Heart Disease & Stress

JIM LUND, PT, DPT

CARDIAC REHABILITATION PROGRAM MANAGER

MONTANA VA HCS

Is there another risk factor?

Is it modifiable?

Objectives

- Recognize AHA 2021 scientific statement on Psychological Health
- Review relationship of psychosocial stress with health & mortality
  - Acute Stress
  - Chronic Stress
- Identify potential stress management interventions
- Collaboration–what resources do you have, what works for you

AHA Scientific Statement 2021

Psychological Health, Well-Being, and Mind-Heart Body Connection

"… there is now an increasing appreciation of how psychological health can contribute not only in a negative way to cardiovascular disease (CVD) *but also in a positive way* to better cardiovascular health and reduced cardiovascular risk"

Levine GN, et al. Psychological Health, Well-Being, and the Mind-Heart-Body Connection: A Scientific Statement From the American Heart Association. Circulation. 2021

AHA Scientific Statement 2021

Psychological Health, Well-Being, and Mind-Heart Body Connection

TABLE 1. EFFECT ESTIMATES FOR ASSOCIATIONS OF NEGATIVE PSYCHOLOGICAL FACTORS WITH CARDIOVASCULAR EVENTS AND CONDITIONS

Negative psychological factors	Parameter/end point	Effect estimates (95% CI)
Depression	Incident MI	RR, 1.30 (1.22–1.40)[42]
	Incident CHD	RR, 1.30 (1.18–1.44)[42]
	Stroke	RR, 1.45 (1.31–1.61)[45]
	Obesity	RR, 1.37 (1.17–1.48)[49]
	Hypertension	RR, 1.42 (1.09–1.86)[51]
	Diabetes	RR, 1.32 (1.18–1.47)[52]
	CVD mortality	RR, 1.41 (1.13–1.76)[39]
	Incident CHD	RR, 1.41 (1.23–1.61)[39]
Anxiety	Coronary artery spasm	RR, 5.20 (4.72–5.40)[40]
	Incident stroke	RR, 1.71 (1.18–2.50)[39]
	Heart failure	RR, 1.35 (1.11–1.64)[39]
Work-related stress	Incident CVD events	RR, 1.4 (1.2–1.8)[18]
Any-cause stress	Incident CHD/CHD mortality	RR, 1.27 (1.12–1.45)[19]
PTSD	Incident CHD	RR, 1.61 (1.46–1.77)[22]
Social isolation and loneliness	Incident CVD events	RR, 1.5 (1.2–1.9)[18]
Pessimism	CHD mortality	OR, 2.17 (1.21–3.89)[50] (highest vs lowest quartile)
Anger and hostility	Incident CHD	HR, 1.19 (1.05–1.35)[33]
	Recurrent CHD	HR, 1.24 (1.08–1.42)[33]

Levine GN, et al. Circulation. 2021

AHA Scientific Statement 2021

Psychological Health, Well-Being, and Mind-Heart Body Connection

TABLE 2. EFFECT ESTIMATES FOR ASSOCIATIONS OF POSITIVE PSYCHOLOGICAL FACTORS WITH CARDIOVASCULAR EVENTS AND CARDIOVASCULAR HEALTH INDICATORS.

Optimism	Incident CVD	RR, 0.65 (0.51–0.78)[66]
	Hospital readmission after ACS	HR, 0.92 (0.86–0.98)[68]
	All-cause mortality	RR, 0.86 (0.80–0.92)[66]
Sense of purpose	CVD risk	RR, 0.83 (0.75–0.92)[76]
	All-cause mortality	RR, 0.83 (0.75–0.91)[76]
Happiness/more positive affect*	Incident CHD	HR, 0.78 (0.63–0.96)[93]
Mindfulness†	Good cardiovascular health	PR, 1.83 (1.07–3.13)[86]
	Nonsmoking	PR, 1.37 (1.06–1.76)[86]
	Body mass index <25 kg/m^2	PR, 2.17 (1.16–4.07)[86]
	Fasting glucose <100 mg/dL	PR, 1.47 (1.06–2.04)[86]
	High level of physical activity	PR, 1.56 (1.04–2.35)[86]
Higher emotional vitality	Incident CHD	RR, 0.81 (0.69–0.94)[88]
Psychological well-being	Cardiovascular mortality	OR, 0.71 (0.59–0.84)[89]

Levine GN, et al. Circulation. 2021

AHA Scientific Statement 2021

Psychological Health, Well-Being, and Mind-Heart Body Connection

"We must strive to reduce negative aspects of psychological health and promote on overall positive and healthy state of being"

Levine GN, et al. Psychological Health, Well-Being, and the Mind-Heart-Body Connection: A Scientific Statement From the American Heart Association. Circulation. 2021

Consequences of Stress

PHYSIOLOGIC RESPONSE

Release of stress hormones (cortisol, adrenaline, norepinephrine)

Breathing quickens

HR & BP increase

Digestion slows

Blood-clotting mechanisms became activated

Consequences of Stress

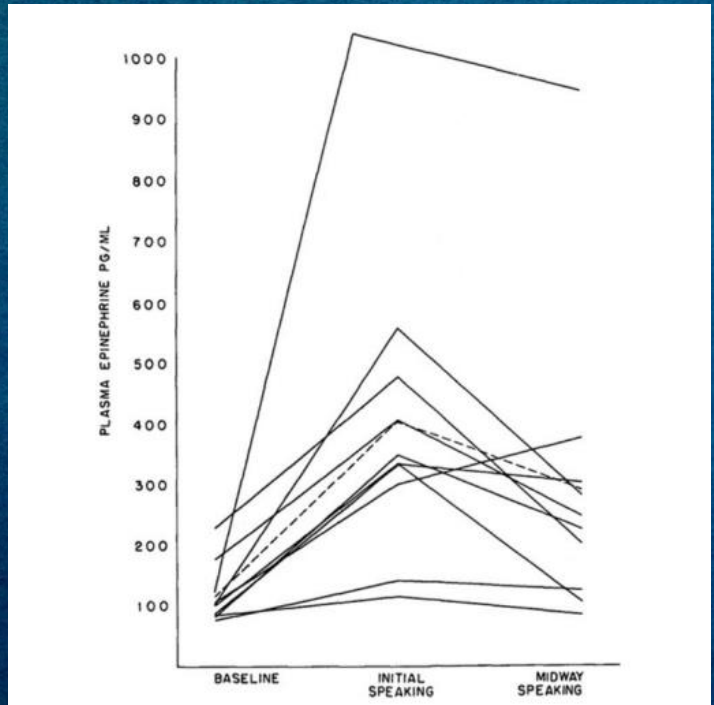


Figure 4. Effect of Public Speaking on Plasma Epinephrine
Plasma epinephrine response to different activities. Each **line** represents a single subject; the **dotted line** indicates the mean. Reprinted, with permission, from Dimsdale and Moss (7).

