

Learning to Bend

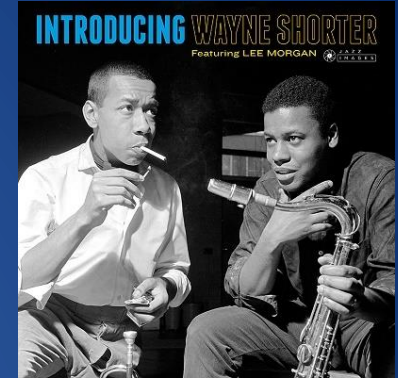
Improving Physical Function and Frailty Through
Psychological Flexibility

8/15/26

Patrick J. Smith, PhD, MPH
University of North Carolina
Associate Professor of Psychiatry

Thank you!

- C. Virginia O'Hayer
- Rhonda Merwin
- Krista Ingle
- Tony Sung
- Chris F. Drescher
- Heather Bruschwein
- Chelsi N. Nurse
- Benson Hoffman
- Marci Loiselle
- Greg Stonerock
- Tim Strauman
- Bill Kraus
- Kim Huffman
- Deb Muoio
- Carl Pieper
- Jon Singer
- Kathy Ramos
- Jim Blumenthal
- Andy Sherwood
- Mike Babyak
- Kathie Welsh-Bohmer
- Deborah Attix
- Jeff N. Browndyke
- Jim Burke
- Heidi Roth
- Daniel Parker
- Heather Whitson
- Guy Potter
- Moria Smoski
- Paul Costa

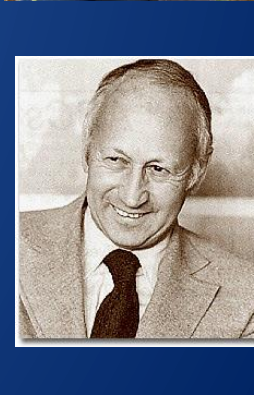
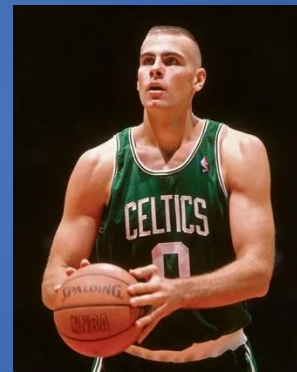


[Contact info](#)

Patrick_smith@med.unc.edu

Outline

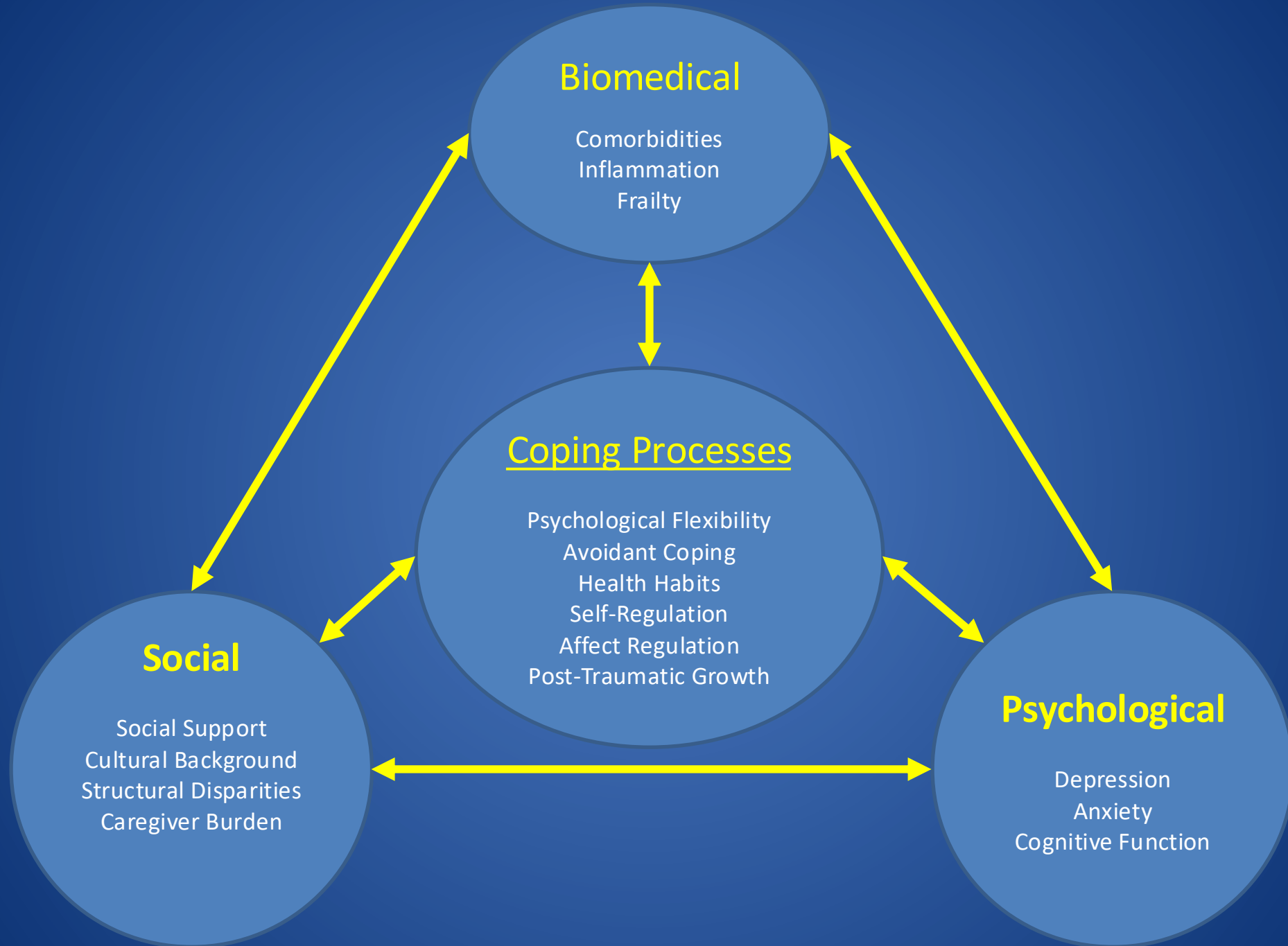
- Psychological Flexibility
 - Domains
 - Key Psychological Processes
 - Trials in Chronic Disease Populations
 - ACT Protocols
- Biobehavioral Resilience / Frailty
 - Domains
 - Convergent risk profiles
 - Randomized trials
 - Coping skills training
 - Mechanisms
- Discussion



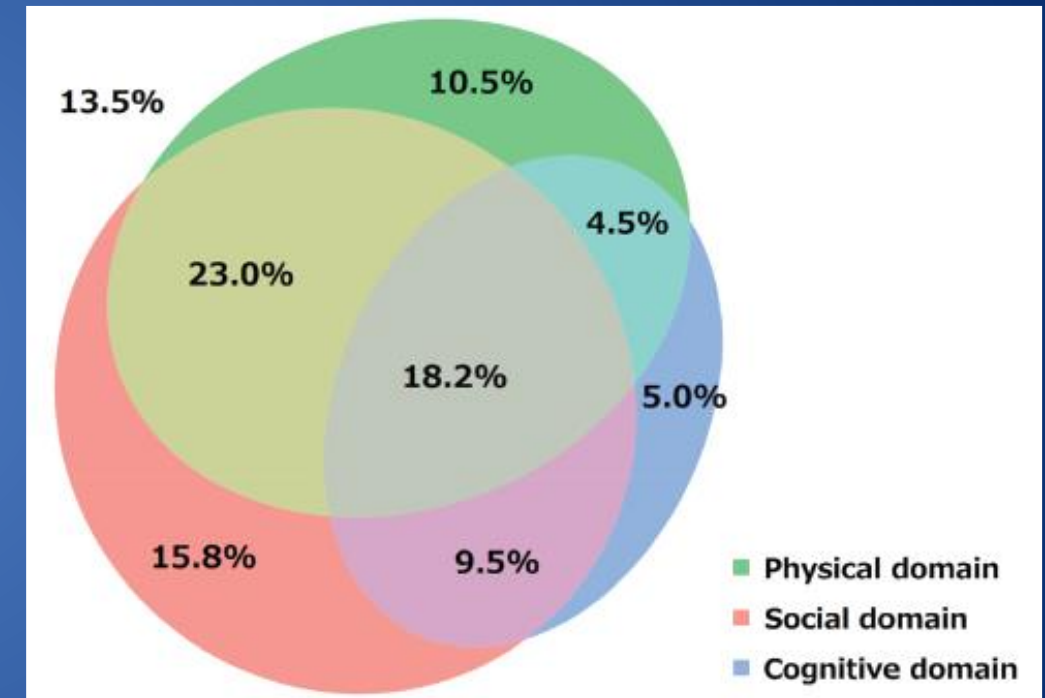
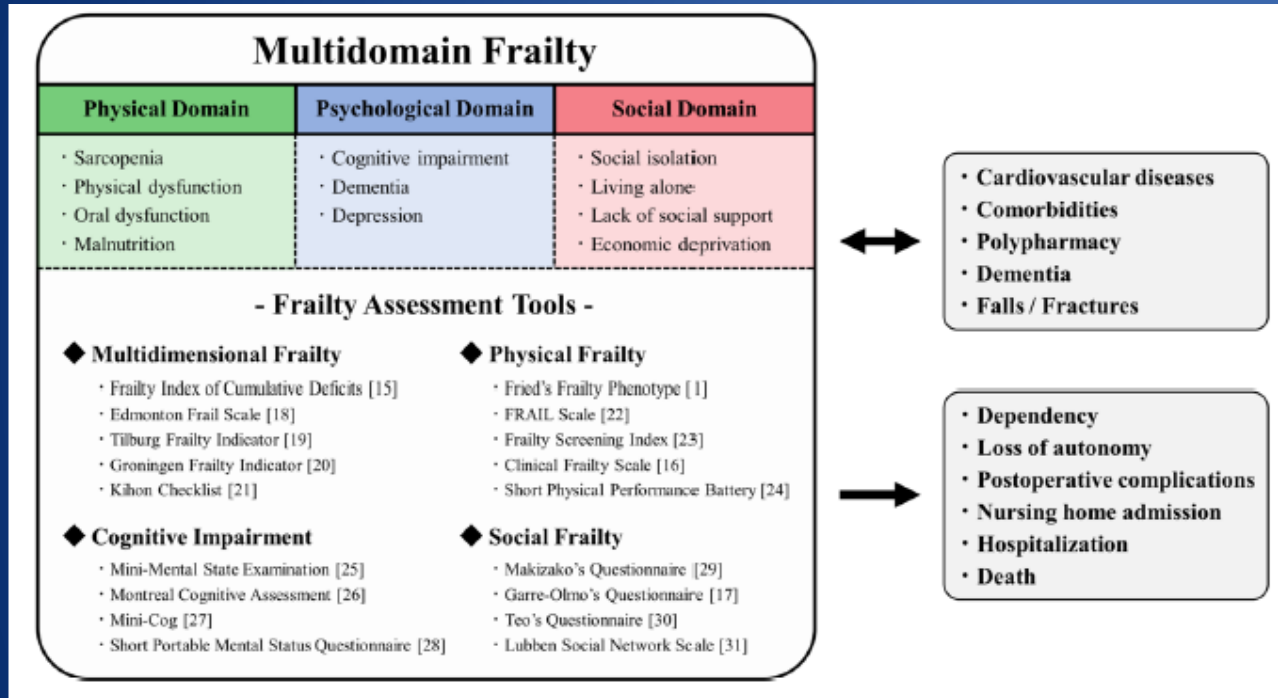
Modifiable Risk Mechanisms

- ‘God grant me the strength to accept the things I cannot change, the courage to change the things I can, and the wisdom to know the difference.’
 - ACT + coping skills-> mood, adherence, QoL, and clinical events
 - Physical activity, sleep, and coping styles
 - Psychological flexibility / resilience
 - Exercise + diet -> cognitive function and mood
 - Fitness, weight loss, vascular + metabolic function
 - Physical frailty

