Affect and Energy Balance: Implications for Diet & PA across the Cancer Continuum

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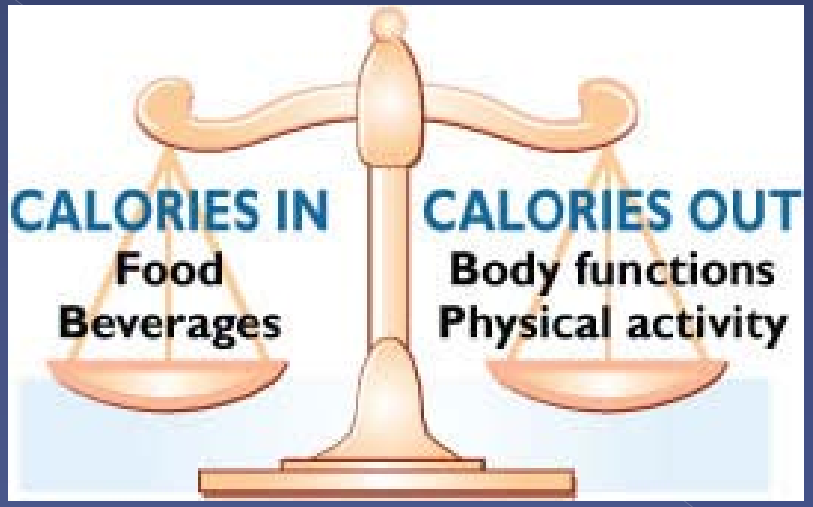
What is Energy Balance?



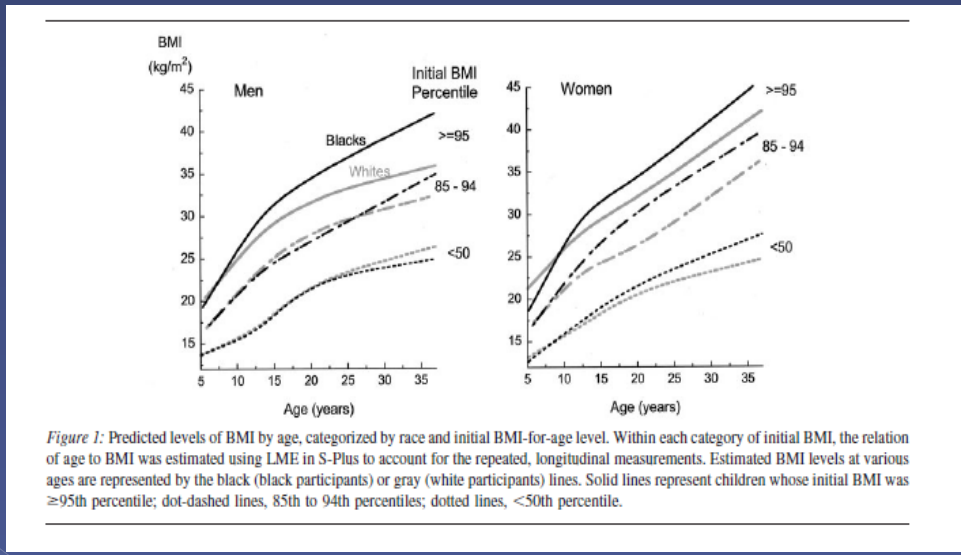
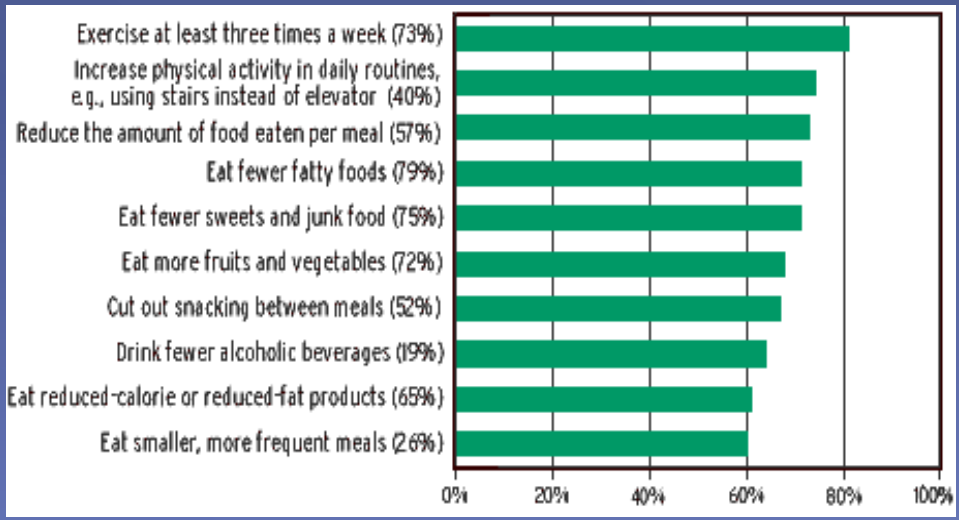