Dimsdale JE, Moss J. Short-term catecholamine response to psychological stress. Psychosom Med. 1980

Consequences of Chronic Stress

Increased blood pressure

Arterial inflammation

Increased cholesterol

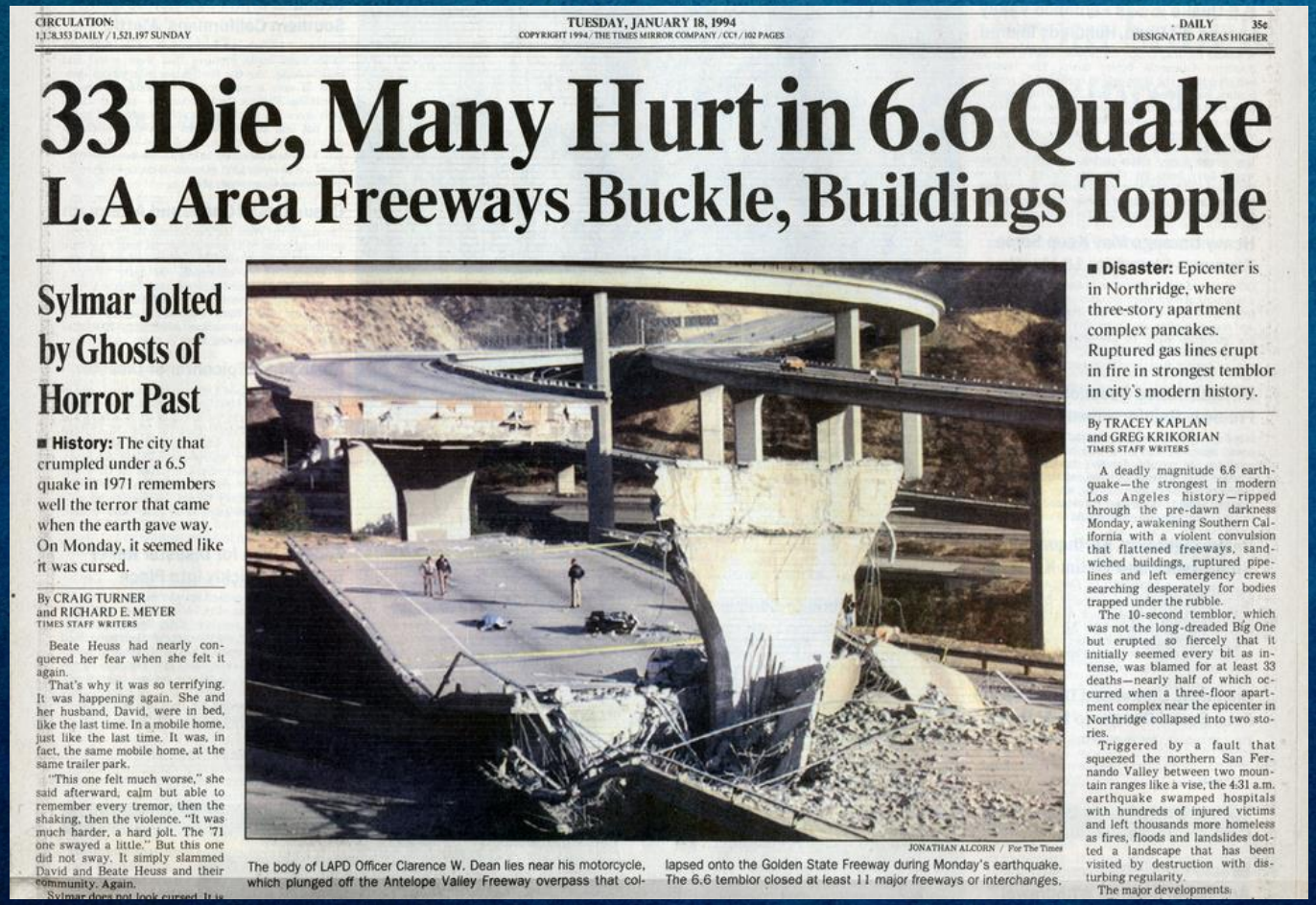
Blood Clotting

Trigger cardiac death

Behavior implications

sleep, activity, eating, smoking

Acute Stress & Mortality



CIRCULATION: 1,338,353 DAILY / 1,521,197 SUNDAY

TUESDAY, JANUARY 18, 1994
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DAILY 35¢
DESIGNATED AREAS HIGHER

33 Die, Many Hurt in 6.6 Quake

L.A. Area Freeways Buckle, Buildings Topple

Sylmar Jolted by Ghosts of Horror Past

■ **History:** The city that crumpled under a 6.5 quake in 1971 remembers well the terror that came when the earth gave way. On Monday, it seemed like it was cursed.

By CRAIG TURNER and RICHARD E. MEYER
TIMES STAFF WRITERS

Beate Heuss had nearly conquered her fear when she felt it again.

That's why it was so terrifying. It was happening again. She and her husband, David, were in bed, like the last time. In a mobile home, just like the last time. It was, in fact, the same mobile home, at the same trailer park.

"This one felt much worse," she said afterward, calm but able to remember every tremor, then the shaking, then the violence. "It was much harder, a hard jolt. The '71 one swayed a little." But this one did not sway. It simply slammed David and Beate Heuss and their community. Again.

Sylmar does not look cursed. It is

JONATHAN ALCORN / For The Times

The body of LAPD Officer Clarence W. Dean lies near his motorcycle, which plunged off the Antelope Valley Freeway overpass that collapsed onto the Golden State Freeway during Monday's earthquake. The 6.6 temblor closed at least 11 major freeways or interchanges.

■ **Disaster:** Epicenter is in Northridge, where three-story apartment complex pancakes. Ruptured gas lines erupt in fire in strongest temblor in city's modern history.

By TRACEY KAPLAN and GREG KRIKORIAN
TIMES STAFF WRITERS

A deadly magnitude 6.6 earthquake—the strongest in modern Los Angeles history—ripped through the pre-dawn darkness Monday, awakening Southern California with a violent convulsion that flattened freeways, sandwiched buildings, ruptured pipelines and left emergency crews searching desperately for bodies trapped under the rubble.

The 10-second temblor, which was not the long-dreaded Big One but erupted so fiercely that it initially seemed every bit as intense, was blamed for at least 33 deaths—nearly half of which occurred when a three-floor apartment complex near the epicenter in Northridge collapsed into two stories.

Triggered by a fault that squeezed the northern San Fernando Valley between two mountain ranges like a vise, the 4:31 a.m. earthquake swamped hospitals with hundreds of injured victims and left thousands more homeless as fires, floods and landslides dotted a landscape that has been visited by destruction with disturbing regularity.