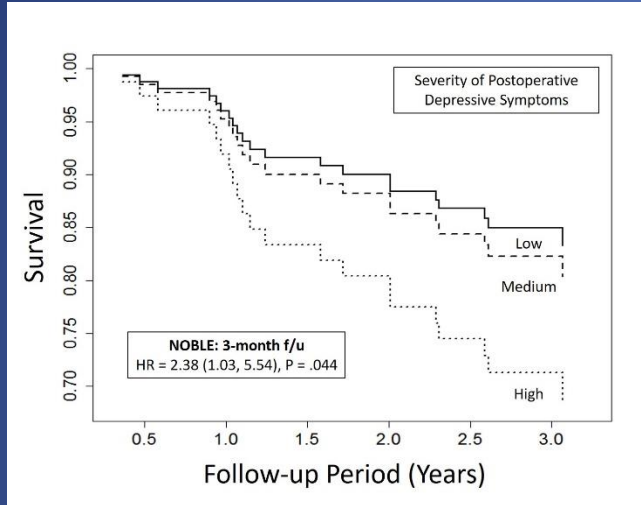




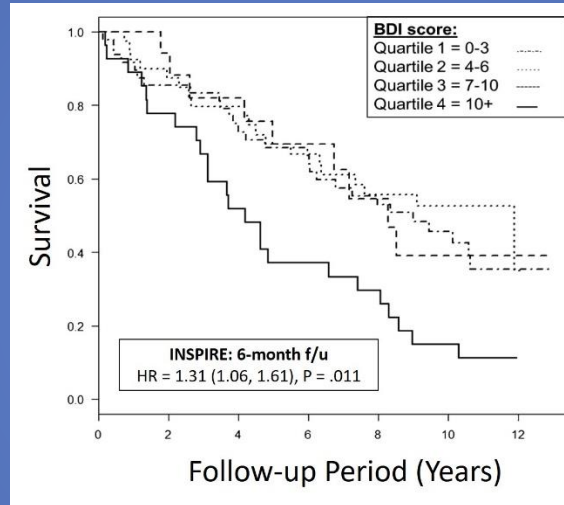
Frailty Domains



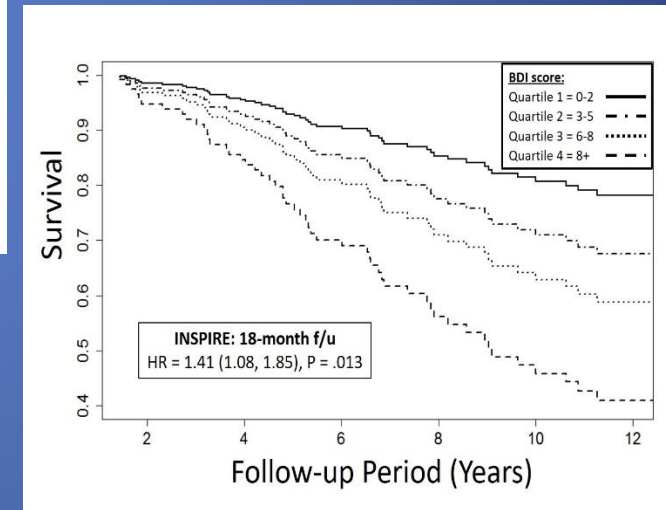
Depressive Symptoms and Clinical Events



3-months post



6-months post



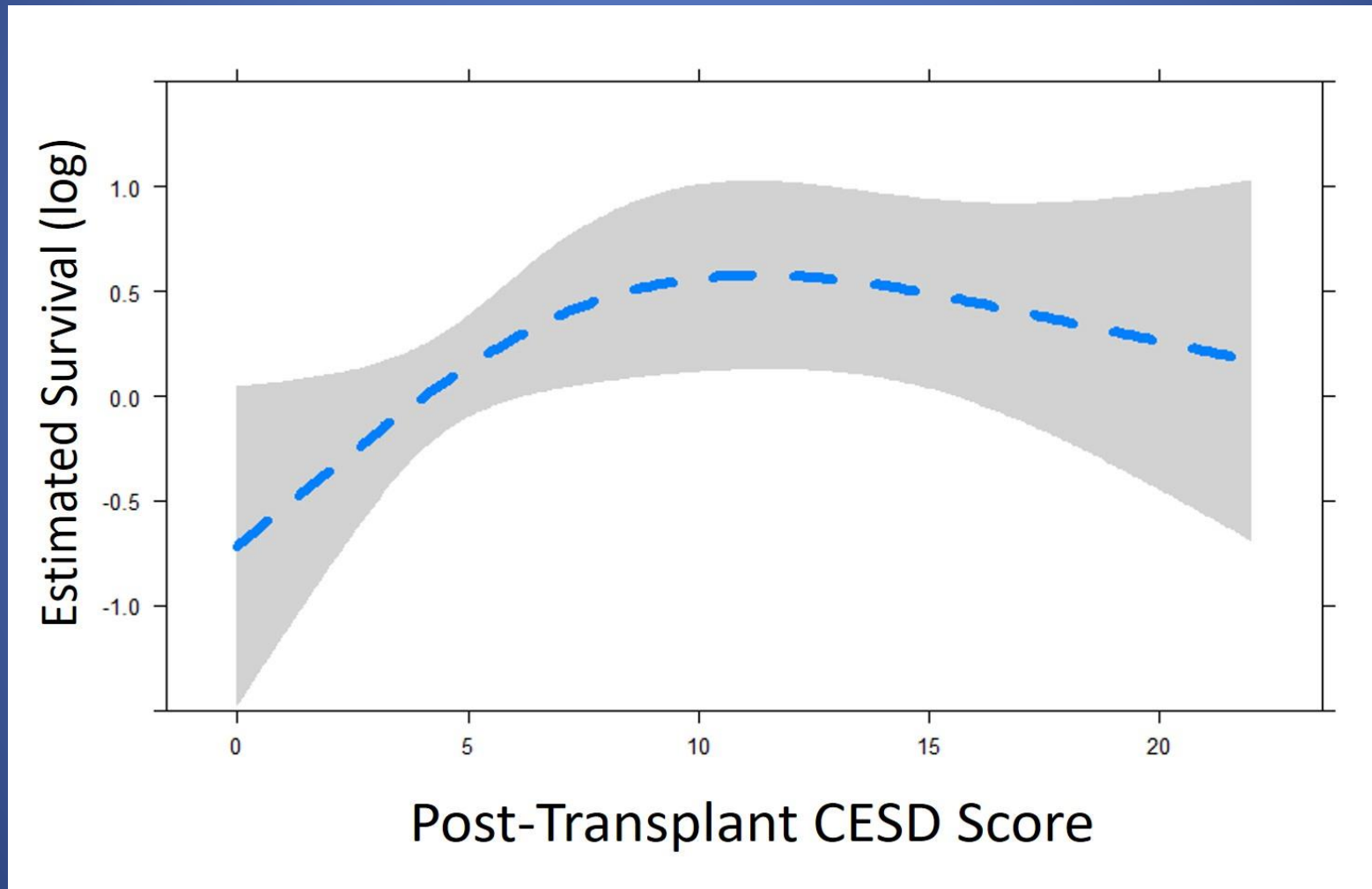
18-months post



Laurie Snyder, MD

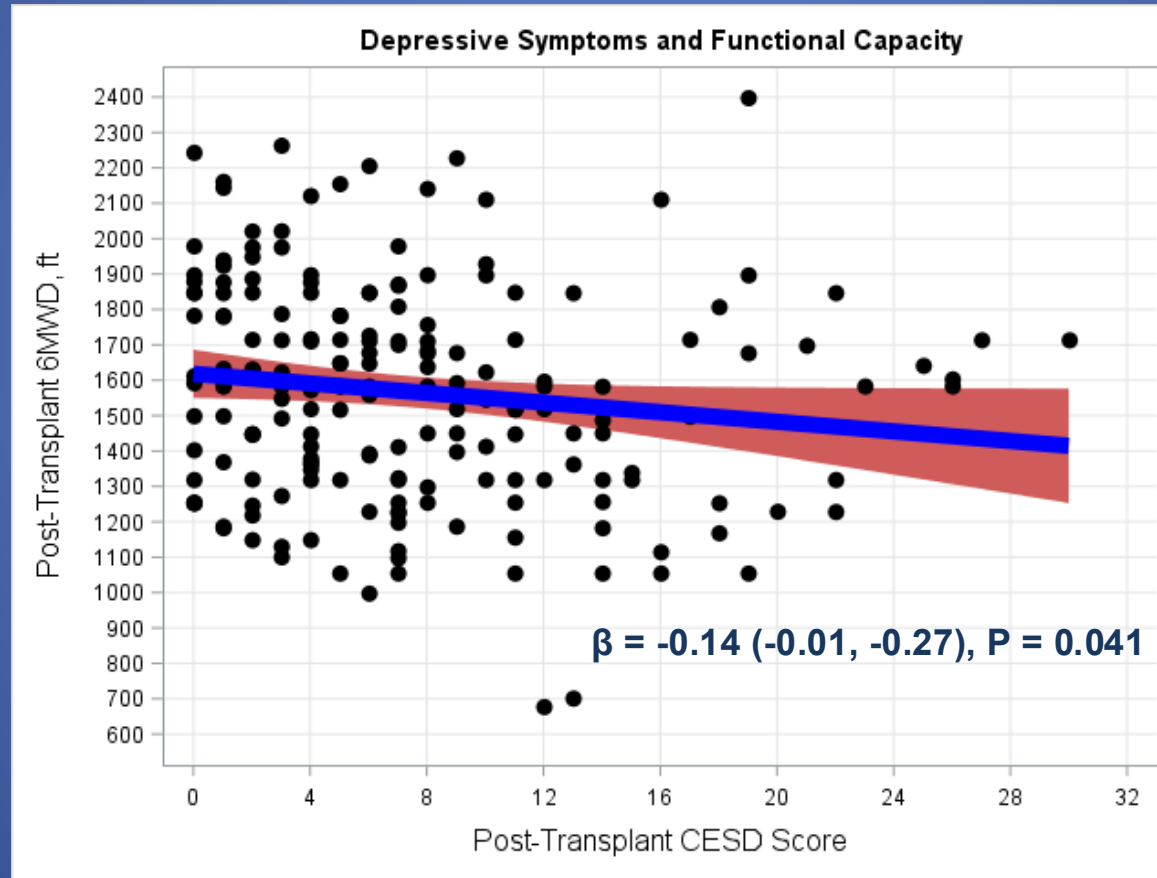
(Smith et al, 2014; Smith et al, 2015; Smith et al, 2017)

Subclinical Depressive Symptoms



(Smith et al, 2018)

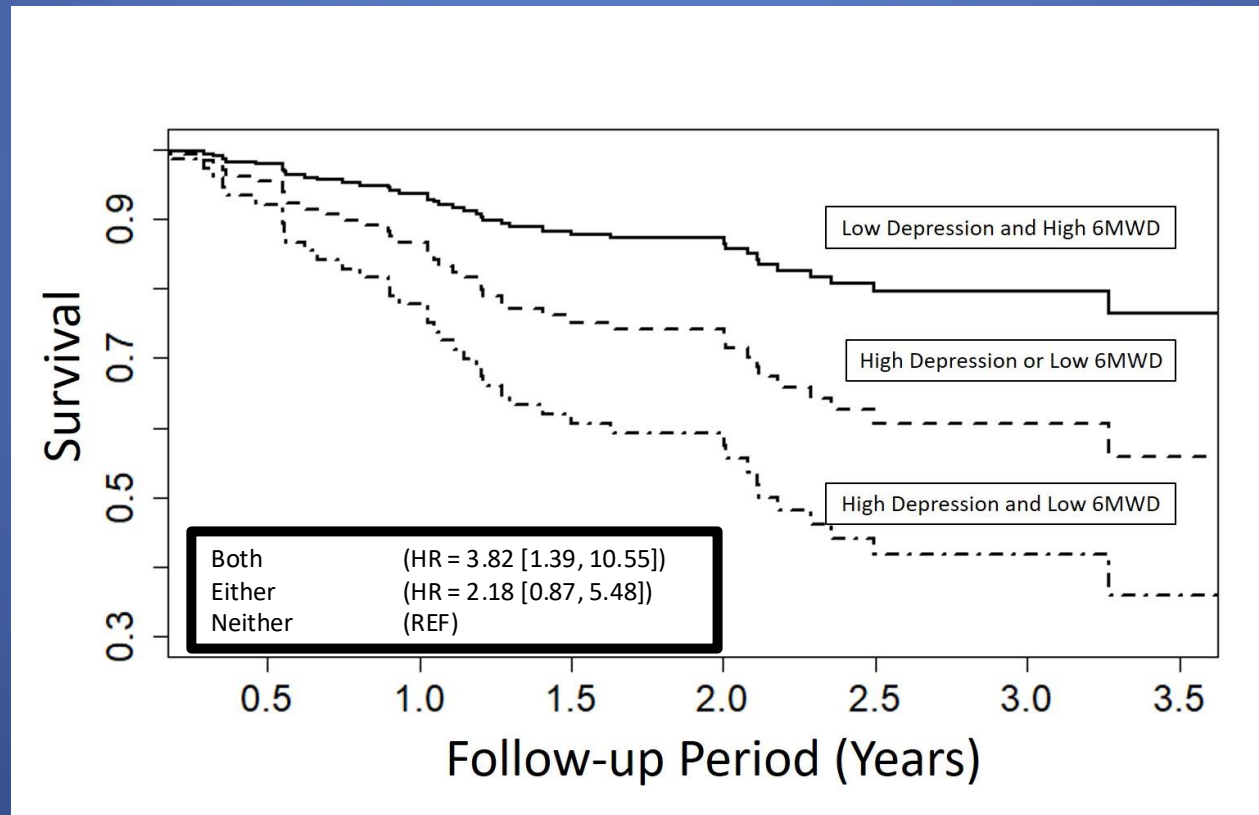
Depression and 6MWD



Smith et al, 2018. Depressive symptoms and 6MWD. Controlling for age at the time of transplant, greater depressive symptoms were associated with lower exercise capacity ($\beta = -0.14 [-0.01, -0.27], P = 0.041$).

