimize mental and cardiac health.

Matching different types of exercise to MH problems.

How baseline conditioning affects optimal exercise prescriptions for MH.

How to improve adherence!

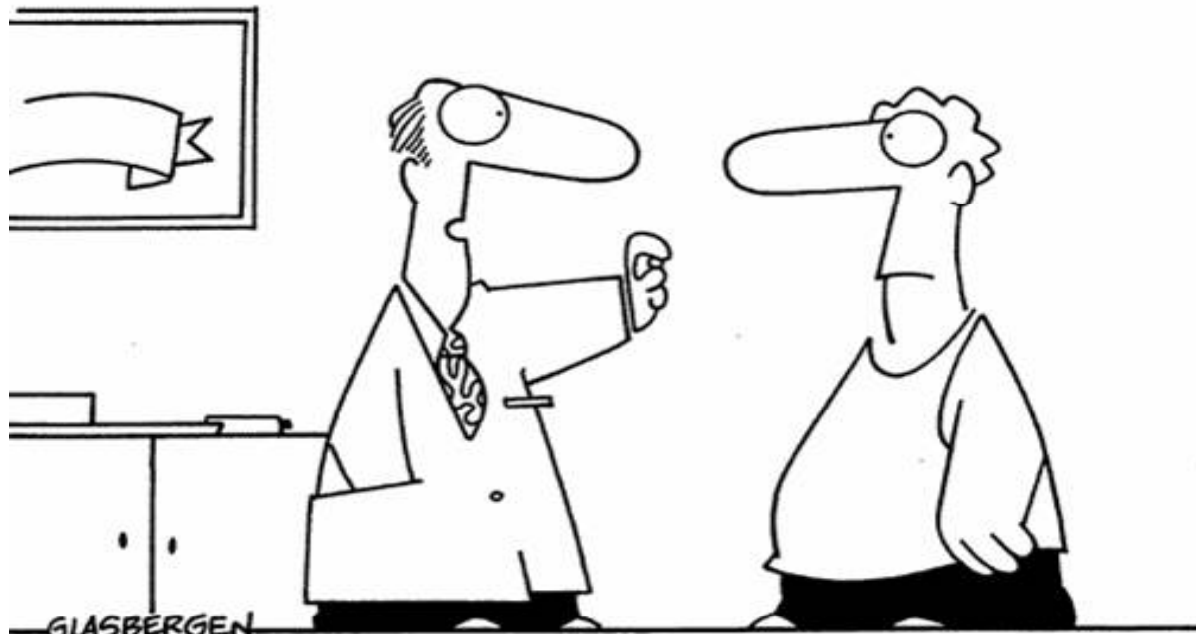
How and when to intervene along the treatment trajectory for cardiac patients- CABG Prehab

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**“To prevent a heart attack, take one aspirin every day.
Take it out for a jog, then take it to the gym,
then take it for a bike ride....”**

Dr. George Kaoukis

Dr. Todd Duhamel