The major developments

Acute Stress & Mortality

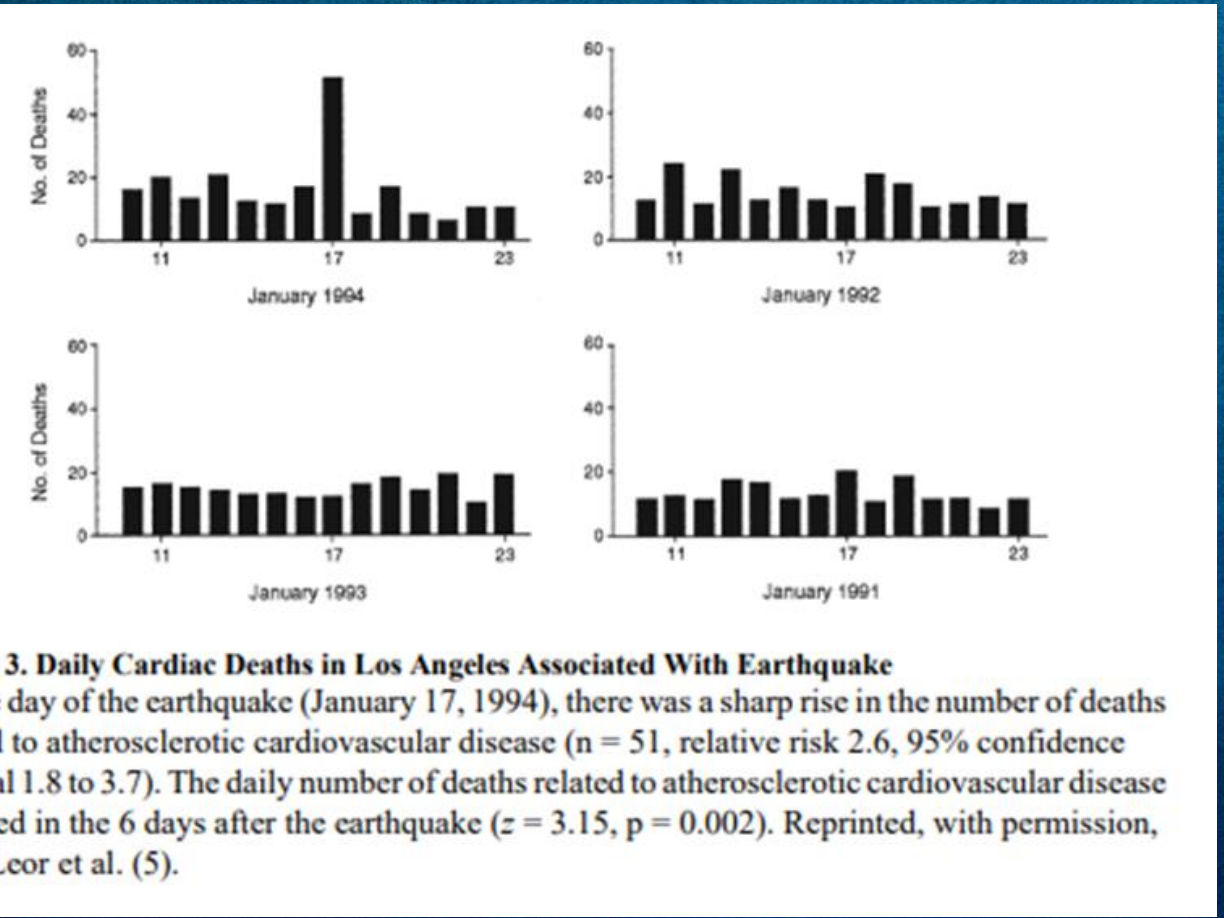
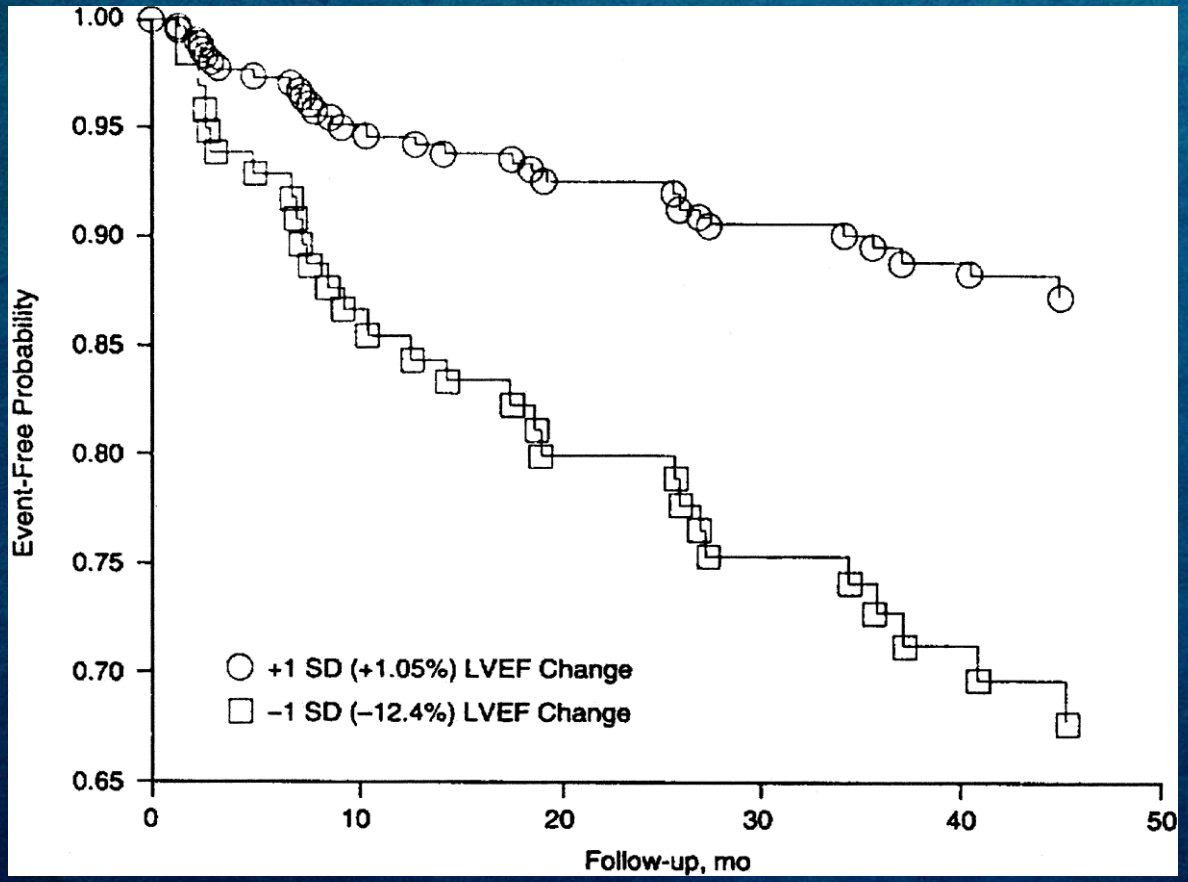


Figure 3. Daily Cardiac Deaths in Los Angeles Associated With Earthquake
On the day of the earthquake (January 17, 1994), there was a sharp rise in the number of deaths related to atherosclerotic cardiovascular disease (n = 51, relative risk 2.6, 95% confidence interval 1.8 to 3.7). The daily number of deaths related to atherosclerotic cardiovascular disease declined in the 6 days after the earthquake ($z = 3.15$, $p = 0.002$). Reprinted, with permission, from Leor et al. (5).

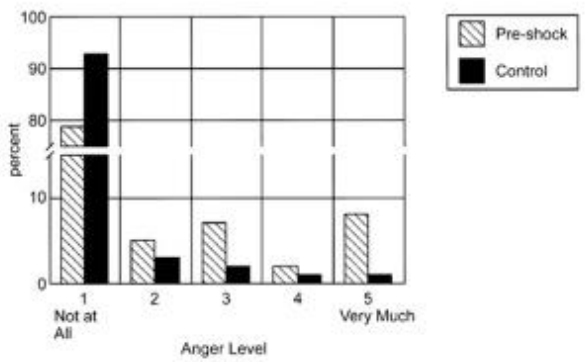
Leor. Sudden cardiac death triggered by an earthquake. N Engl J Med. 1996

Arithmetic and LVEF



Dimsdale JE. Psychological stress and cardiovascular disease. J Am Coll Cardiol. 2008

Anger & Cardiac Arrythmias



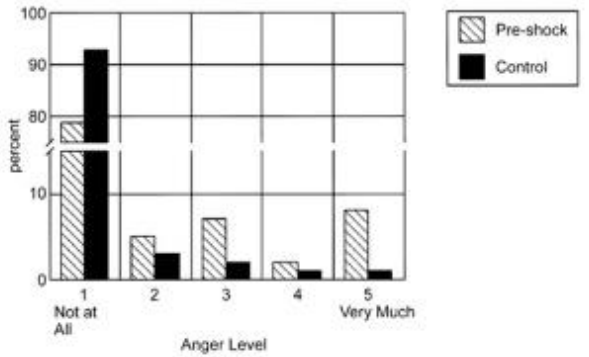
Rachel Lampert. Circulation. Emotional and Physical Precipitants of Ventricular Arrhythmia. Volume: 106, Issue: 14, Pages: 1800-1805, DOI: (10.1161/01.CIR.0000031733.51374.C1)

Lampert R. Emotional and physical precipitants of ventricular arrhythmia. Circulation. 2002

Anger & Cardiac Arrythmias

Lampert NIH Presentation on YouTube:

"Psychological Stress and Sudden Cardiac Death"



Rachel Lampert. Circulation. Emotional and Physical Precipitants of Ventricular Arrhythmia. Volume: 106, Issue: 14, Pages: 1800-1805, DOI: (10.1161/01.CIR.0000031733.51374.C1)

Lampert R. Emotional and physical precipitants of ventricular arrhythmia. Circulation. 2002

PTSD & CVD

Vietnam Veterans (Boscarino 2008)

- PTSD hazard ration >2.25 (as compared to those without PTSD)

PTSD, CVD, Women Veterans (Ebrahimi 2021)

- 44% more likely to develop ischemic heart disease including heart attacks
- 72% increased risk for women <40
- "Understudied, underdiagnosed, undertreated"
- Black, Hispanic, Non-white at higher risk

PTSD and Myocardial Ischemia

Turner 2013

Evidence of Ischemia

- PTSD 17%
- No PTSD 10%
- Odds ratio: 2.42

- PTSD was independent predictor of myocardial disease

The association of PTSD and ischemia among patients without known CVD highlights an opportunity for early interventions to prevent progression of cardiovascular disease.