Final Survival Model

Predictor	Hazard Ratio (95% CI)	P-value
Age (22)	1.37 (0.89, 2.14)	0.161
Post-Rehab 6MWD (420)	0.58 (0.38, 0.90)	0.021
Post-Rehab CESD (8)	1.39 (1.05, 1.84)	0.021



Psychological Flexibility Domains

- **Values** — what gives your life meaning. Not goal bound. ‘Honesty. Having close relationships. Promoting justice. Competency. Excitement. Honoring traditions. Physical fitness.’
- **Acceptance**— the active and aware embrace of those private events occasioned by life history without unnecessary attempts to change their frequency or form, especially when change would cause psychological harm. Opposite – experiential avoidance
- **Cognitive defusion** — de-literalization of thought content. Example, ‘I’m not good’ becoming ‘having the thought I’m no good’
- **Contact with present moment** - mindfulness

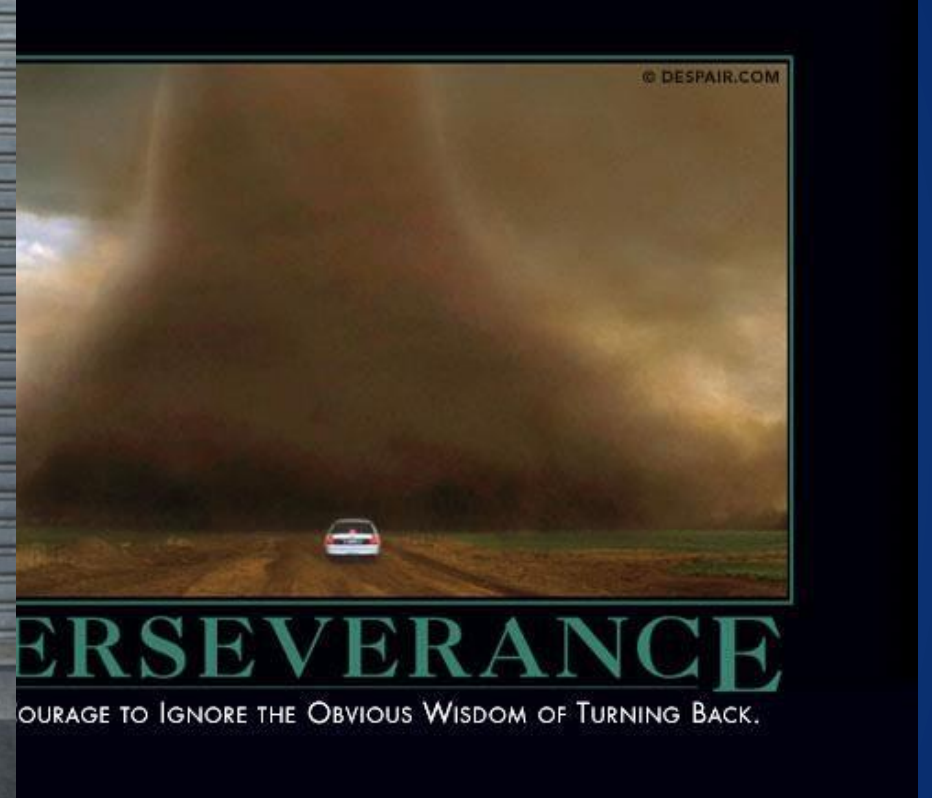


Learning as Core Process

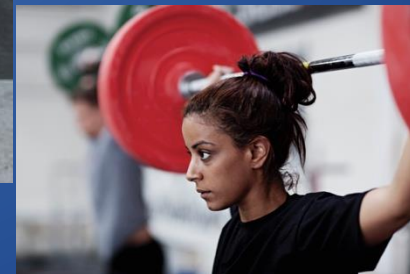
- Brain is made to learn from experience. Harder to unlearn.
- Layering new neural connections on top of old ones
 - Different learning, associations, prepotent response
 - Salient, novel, funny associations particularly ‘sticky’
 - Defusion word examples
 - Milk / Fish
 - Transplant
 - Cancer
- CBT vs. ACT
 - CBT: great for irrational fears
 - ACT: great for inevitable fears



Context



- Linked by affective
- Long-term coping r
 - More deliberate
 - Less dictated by affect



Flexibility Paradoxes

Clin Psychol Rev. 2010 November 1; 30(7): 865–878. doi:10.1016/j.cpr.2010.03.001.

Psychological Flexibility as a Fundamental Aspect of Health

Todd B. Kashdan

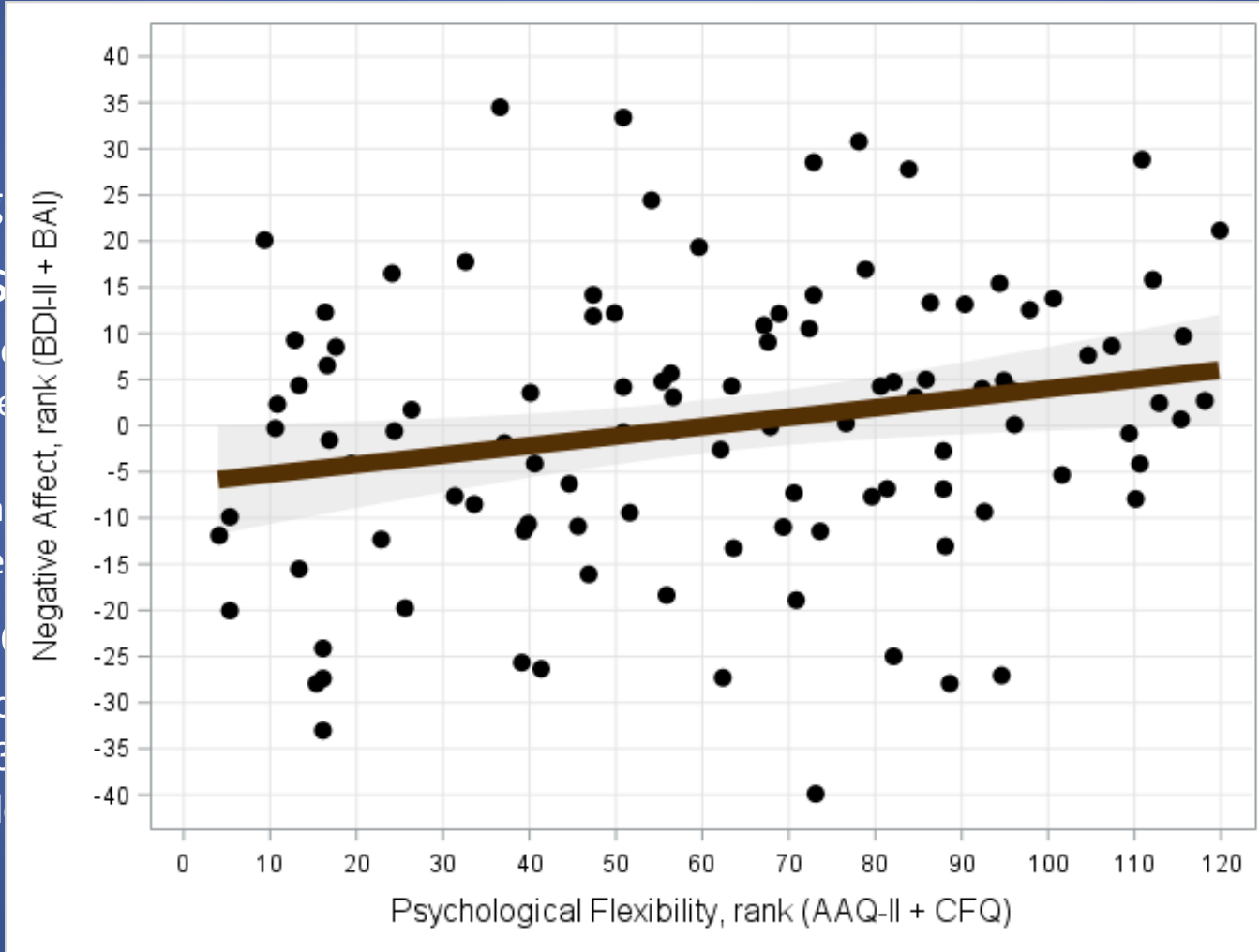
George Mason University Jonathan Rottenberg University of South Florida

Abstract

Traditionally, positive emotions and thoughts, strengths, and the satisfaction of basic psychological needs for belonging, competence, and autonomy have been seen as the cornerstones of psychological health. Without disputing their importance, these foci fail to capture many of the fluctuating, conflicting forces that are readily apparent when people navigate the environment and social world. In this paper, we review literature to offer evidence for the prominence of psychological flexibility in understanding psychological health. Thus far, the importance of

Coping Styles, Flexibility, and Mood

- ACT with C
- 127 adults
 - 58% taking
- Baseline ps
 - Negative Affe
 - Medical Mode
 - Psychological
 - Short Grit Sca
 - Over-vs-Unde
- Correlates of
 - MCMQ avoid
 - Grit (B = -0.3
 - Over-vs-und
 - Psychological



re (ACT)

anxiety)

ms)

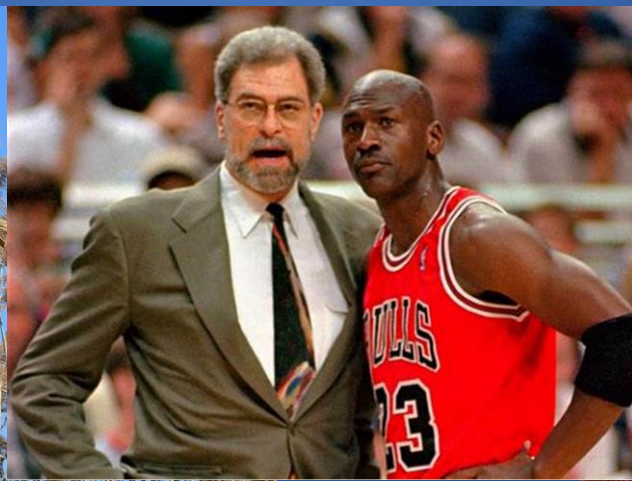
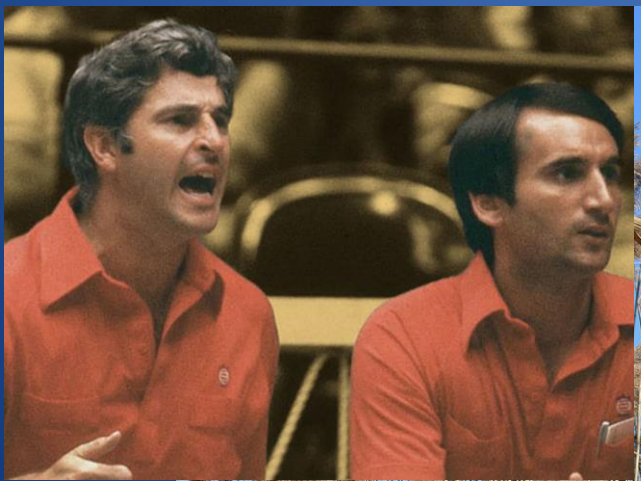
51, $P < .001$)