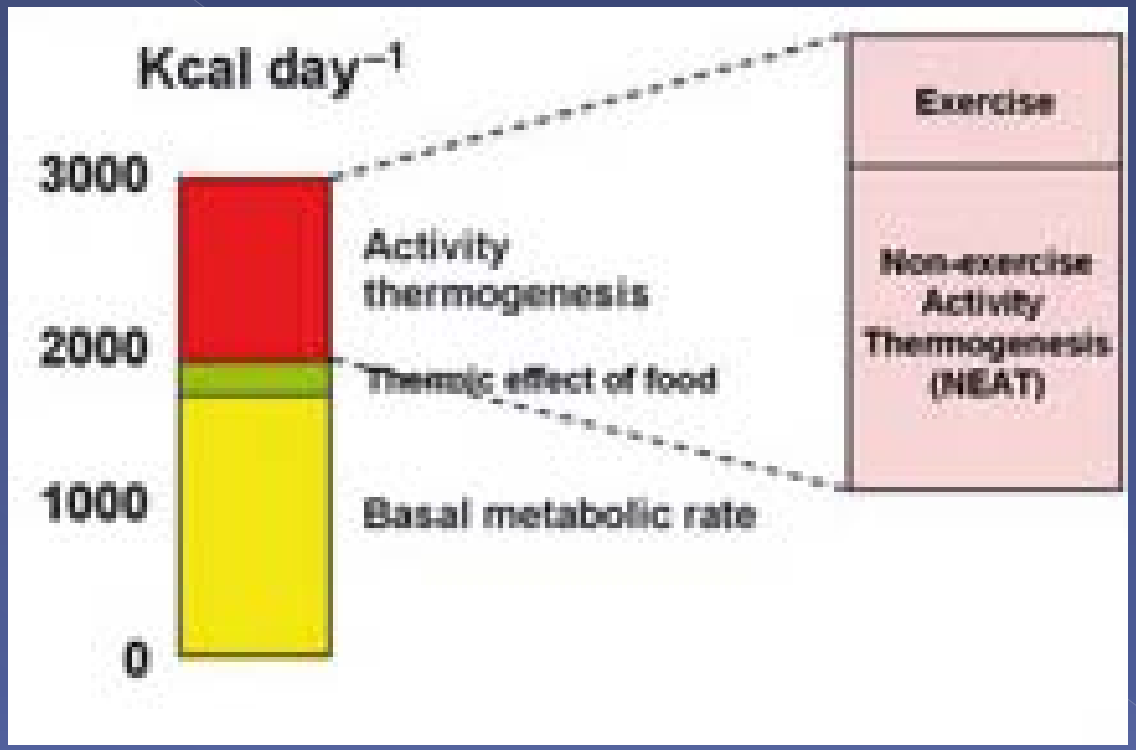
Figure 1: Predicted levels of BMI by age, categorized by race and initial BMI-for-age level. Within each category of initial BMI, the relation of age to BMI was estimated using LME in S-Plus to account for the repeated, longitudinal measurements. Estimated BMI levels at various ages are represented by the black (black participants) or gray (white participants) lines. Solid lines represent children whose initial BMI was ≥95th percentile; dot-dashed lines, 85th to 94th percentiles; dotted lines, <50th percentile.