Turner, et al. Objective evidence of myocardial ischemia in patients with posttraumatic stress disorder. *Biol Psychiatry*. 2013

Perception of Stress & Mortality

FROM NHIS 1996 SURVEY (n=28,753, 8 year f/u)

Previous 12 months

Reported Stress

no stress *little stress* *moderate stress* *a lot of stress*

Perception that stress affected health

a lot *hardly any* *none*

Keller A, et al. Does the perception that stress affects health matter? The association with health and mortality. Health Psychol. 2012

Perception of Stress & Mortality

"A LOT OF STRESS" & EFFECT ON HEALTH "A LOT"

43% Increased Risk of Premature Death

"A LOT OF STRESS" & EFFECT ON HEALTH "NONE"

lowest risk of premature death!

(TED TALK Kelly McGonigal-Health Psychologist-How to Make Stress Your Friend)

Keller A, et al. Does the perception that stress affects health matter? The association with health and mortality. Health Psychol. 2012

INTERHEART STUDY

Case Control Design

- 11,119 patients (first MI) with matched controls
- 262 centers, 52 countries
- Mean age 58.2 (MI), 57.1 (control)
- Female 24.5% (MI), 26.5% (control)

Rosengren A, et al. INTERHEART investigators. Association of psychosocial risk factors with risk of acute myocardial infarction in 11119 cases and 13648 controls from 52 countries Lancet. 2004

INTERHEART STUDY

Work and Home Stress

"How often did you feel stress?"

Never *Some periods* *Several Periods* *Permanent stress*

Financial Stress

little or none *moderate* *high or severe*

Rosengren A, et al. INTERHEART investigators. Association of psychosocial risk factors with risk of acute myocardial infarction in 11119 cases and 13648 controls from 52 countries Lancet. 2004

INTERHEART STUDY

RESULTS

	MI	Control
Work Stress	23.0%	17.9%
5 year permanent work stress	10.0%	5.0%
Home Stress	11.6%	8.6%
Permanent home stress	3.5%	1.9%
Severe Financial Stress	14.6%	12.2%

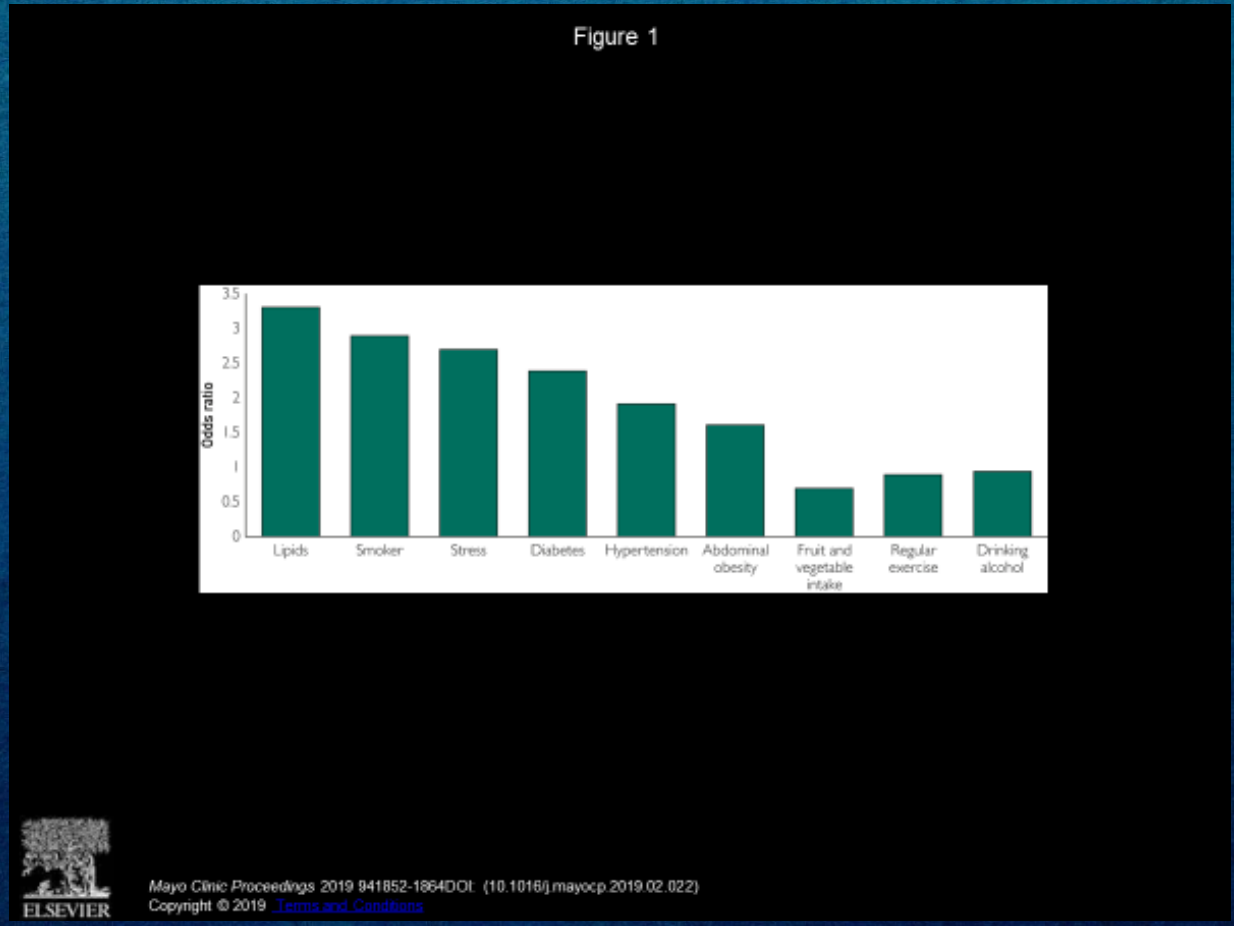
Rosengren A, et al. INTERHEART investigators. Association of psychosocial risk factors with risk of acute myocardial infarction in 11119 cases and 13648 controls from 52 countries Lancet. 2004

INTERHEART STUDY

Psychosocial factors

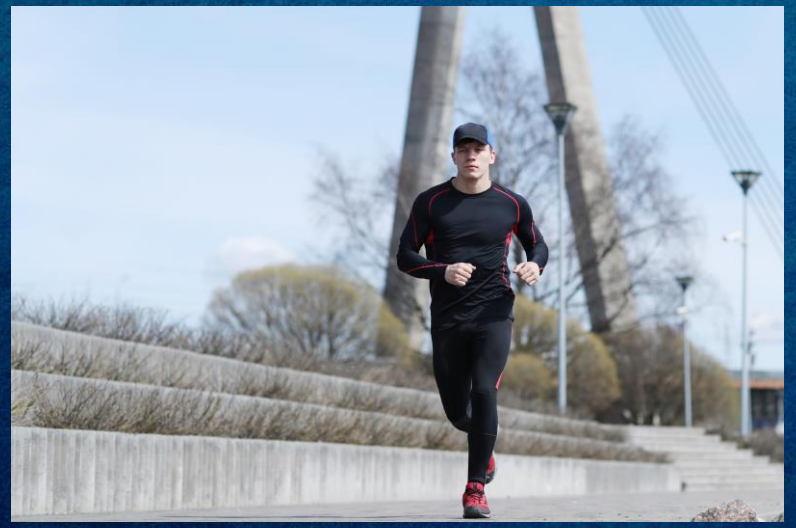
carry an odds ratio for myocardial infarction

similar to that of "traditional" risk factors



Rosengren A, et al. INTERHEART investigators. Association of psychosocial risk factors with risk of acute myocardial infarction in 11119 cases and 13648 controls from 52 countries Lancet. 2004