Mighty Oak and Humble Reeds

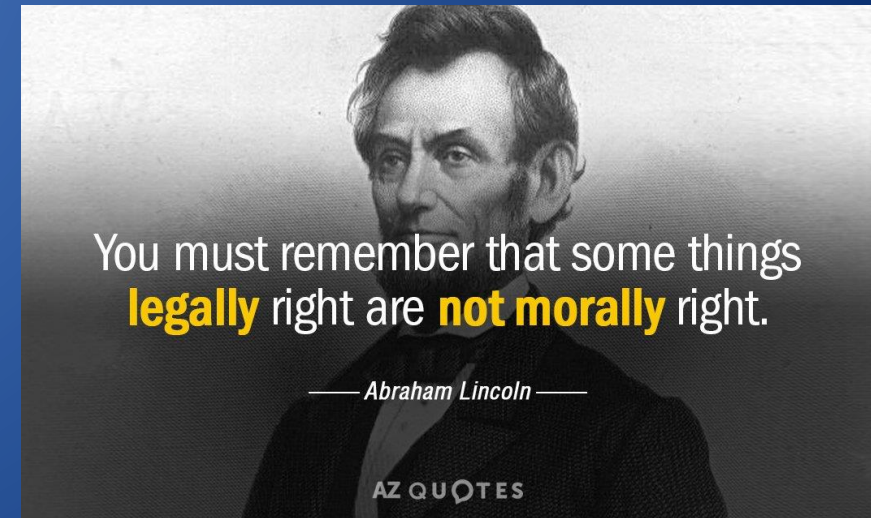
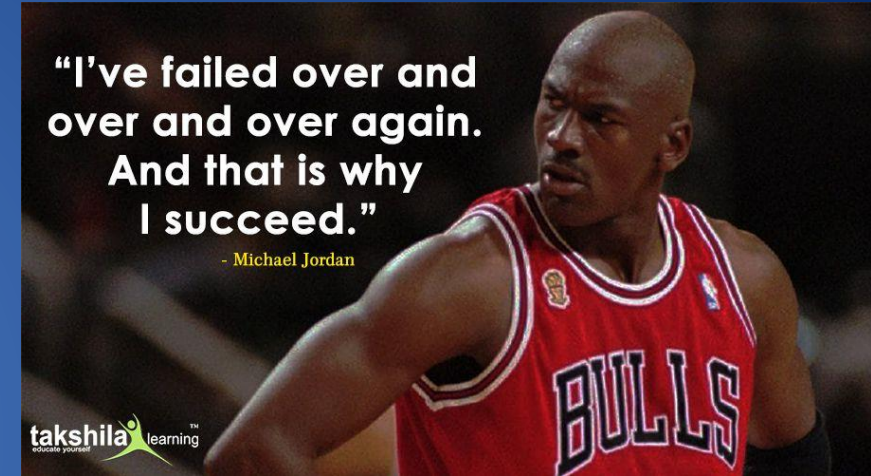
(Aesop's Fables)

- A [prideful] oak stood next to a pool in the jungle. In and around the pool were thin reeds. The reeds would bend the way the wind blew.
 - Oak: “Look at me and learn. I never bow down. You must learn to follow my example.”
 - Reeds: “Nature has made each creature different from the other. Your way is to brave storms, ours to bow.”
- Months later, there was a strong gale. The oak fought it for hours but was uprooted. The reeds survived as they had bent to the winds.
- Contextual / novelty demands, different premorbid profiles (strength / weakness), adaptation abilities



Importance of Context

- Michael Jordan
 - Growth mindset, resilience, competitor
 - Creative methods of self-motivation
 - Holding grudges
 - Janitor example
- Abraham Lincoln
 - Principled living, deep life experience
 - Tragedy -> genuine concern for others
 - Variation in 'right behaviors' by context
 - Interpersonal settings
 - Political settings



Psychological Flexibility Examples

		Paraphrased item content
1. My thoughts cause me distress or emotional pain.	ement is fo	Key to a good life is never feeling any pain Quick to leave situations that make me uneasy Try to put unpleasant memories out of mind Feel disconnected from my emotions Won't do something unless I absolutely have to Fear/anxiety won't stop me from doing important things Would give up a lot not to feel bad
2. I get so caught up in my thoughts that I am unable to do the things that I most want to do.	5 frequently true	Rarely do things that might upset me Hard for me to know what I am feeling Try to put off unpleasant tasks for as long as possible Go out of my way to avoid uncomfortable situations A big goal is to be free from painful emotions Work hard to keep out upsetting feelings Won't do something if I have doubts Pain always leads to suffering
3. I overanalyze situations to the point where it's unhelpful to me.	ve a life th	
4. I struggle with my thoughts.	r than be	
5. I get upset with myself for having certain thoughts.		
6. I tend to get very entangled in my thoughts.	hat I rea to be	
7. It's such a struggle to let go of upsetting thoughts even when I know that letting go would be helpful.	er than focusing on what	

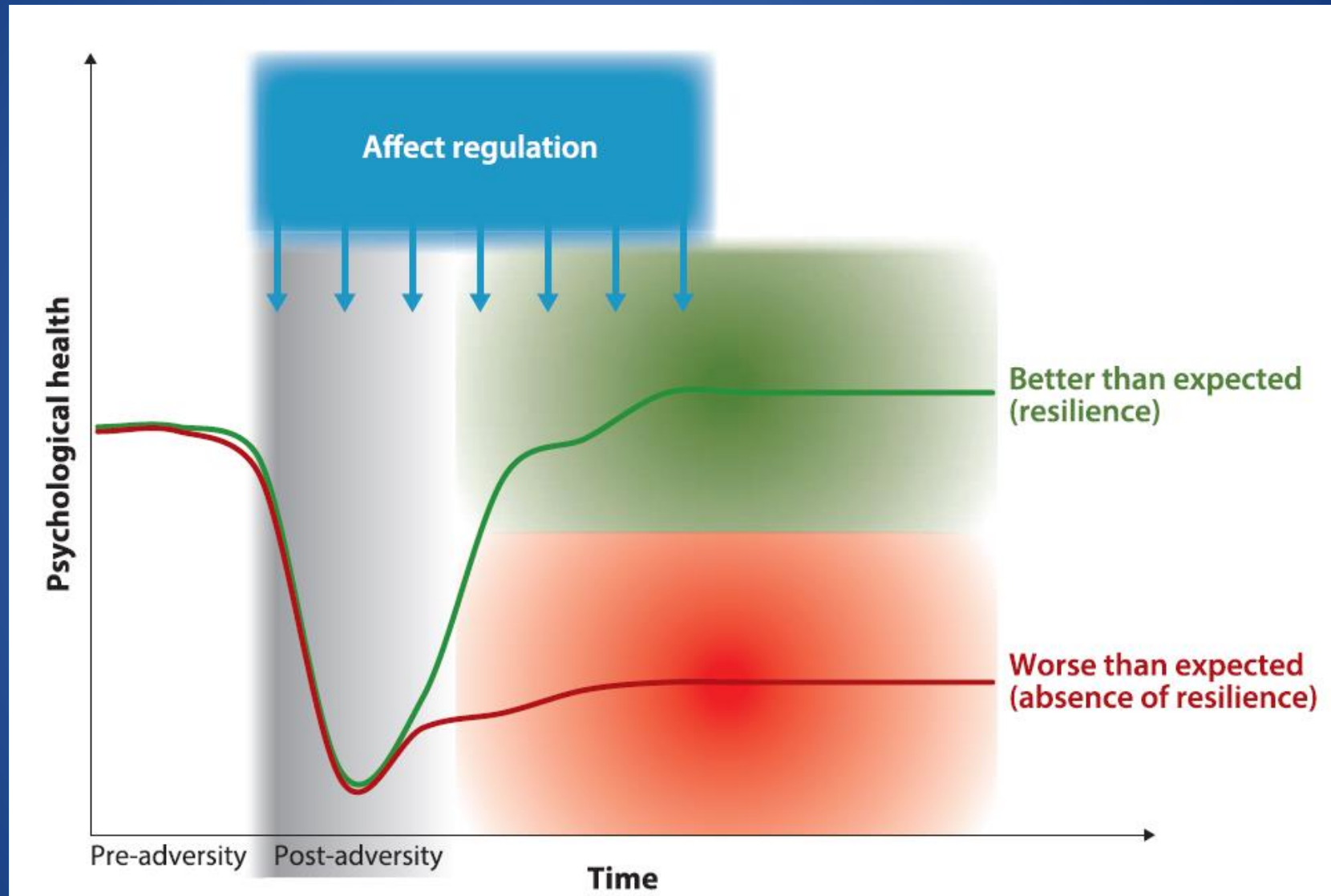


The real risk is not changing. I have to feel that I'm after something. If I make money, fine. But I'd rather be striving. It's the striving, man, it's that I want.

— *John Coltrane* —

AZ QUOTES

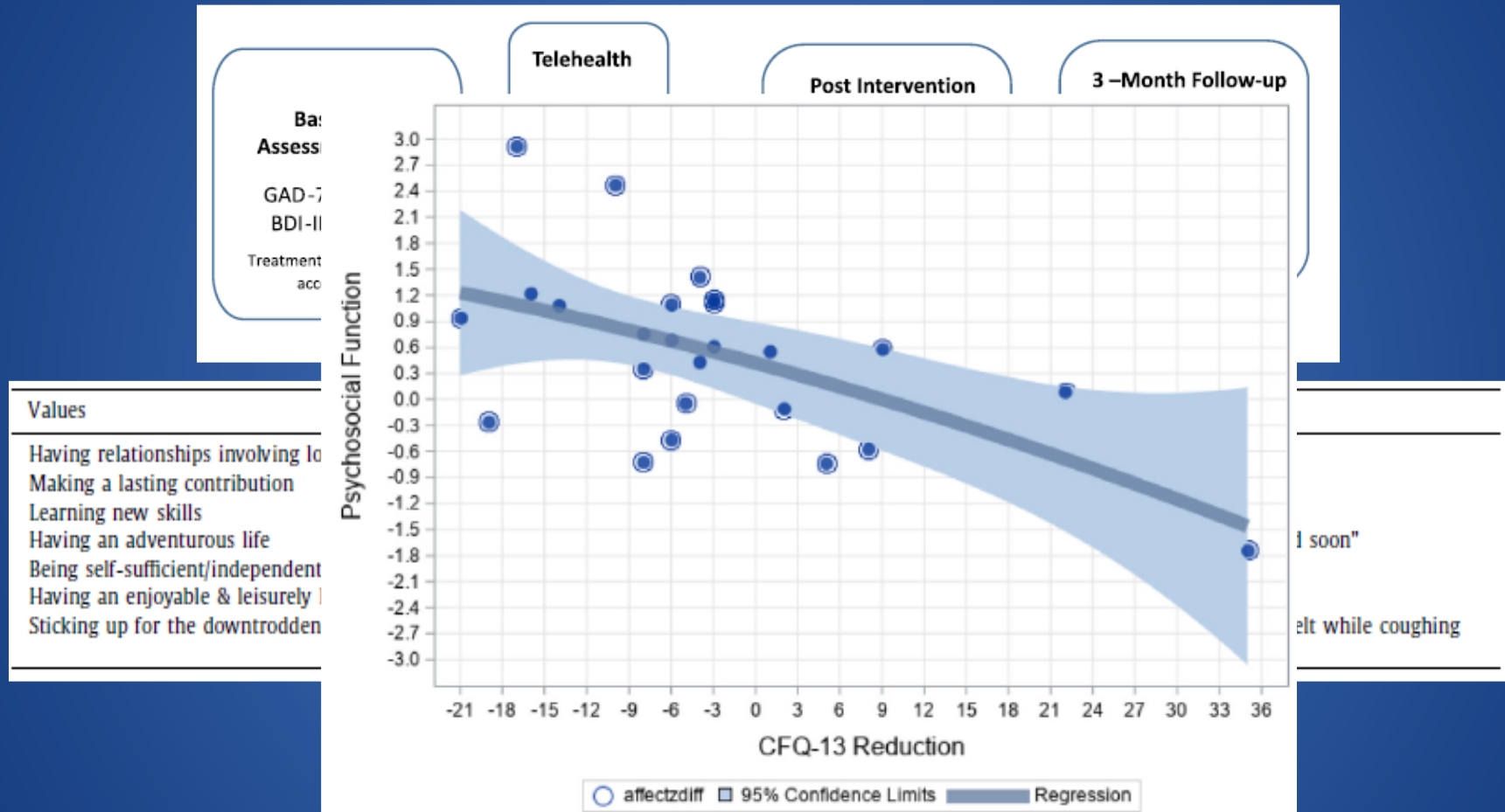
Timing is Everything?



Frailty and Resilience Concepts

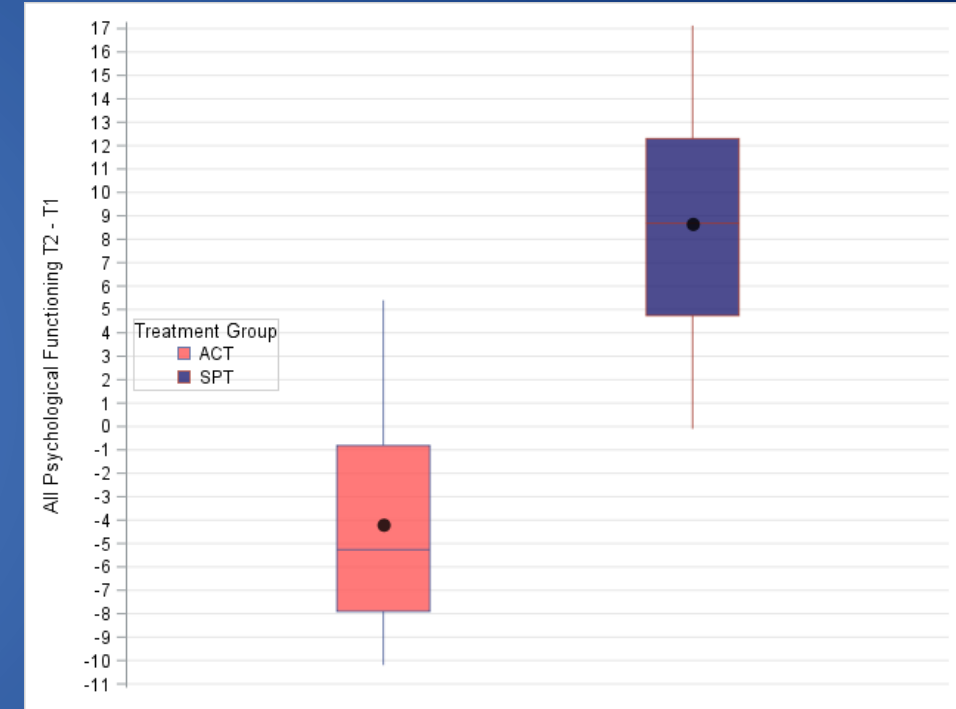
“Frailty” Constructs	Examples	Frailty and Resilience from the Perspective of a Complex Structure (Golden Gate Bridge)	Potential Strengths
A. Phenotypic Frailty (defined state)	Fried CHS Study Sarcopenic Obesity		Capture existence of a clinically defined and measurable phenotypic state Define risk factors and mechanisms with some specificity for given phenotype Measure treatment effect when a degree of treatment specificity is involved
B. Stochastic Frailty (accumulation of deficits)	Rockwood FI Index (e.g. FI _{clin} , FI _{lab})		Perform prognostication Define cross-cutting risk factors Measure treatment effects when more pleiotropic interventions are studied Measure treatment effects when testing geroscience-guided therapeutics
C. Resilience (Measure of homeostasis in face of stressor)	Orthostasis Vaccine Responses Recovery from infection, surgery, anesthesia, dehydration, bedrest, chemotherapy, trauma or BM transplant		Identify “hidden” vulnerability Identify resilient mechanisms Obtain more individualized risk Design more precise interventions Design earlier interventions Design interventions targeting resilient mechanisms

Telehealth ACT



ACT with CF Psychosocial Outcomes

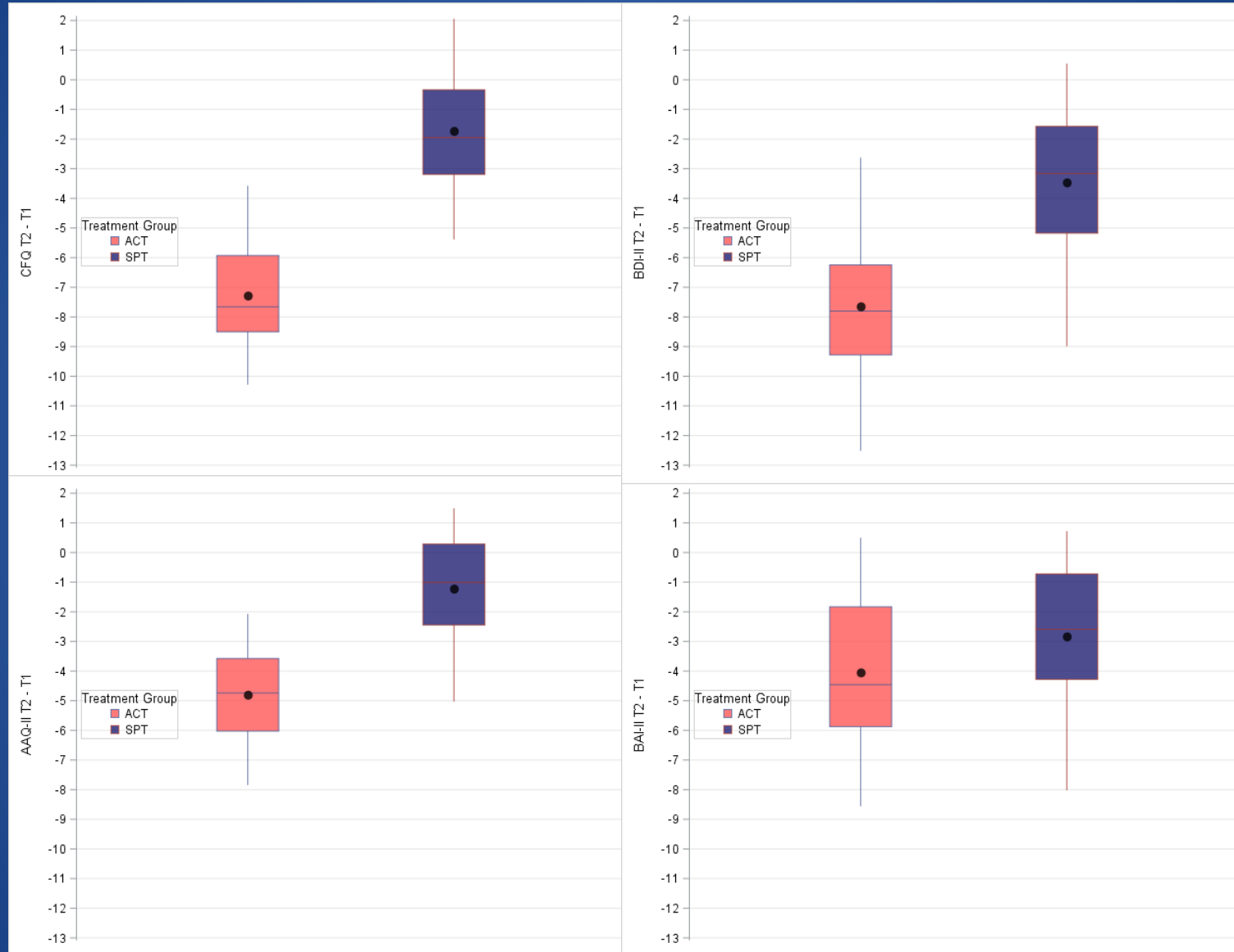
- Both groups experienced reductions in depression (BDI-II)
 - ACT: 20.9 [18.6, 23.3] to 12.9 [10.4, 15.5]
 - SPT: 15.2 [12.8, 17.6] to 11.7 [9.2, 14.2] BDI-II ($P = .002$)
- Both groups had modest reductions in anxiety (BAI)
 - ACT: 14.8 [12.6, 17.1] to 10.5 [8.2, 12.9]
 - SPT: 11.7 [9.4, 14.0] to 8.9 [6.5, 11.2]
- ACT showed greater reductions in Cognitive Fusion (CFQ)
 - ACT: 51.5 [48.3, 54.7] to 44.0 [40.5, 47.4]
 - SPT: 45.4 [42.2, 48.7] vs. 43.7 [40.4, 47.1]
- ACT showed greater improvements in Acceptance and Action (AAQ-II)
 - ACT: 26.9 [24.5, 29.4] to 21.9 [19.2, 24.5]
 - SPT: 22.2 [19.8, 24.7] to 21.1 [18.5, 23.6]



Adjusted for baseline psychological functioning, age, sex, and FEV₁.

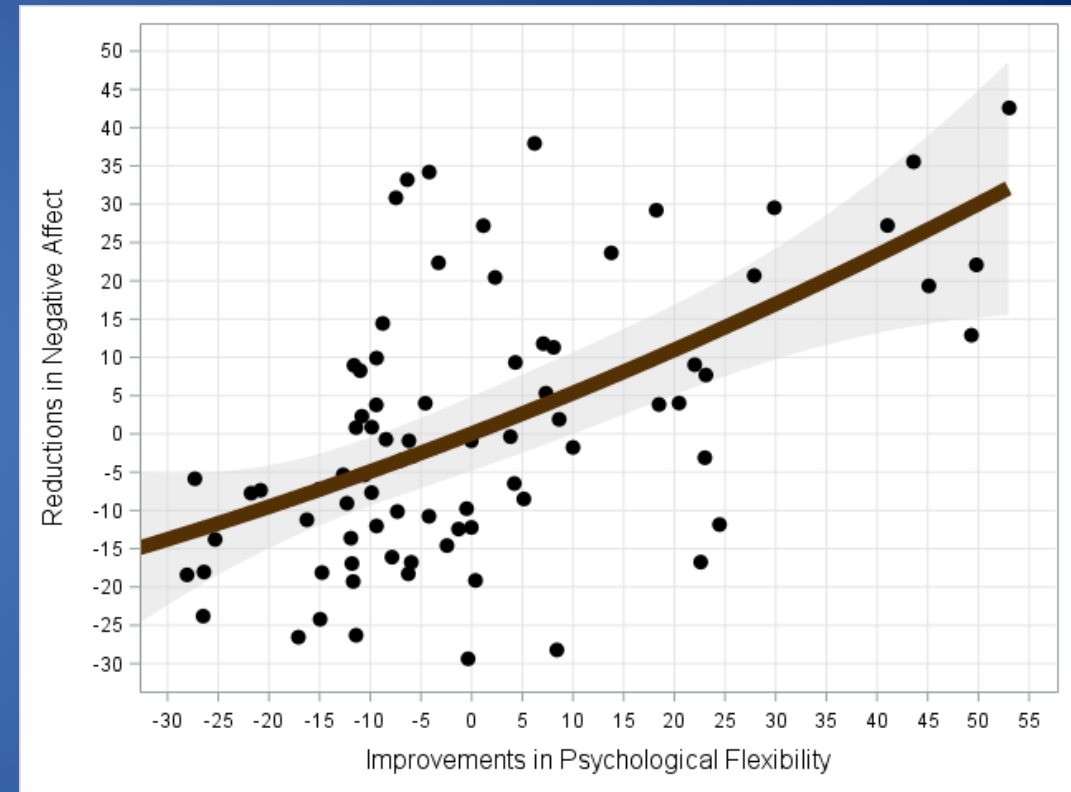
- Overall psychological function improved more in ACT vs. SPT ($P = .045$)

ACT with CF Psychosocial Outcomes



Psychological Flexibility, Depression, & Anxiety

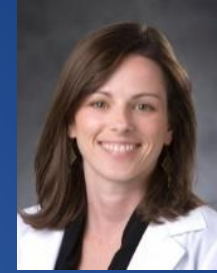
- Greater increases in psychological flexibility associated with greater reductions in negative affect ($B = -0.45$, $P < .001$).
- Baseline negative affect, baseline psychological flexibility, and changes in psychological flexibility were the strongest predictors of treatment-related reductions in negative affect.