Interventions



Coping Strategies

Effective coping strategies can offset the state of hyperarousal associated with stress response

Potential stress management techniques

- meditation
- deep breathing
- mental imagery
- progressive muscle relaxation
- physical activity
- [mindfulness activities]

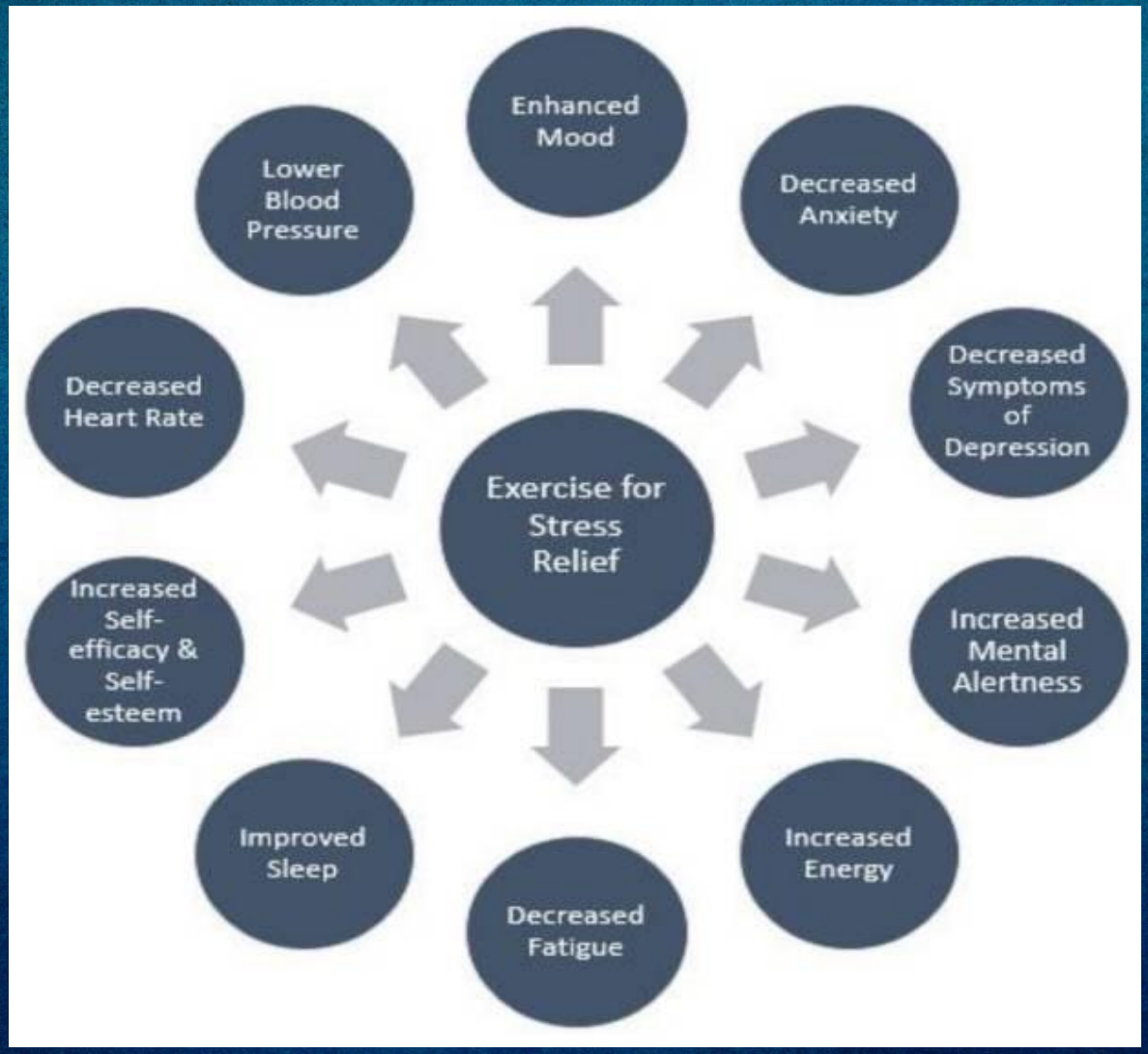
Franklin BA, et al. Chronic Stress, Exercise and Cardiovascular Disease: Placing the Benefits and Risks of Physical Activity into Perspective. Int J Environ Res Public Health. 2021

Stress Bucket

Brabban and Turkington 2002

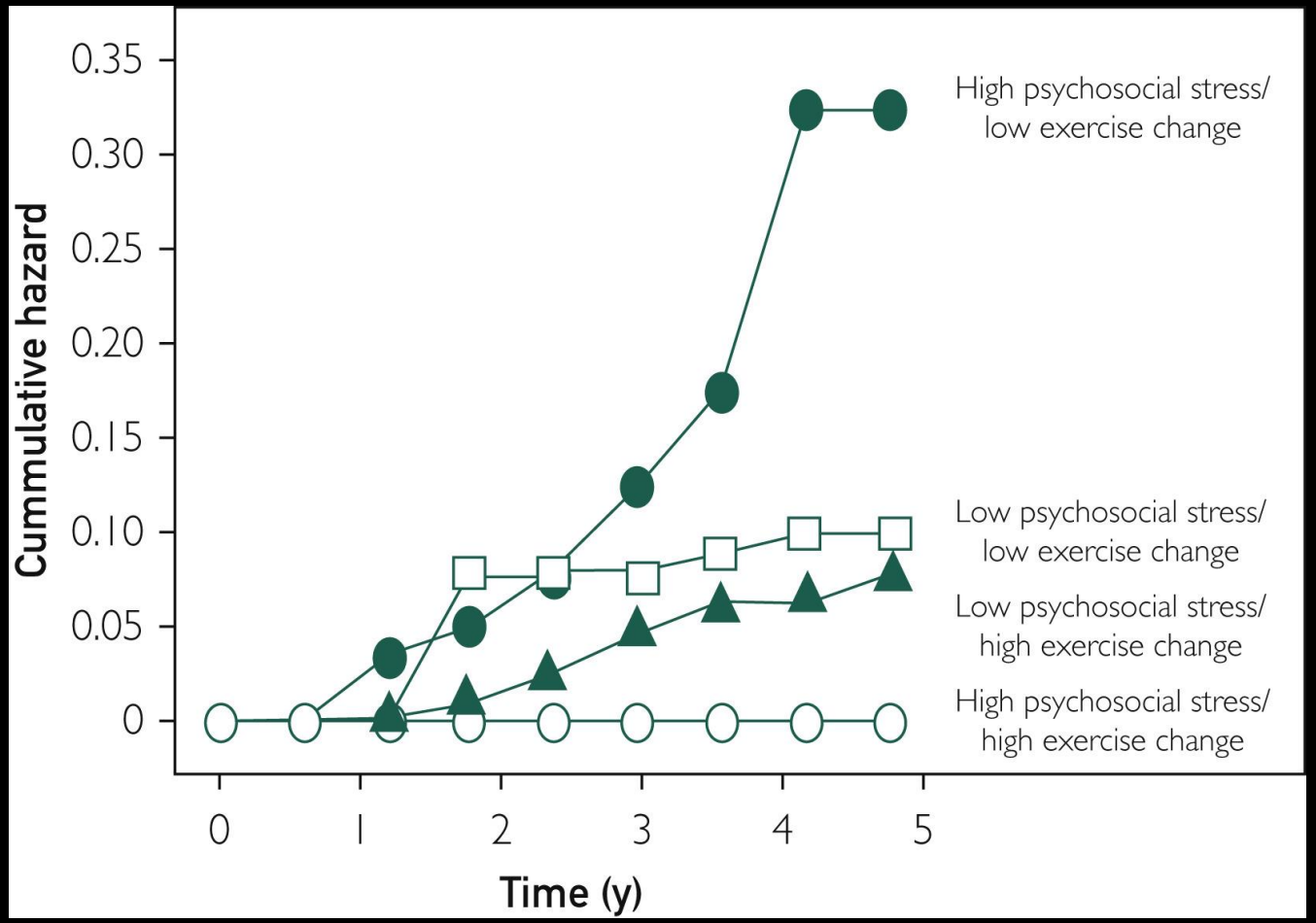
[Mental Health, UK The Stress Bucket (accessed 11/13/21) https://mentalhealth-uk.org/blog/the-stress-bucket/]