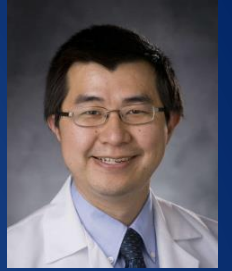
Adjusted for baseline psychological functioning, age, sex, and FEV₁.

ACT in BMT

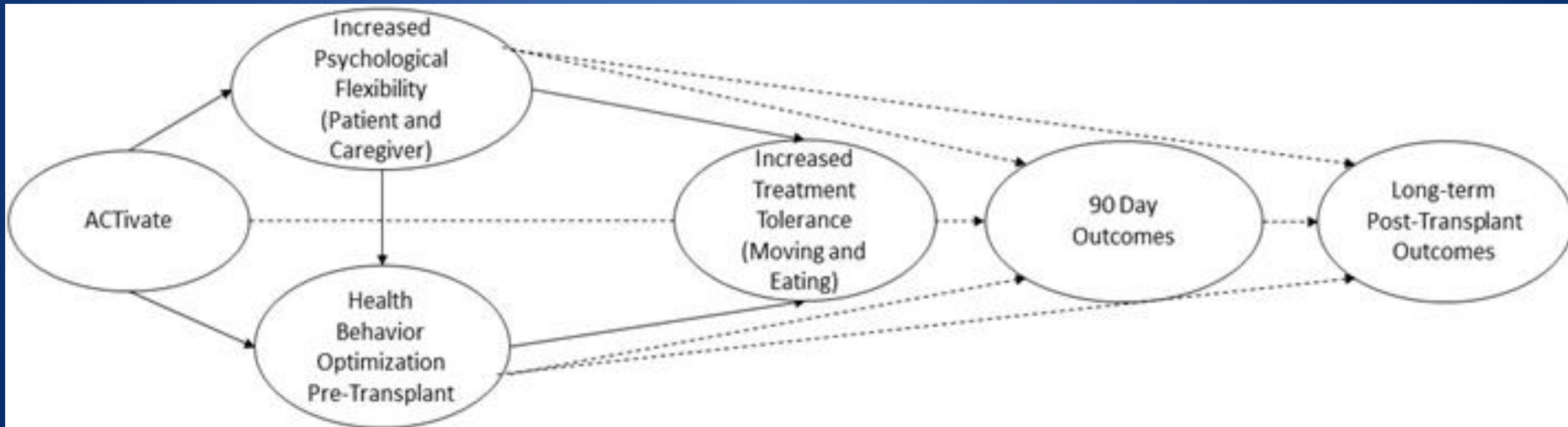
- Ongoing pilot study in BMT recipients
 - Sung, Merwin, and Smith
 - ACT skills training ('priming') prior to induction



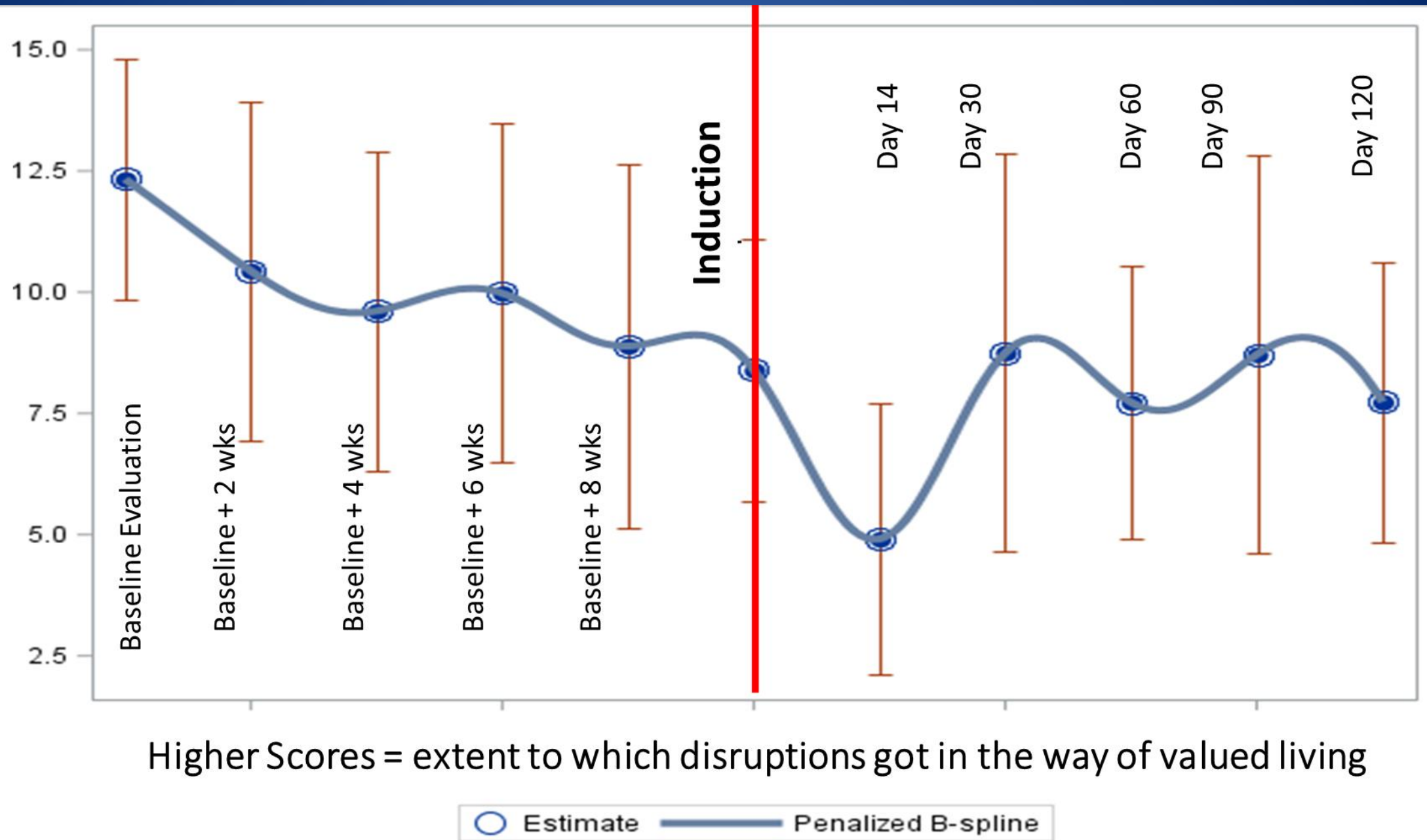
Rhonda Merwin, PhD



Tony Sung, MD

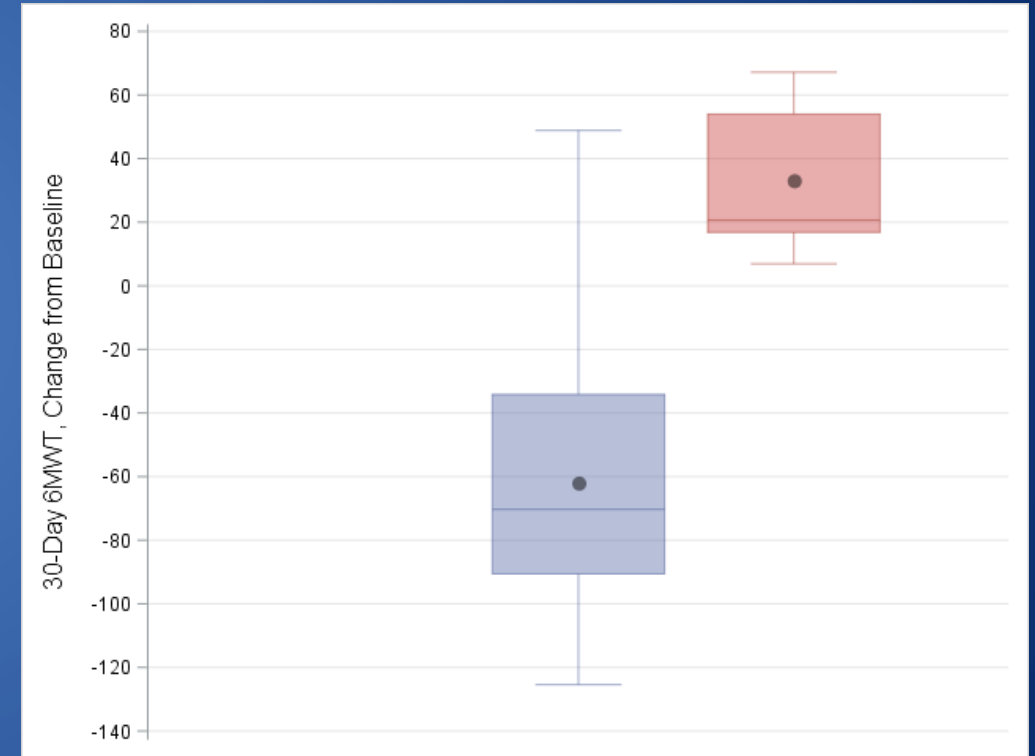


Valuing Obstruction Scale

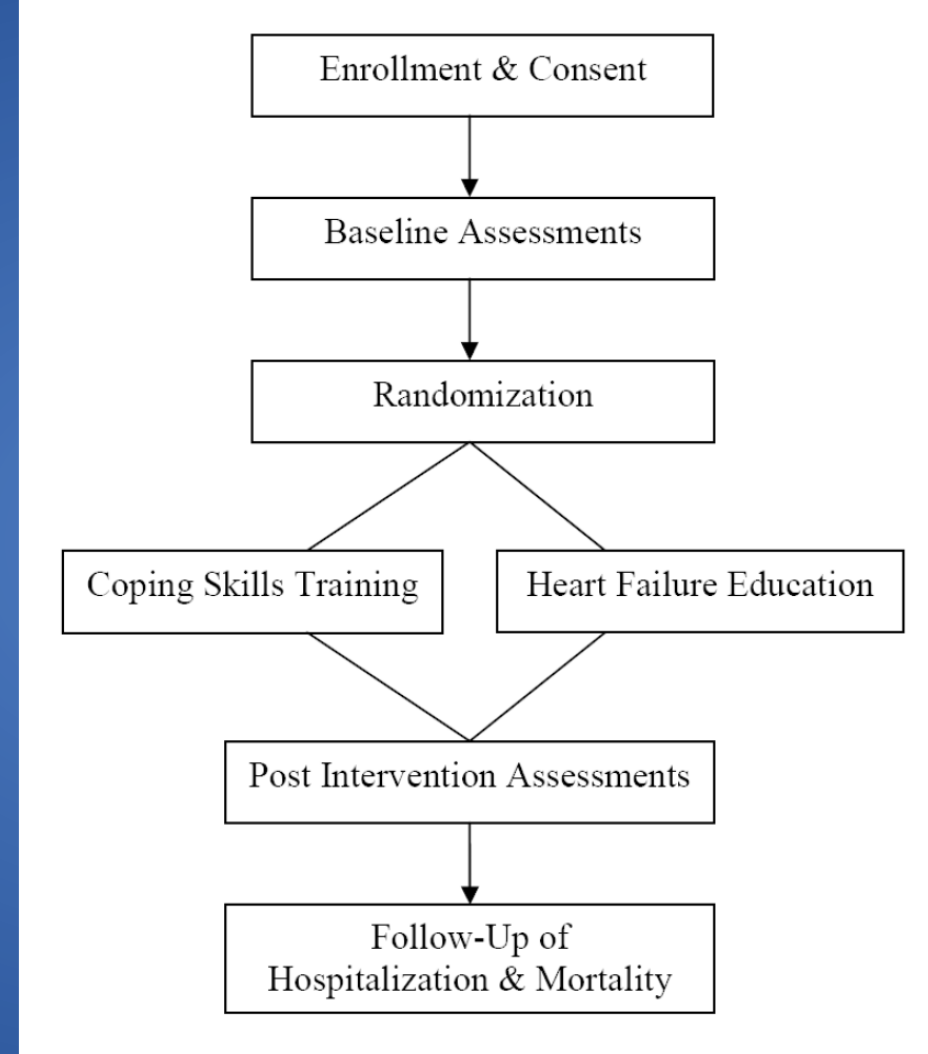
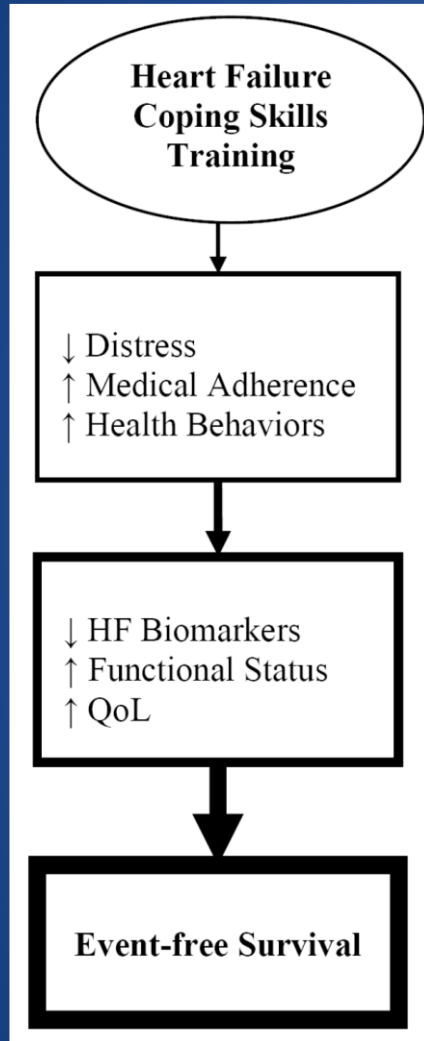


ACT with BMT Findings

- Baseline findings
 - Greater Valuing Progress associated with:
 - Lower levels of denial ($r = -0.87$, $P = .025$)
 - Behavioral disengagement ($r = -0.86$, $P = .023$)
 - Avoidance ($r = -0.84$, $P = .038$)
 - Greater acceptance and action associated with:
 - Greater self-efficacy ($r = 0.62$, $P < .001$)
 - Lower levels of blame ($r = -0.53$, $P < .001$)
 - Lower levels of avoidance ($r = -0.73$, $P < .001$)
- Preliminary efficacy:
 - ACT participants improved:
 - Valuing obstruction ($P = .049$)
 - Greater 6MWD at 30-days ($P = .038$)



COPE-HF Trial



Andrew
Sherwood, PhD

Sherwood A, Blumenthal JA, Koch GC, Hoffman BM, Watkins LL, **Smith PJ**, O'Connor CM, Adams KF, Rogers J, Sueta C, Change PP, Blazing M, Johnson KS, Schwartz J, Hinderliter AL. Telephone-Based Coping Skills Training for Patients with Heart Failure: The Coping Effectively with Heart Failure (COPE-HF) Randomized Clinical Trial. *Circulation Heart Failure*.

COPE-HF Findings

Variable	Coping Skills Training (n=89)	Heart Failure Education (n=90)	P Value
QoL			
Attitudes about impairment	3.7 (2.2 to 5.3)	1.8 (0.3to 3.2)	0.070
Beck Depression Inventory	−4.5 (−5.8 to −3.1)	−2.4 (−3.7 to −1.1)	0.027
KCCQ total score	8.3 (5.0 to 11.5)	2.3 (−0.8 to 5.4)	0.009
6-min walk distance, m	15.8 (4.8 to 26.7)	−3.5 (−13.9 to 7.0)	0.012
State Anxiety	−2.6 (−4.4 to −0.8)	−0.2 (−1.9 to 1.6)	0.057
Heart failure disease biomarkers			
B-type natriuretic peptide, pg/mL	−23.5 (−63.6 to 16.2)	−25.0 (−62.9 to 12.8)	0.958
Left ventricular ejection fraction, %	0.2 (−0.9 to 1.4)	−1.3 (−2.4 to −0.2)	0.066
Heart rate variability (SDNN)	2.0 (−4.7 to 8.7)	−3.7 (−11.0 to 3.5)	0.246
Flow-mediated dilation, %	0.2 (−0.5 to 0.9)	0.0 (−0.7 to 0.7)	0.733
C-reactive protein, mg/L	−0.3 (−0.9 to 0.2)	0.3 (−0.2 to 0.9)	0.102

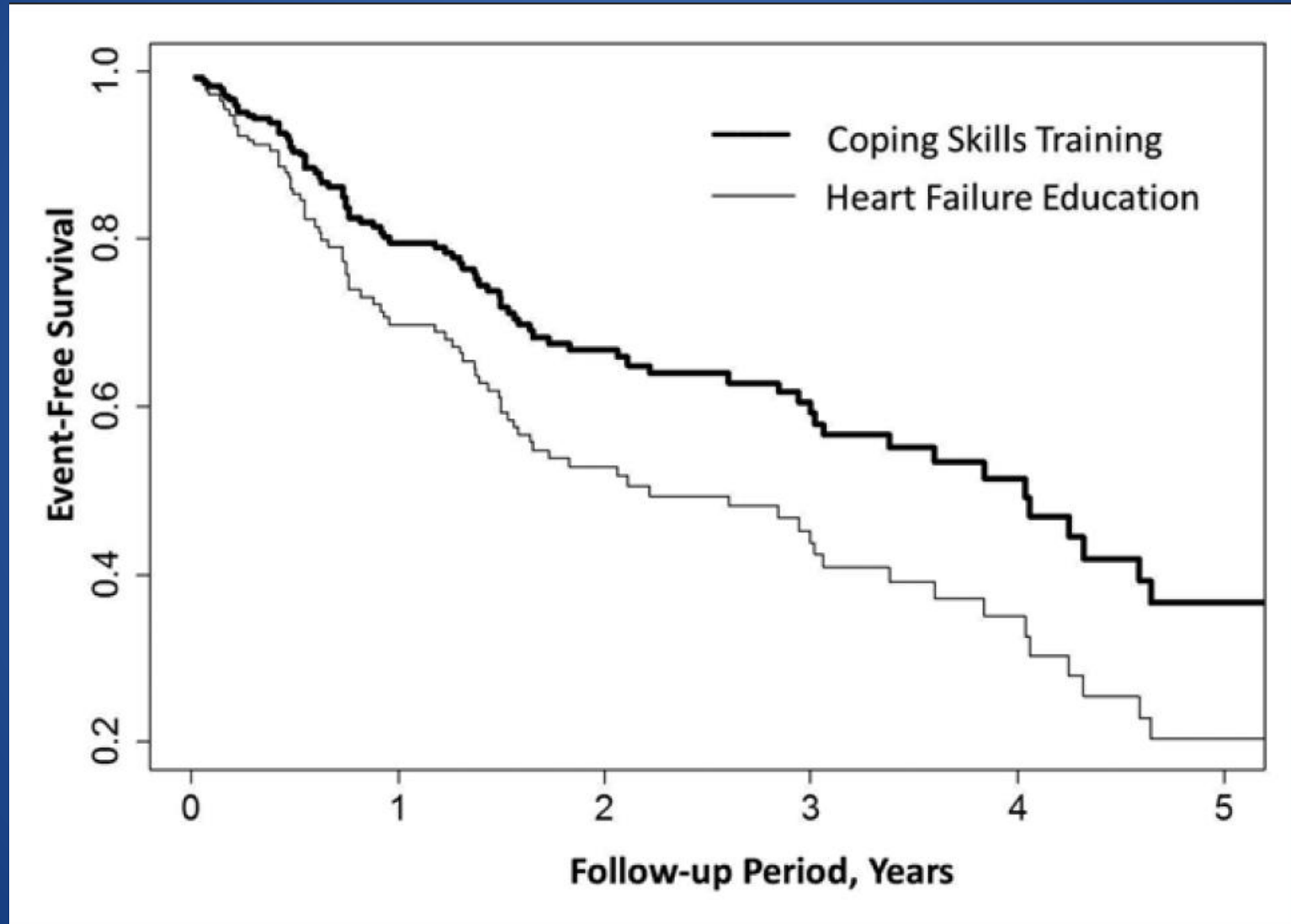
Sherwood A, Blumenthal JA, Koch GC, Hoffman BM, Watkins LL, **Smith PJ**, O'Connor CM, Adams KF, Rogers J, Sueta C, Change PP, Blazing M, Johnson KS, Schwartz J, Hinderliter AL. Telephone-Based Coping Skills Training for Patients with Heart Failure: The Coping Effectively with Heart Failure (COPE-HF) Randomized Clinical Trial. *Circulation Heart Failure*.

Impact on Hospitalization / Death

Variables	All-Cause Hospitalization or Death (127 Events)		HF Hospitalization or Death (80 Events)	
Model	Hazard Ratio (95% CI)	P Value	Hazard Ratio (95% CI)	P Value
Age (>60 vs <60 y)	1.07 (0.75–1.54)	0.714	1.01 (0.67–1.53)	0.949
Cause (ischemic vs nonischemic)	1.00 (0.69–1.43)	0.986	0.77 (0.48–1.17)	0.203
BNP at baseline (1000 pg/mL)	2.32 (1.58–3.40)	<0.001	3.48 (2.31–5.12)	<0.001
Ejection fraction at baseline (10%)	1.00 (0.83–1.21)	0.992	0.92 (0.75–1.13)	0.437
Hospitalizations in past year (ref=0): 1–2≥3	0.82 (0.55–1.22) 1.77 (1.01–3.07)	0.337 0.045	0.84 (0.52–1.34) 1.77 (1.06–2.97)	0.462 0.031
Coping skills training	0.84 (0.59–1.21)	0.352	0.65 (0.44–0.98)	0.040

Sherwood A, Blumenthal JA, Koch GC, Hoffman BM, Watkins LL, **Smith PJ**, O'Connor CM, Adams KF, Rogers J, Sueta C, Change PP, Blazing M, Johnson KS, Schwartz J, Hinderliter AL. Telephone-Based Coping Skills Training for Patients with Heart Failure: The Coping Effectively with Heart Failure (COPE-HF) Randomized Clinical Trial. *Circulation Heart Failure*. (In Press).

Impact on Hospitalization / Death



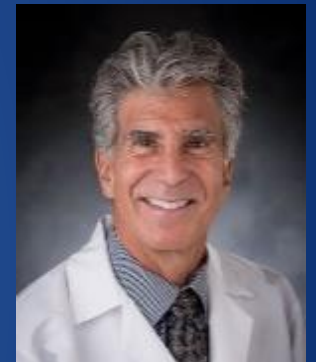
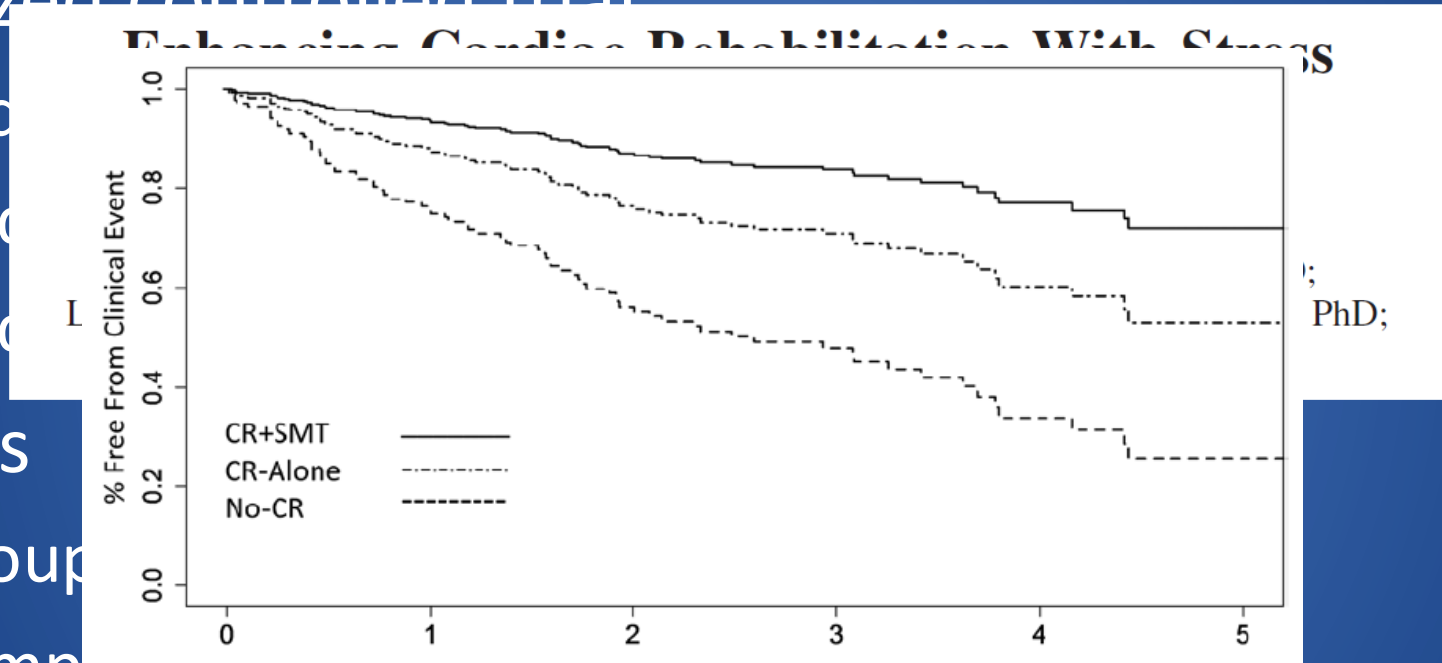
ENHANCED Trial – MACE Events