Exercise



Franklin BA, et al. Chronic Stress, Exercise and Cardiovascular Disease: Placing the Benefits and Risks of Physical Activity into Perspective. Int J Environ Res Public Health. 2021

Figure 3



Mayo Clinic Proceedings 2019 941852-1864DOI: (10.1016/j.mayocp.2019.02.022)

Endurance Training & Psychosocial Stress

Klaperski 2014

- RCT, 96 men
- 12-week exercise training vs relaxation training vs control
- Trier Social Stress Test
  - Salivary free cortisol
  - Heart rate
  - Heart rate variability

Klaperski S, et al. Effects of a 12-week endurance training program on the physiological response to psychosocial stress in men: a randomized controlled trial. J Behav Med. 2014

Endurance Training & Psychosocial Stress

Klaperski 2014

CROSS-STRESSOR ADAPTATION HYPOTHOTHESIS

Regular exercise leads to biological adaptations which contribute to reduced physiological reactions not only to exercise-related stressors **but to stressors in general**

Endurance Training & Psychosocial Stress

Klaperski 2014

Exercise Group (Running)

- Two 60 minute training sessions/week
- 1 weekly group, 1 weekly individual
- HR controlled running program for beginners, outdoors
- Walk-running initially
  - then 60-80% of MHR (@5 weeks)
- Utilized HR monitor, training journal

Relaxation Training

- 4-6 approaches for relaxation
  - (PMR, breathing, imagery)
- Did not report if this was done in group, individual, or independently

Klaperski S, et al. Effects of a 12-week endurance training program on the physiological response to psychosocial stress in men: a randomized controlled trial. J Behav Med. 2014

Endurance Training & Psychosocial Stress

Klaperski 2014

RESULTS

	CORTISOL REACTIVITY	HR REACTIVITY	HRV REACTIVITY
RUNNING GROUP	Improved	Improved	Improved
RELAXATION GROUP	Improved		
CONTROL			

Klaperski S, et al. Effects of a 12-week endurance training program on the physiological response to psychosocial stress in men: a randomized controlled trial. J Behav Med. 2014

“Everything can be taken from a man but one thing:
the last of the human freedoms —
to choose one's attitude in any given set of circumstances,
to choose one's own way.”

Viktor Frankl

(Lived to age 92)

Cognitive Behavior Therapy Intervention

Gulliksson

Cognitive behavioral therapy helps you become aware of inaccurate or negative thinking so you can view challenging situations more clearly and respond to them in a more effective way.

Gulliksson M, et al. Randomized controlled trial of cognitive behavioral therapy vs standard treatment to prevent recurrent cardiovascular events in patients with coronary heart disease. Arch Intern Med. 2011 Jan 24;171(2):134-40.

Cognitive Behavior Therapy Intervention-POST CAD

Gulliksson

RCT comparing CBT intervention group to control

- Primary variable CVD recurrence (mortality, MI, hospitalization)
- N=362 (85 females)
- Coronary Heart Disease Event prior 12 months
- Traditional care (170 participants)
- Traditional care & CBT program (192 patients)

Gulliksson M, et al. Randomized controlled trial of cognitive behavioral therapy vs standard treatment to prevent recurrent cardiovascular events in patients with coronary heart disease. Arch Intern Med. 2011 Jan 24;171(2):134-40.

Cognitive Behavior Therapy Intervention

Gulliksson

Cognitive Behavioral Therapy Program

- focused on stress management
- **20 sessions, two hours each, over 1 year**
- Group sessions led by a therapist, 7-9 participants
  - Male or Female groups (not coed)
- 85% attendance

Gulliksson M, et al. Randomized controlled trial of cognitive behavioral therapy vs standard treatment to prevent recurrent cardiovascular events in patients with coronary heart disease. Arch Intern Med. 2011 Jan 24;171(2):134-40.

Cognitive Behavior Therapy Intervention

Gulliksson

Cognitive Behavioral Therapy Program

5 KEY COMPONANTS

- Education
- Self-Monitoring
- Skills Training
- Cognitive Restructuring
- Spiritual Development

Gulliksson M, et al. Randomized controlled trial of cognitive behavioral therapy vs standard treatment to prevent recurrent cardiovascular events in patients with coronary heart disease. Arch Intern Med. 2011 Jan 24;171(2):134-40.

Cognitive Behavior Therapy Intervention

Gulliksson

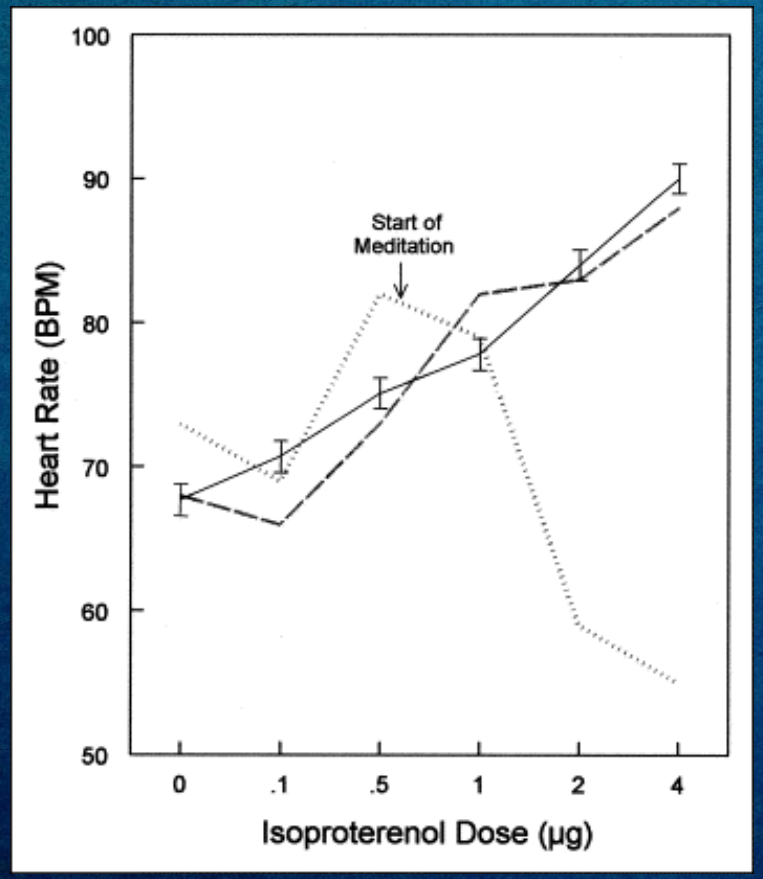
Results

- Mean f/u 94 months (7 years, 10 months)
- CBT group 41% lower rate of fatal and non-fatal first recurrent CVD events
- 45% fewer recurrent MI's
- 28% lower all cause mortality (non-significant)

- Dose response effect observed in relation to attendance (intervention group)