- Randomized controlled trial

- 151 cardiac rehab centers
- Standard of care
- Standard of care

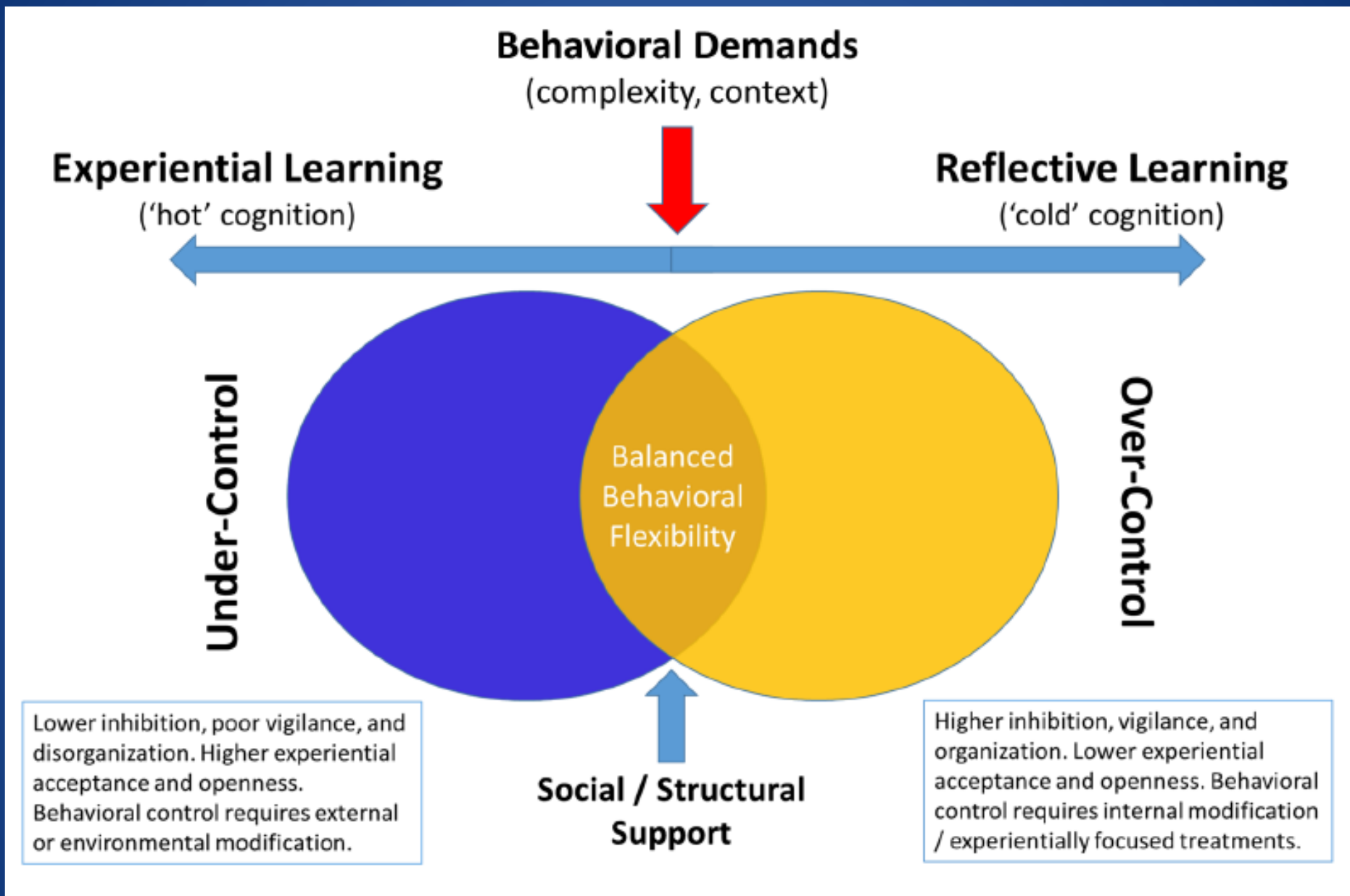
- Outcomes

- Both groups
- SMT = improved stress and lower clinical events

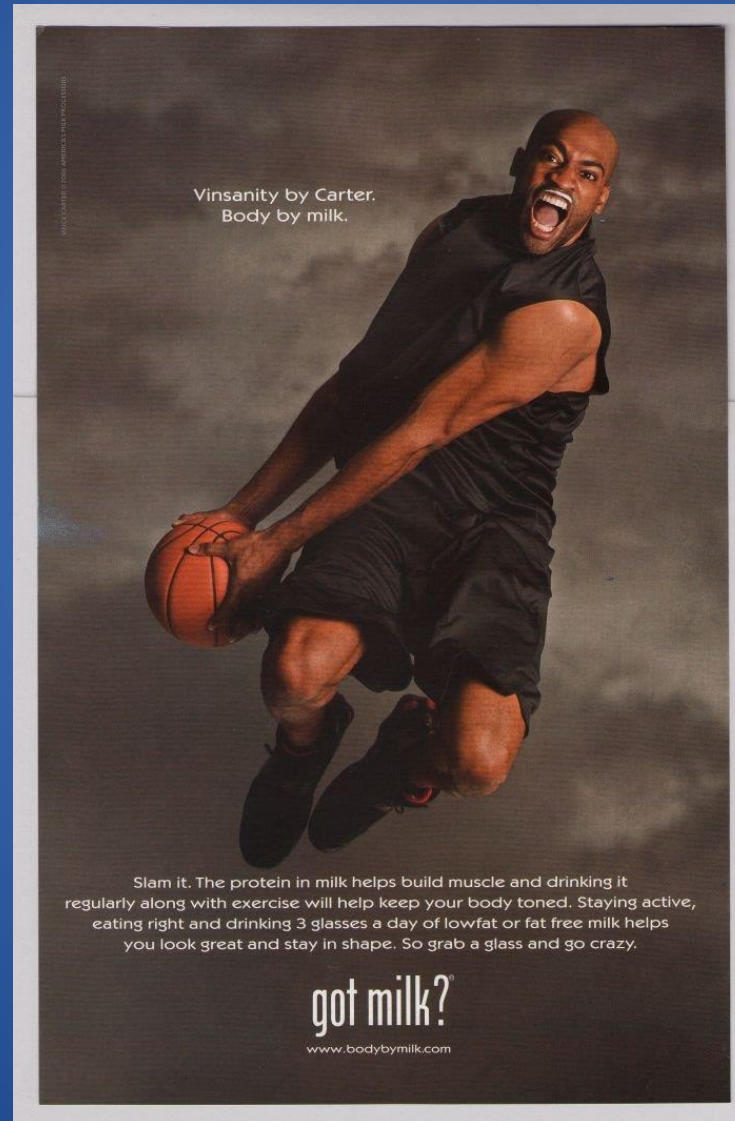


Jim Blumenthal, PhD

Variable	CR+SMT (n=76)	CR (n=75)	Cohen d	Time Effect	P, CR+SMT Versus CR
Beck Depression Inventory-II	-3.5 (-5.0 to -2.1)	-2.6 (-4.1 to -1.2)	0.15	<0.001	0.37
Spielberger Anxiety Inventory-State	-5.6 (-7.4 to -3.7)	-2.6 (-4.5 to -0.7)	0.37	<0.001	0.025
General Health Questionnaire	-4.8 (-5.8 to -3.7)	-3.3 (-4.4 to -2.2)	0.33	<0.001	0.049
PROMIS Anger questionnaire	-2.0 (-3.0 to -1.0)	-1.0 (-2.1 to 0.0)	0.22	0.001	0.16
Perceived Stress Scale	-4.2 (-5.4 to -3.0)	-2.6 (-3.9 to -1.3)	0.30	<0.001	0.063

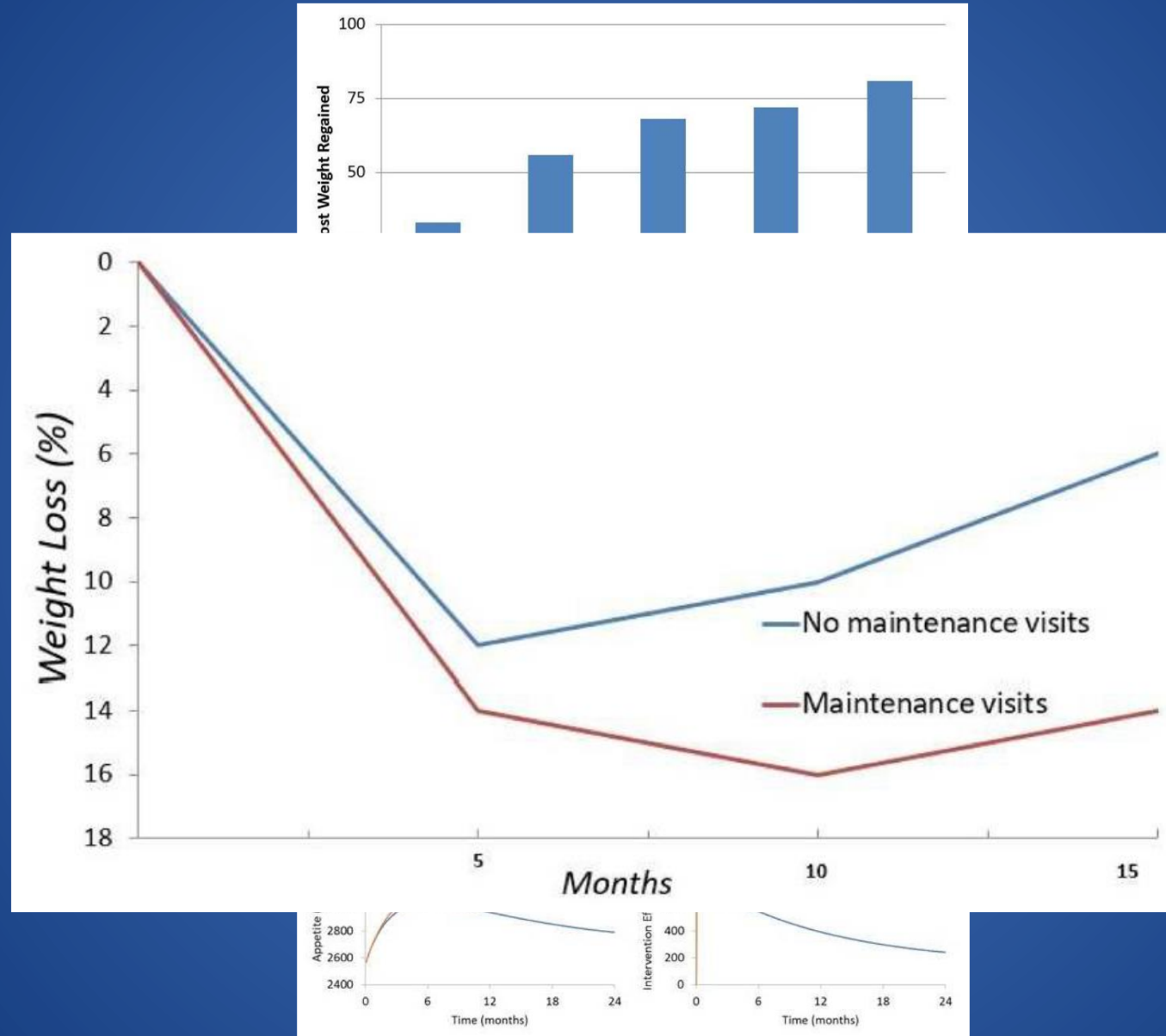


Thanks and Go Heels!



Extra Slides

Weight Loss Maintenance



Hall & Kahan, 2018