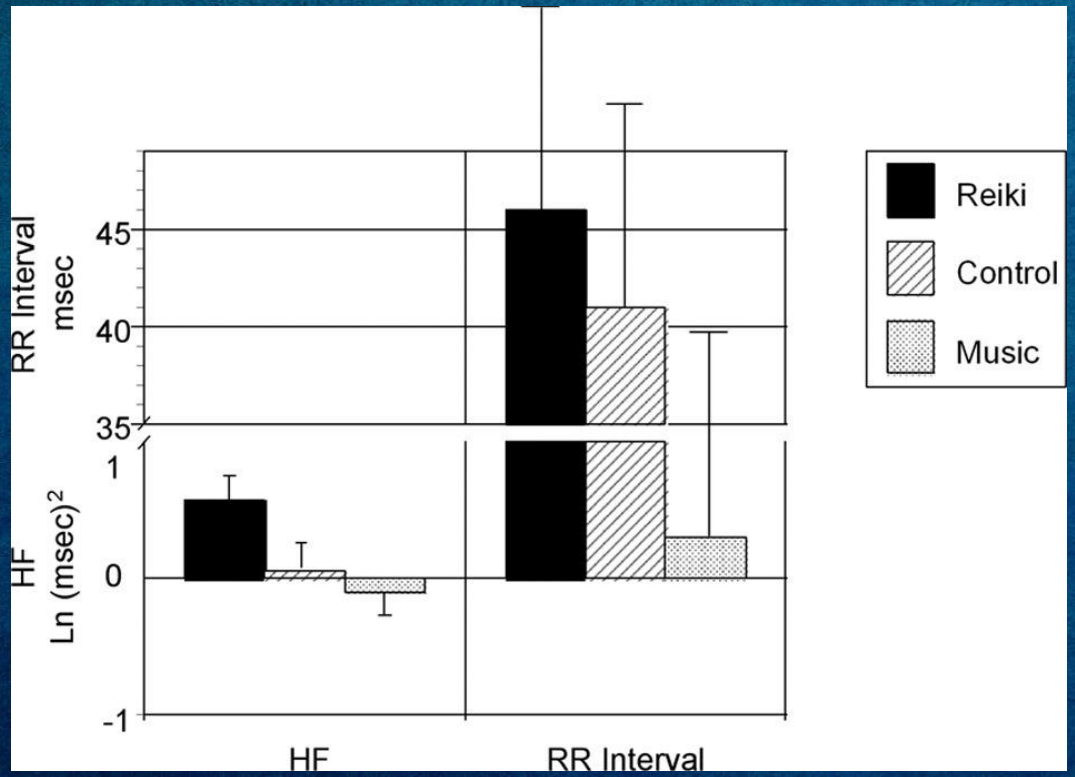
Gulliksson M, et al. Randomized controlled trial of cognitive behavioral therapy vs standard treatment to prevent recurrent cardiovascular events in patients with coronary heart disease. Arch Intern Med. 2011 Jan 24;171(2):134-40.

Meditation vs. Beta Agonist



Dimsdale JE, Mills PJ. An unanticipated effect of meditation on cardiovascular pharmacology and physiology. Am J Cardiol. 2002

Reiki after Acute Coronary Syndrome



Friedman RS, Burg MM, Miles P, Lee F, Lampert R. Effects of Reiki on autonomic activity early after acute coronary syndrome. J Am Coll Cardiol. 2010

Cardiac Rehab vs. CR with Stress Management Training

151 Participants Randomized to CR OR Cardiac Rehab and SMT

Matched sample of CR-eligible patients who di not receive CR (non-CR comparison group

Median f/u of 3.2 years for clinical events

(comprehensive CR at Duke and UNC)

Blumenthal, JA et al. Enhancing Cardiac Rehabilitation With Stress Management Training. Circulation. 2016

Cardiac Rehab vs. CR with Stress Management Training

Stress Management Training

- Education
- Group Support
- Cognitive-Behavioral Therapy

Blumenthal, JA et al. Enhancing Cardiac Rehabilitation With Stress Management Training. Circulation. 2016

Cardiac Rehab vs. CR with Stress Management Training

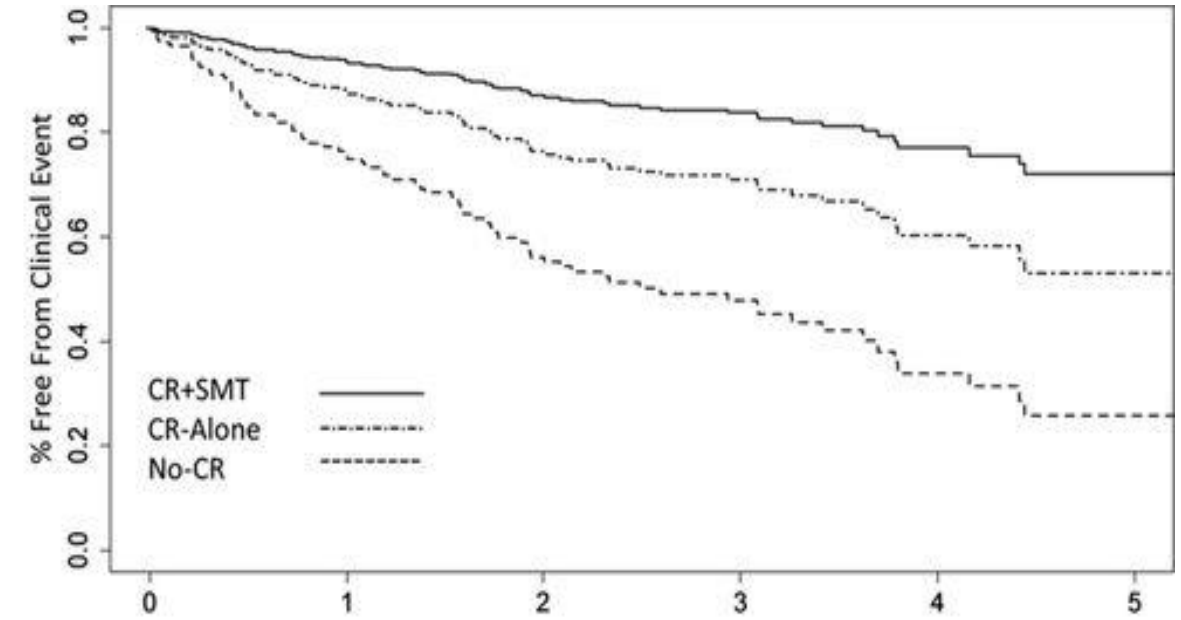
<u>Stress Management Training</u>

- Education
- Group Support
- Cognitive-Behavioral Therapy

12 Weekly 90 min sessions

4-8 participants

Blumenthal, JA et al. Enhancing Cardiac Rehabilitation With Stress Management Training. Circulation. 2016



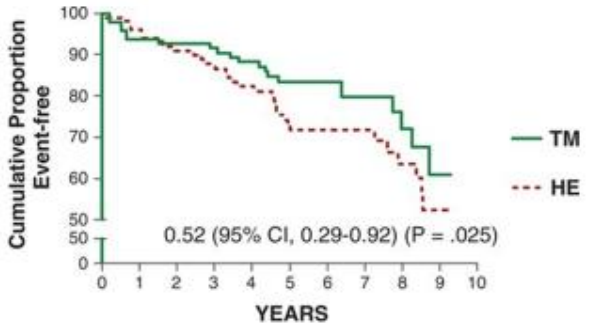
No. at risk			
Overall	226	111	27
CR+SMT	76	49	9
CR-Alone	75	37	11
No-CR	75	25	7

Clinical Events (vs no CR)

CR	18% fewer
CR&SMT	33% fewer

James A. Blumenthal. Circulation. Enhancing Cardiac Rehabilitation With Stress Management Training, Volume: 133, Issue: 14, Pages: 1341-1350, DOI: (10.1161/CIRCULATIONAHA.115.018926)

Meditation in patients with CAD



48% reduction in the risk for cardiovascular clinical events
(mortality, myocardial infarction)

Schneider RH, Grim CE, Rainforth MV, et al. Stress reduction in the secondary prevention of cardiovascular disease: randomized, controlled trial of transcendental meditation and health education in Blacks. Circ Cardiovasc Qual Outcomes. 2012

HeartMath

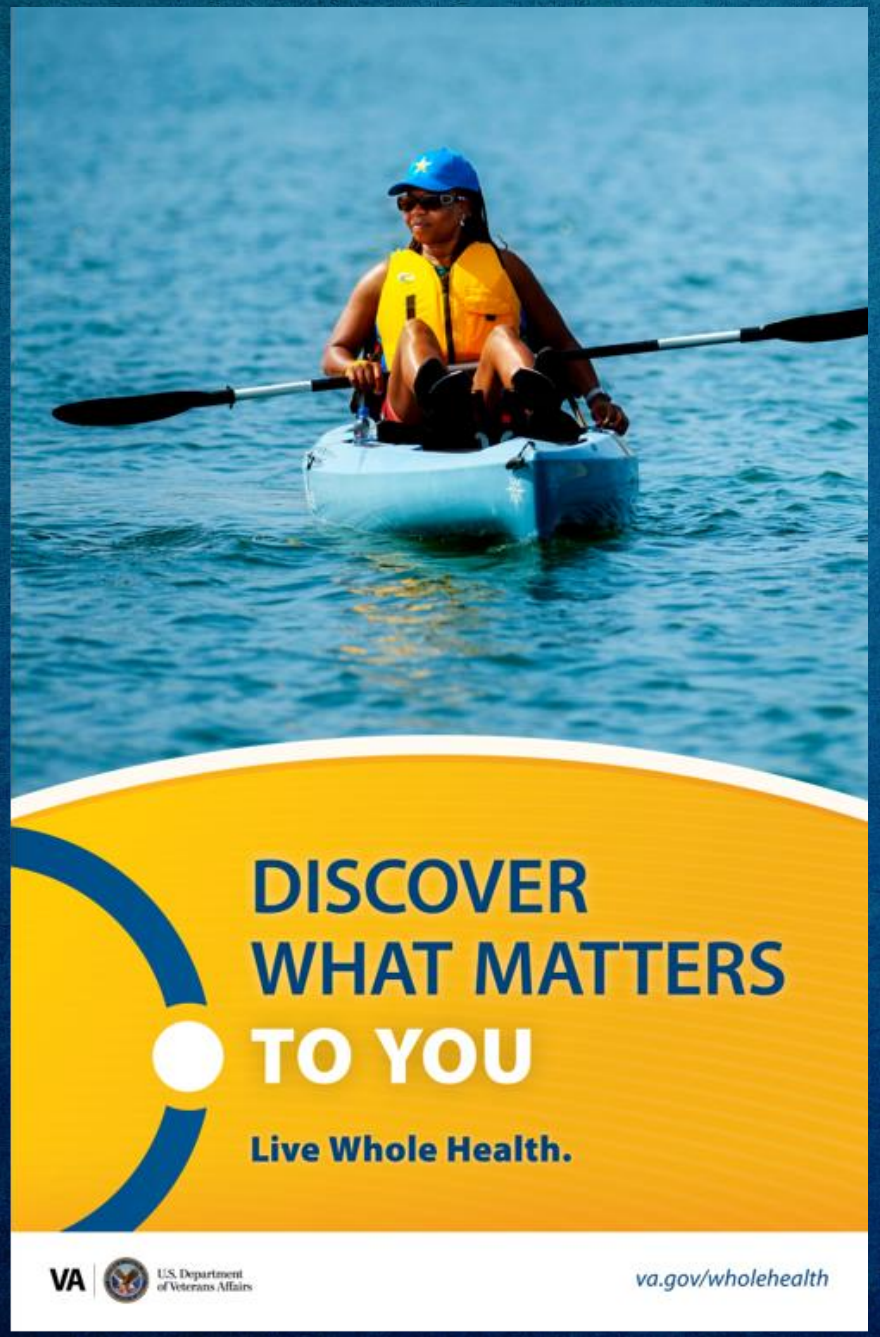
- Heart Focused Breath
- Depletion to Renewal Plan
- Quick Coherence Technique
- Heart Lock-in
- Coherent Communication Technique
- Attitude Breathing Technique
- Freeze Frame Technique

HeartMath

HeartMath® Technology

- Biofeedback device
- Phone app
- Tracks Practice
- Provides feedback on progress

Live Whole Health.
va.gov/wholehealth



Live Whole Health.
va.gov/wholehealth

Personal Health Inventory

Live Whole Health.
va.gov/wholehealth

Rate where you feel you are on the scales below from 1-5, with 1 being miserable and 5 being great.

Physical Well-Being				
☐ 1 Miserable	☐ 2	☐ 3	☐ 4	☐ 5 Great
Mental/Emotional Well-Being				
☐ 1 Miserable	☐ 2	☐ 3	☐ 4	☐ 5 Great
Life: How is it to live your day-to-day life?				
☐ 1 Miserable	☐ 2	☐ 3	☐ 4	☐ 5 Great

What is your mission, aspiration, or purpose? What do you live for? What matters most to you?
Write a few words to capture your thoughts:

Personal Health Inventory

Live Whole Health.
va.gov/wholehealth

Where You Are and Where You Would Like to Be

For each area below, consider "Where you are" and "Where you want to be". Write in a number between 1 (low) and 5 (high) that best represents where you are and where you want to be. You do not need to be a "5" in any of the areas now, nor even wish to be a "5" in the future.

Area of Self Care	Where I am Now (1-5)	Where I Want to Be (1-5)
Moving the Body: Our physical, mental, and emotional health are impacted by the amount and kind of movement we do. Moving the body can take many forms such as dancing, walking, gardening, yoga, and exercise.		
Recharge: Our bodies and minds must rest and recharge in order to optimize our health. Getting a good night's rest as well as recharging our mental and physical energy throughout the day are vital to well-being. Taking short breaks or doing something you enjoy or feels good for moments throughout the day are examples of ways to refresh.		
Food and Drink: What we eat and drink can have a huge effect on how we experience life, both physically and mentally. Energy, mood, weight, how long we live, and overall health are all impacted by what and how we choose to eat and drink.		
Personal Development: Our health is impacted by how we choose to spend our time. Aligning our work and personal activities with what really matters to us, or what brings us joy, can have a big effect on our health and outlook on life.		
Family, Friends, and Co-Workers: Our relationships, including those with pets, have as significant an effect on our physical and emotional health as any other factor associated with well-being. Spending more time in relationships that 'fuel' us and less in relationships that 'drain' us is one potential option. Improving our relationship skills or creating new		

Personal Health Inventory

Reflections

Now that you have thought about what matters to you in all of these areas, what would your life look like if you had the health you want? What kind of activities would you be doing? Or how might you feel different? What area might you focus on?

What might get in the way? How might you start?

After completing the Personal Health Inventory, talk to a friend, a family member, your health coach, a peer, or someone on your health care team about areas you would like to explore further. Or visit www.va.gov/wholehealth.

VA Manage Stress Workbook

[Manage Stress Workbook (Department of Veterans Affairs) (va.gov)]

Screening for Stress

Perceived Stress Scale

- 10 Item Scale
- Scores rang from 0-40
- 0-13 low stress
- 14-26 moderate stress
- 27-40 high stress

For each question choose from the following alternatives:
0 - never 1 - almost never 2 - sometimes 3 - fairly often 4 - very often

_____ l. In the last month, how often have you been upset because of something that happened unexpectedly?

_____ 2. In the last month, how often have you felt that you were unable to control the important things in your life?

_____ 3. In the last month, how often have you felt nervous and stressed?

_____ 4. In the last month, how often have you felt confident about your ability to handle your personal problems?

_____ 5. In the last month, how often have you felt that things were going your way?

_____ 6. In the last month, how often have you found that you could not cope with all the things that you had to do?

_____ 7. In the last month, how often have you been able to control irritations in your life?

_____ 8. In the last month, how often have you felt that you were on top of things?

_____ 9. In the last month, how often have you been angered because of things that happened that were outside of your control?

_____ 10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?