Winning Losing Strategies



Sources: Freedman DS, et al Racial Differences in the Tracking of Childhood BMI to Adulthood, Obesity Research 2005;13: 928-934; Consumer reports, 2002

Primary Components of Energy Expenditure



Levine, J. (2007) J Intern Med; 262: 273–287

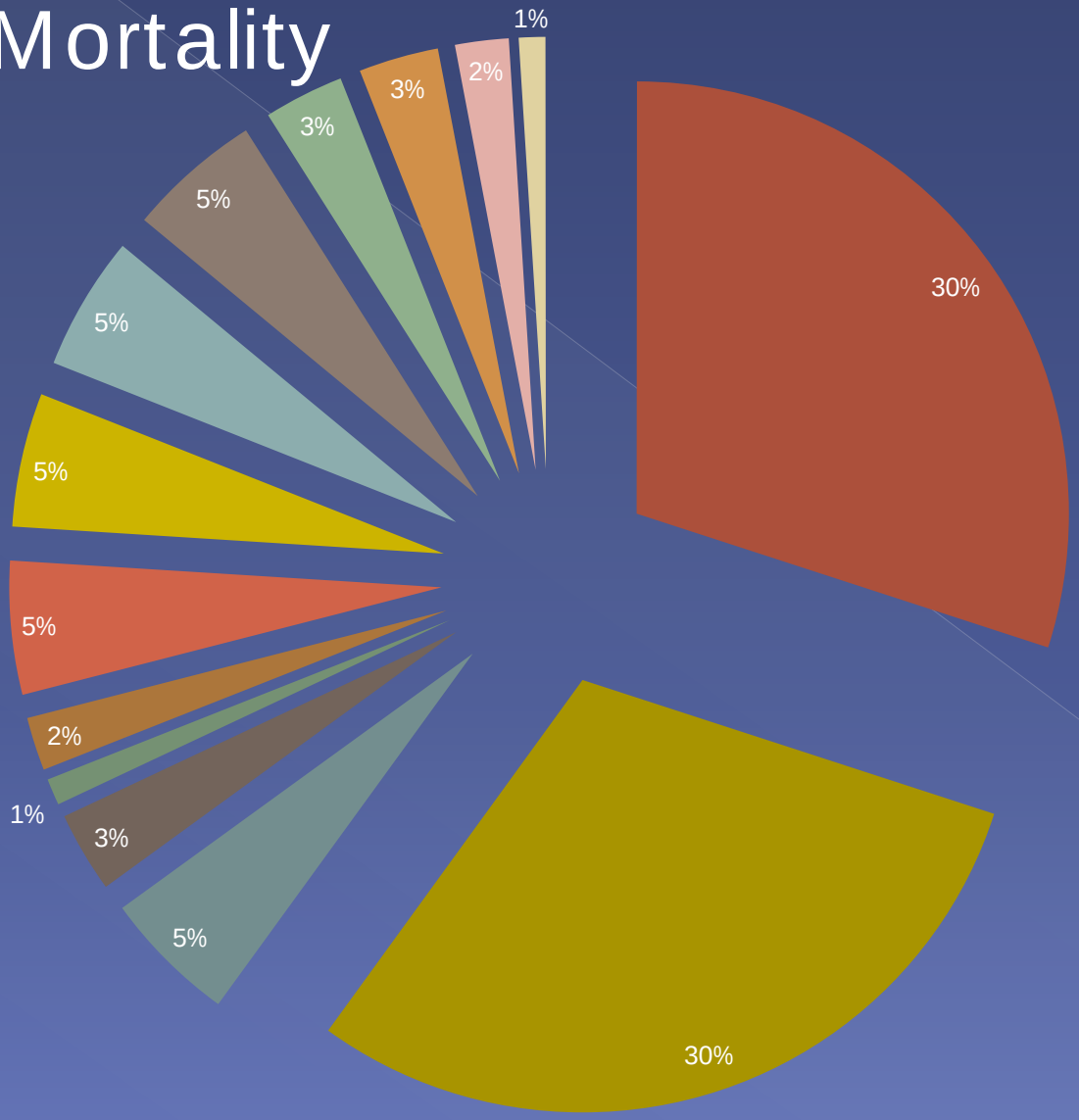
Why (Energy Balance) Behaviors are Important

Causes of Death in the US

Cause	Number	Percentage
Tobacco	435,000	18%
Diet & Activity	400,000	17%
Alcohol	85,000	4%
Microbial agents	75,000	3%
Toxic agents	55,000	2%
Motor Vehicle Crash	43,000	2%
Firearms	29,000	1%
Sexual Behavior	20,000	1%

From: Mokdad et al, *JAMA*, 2004

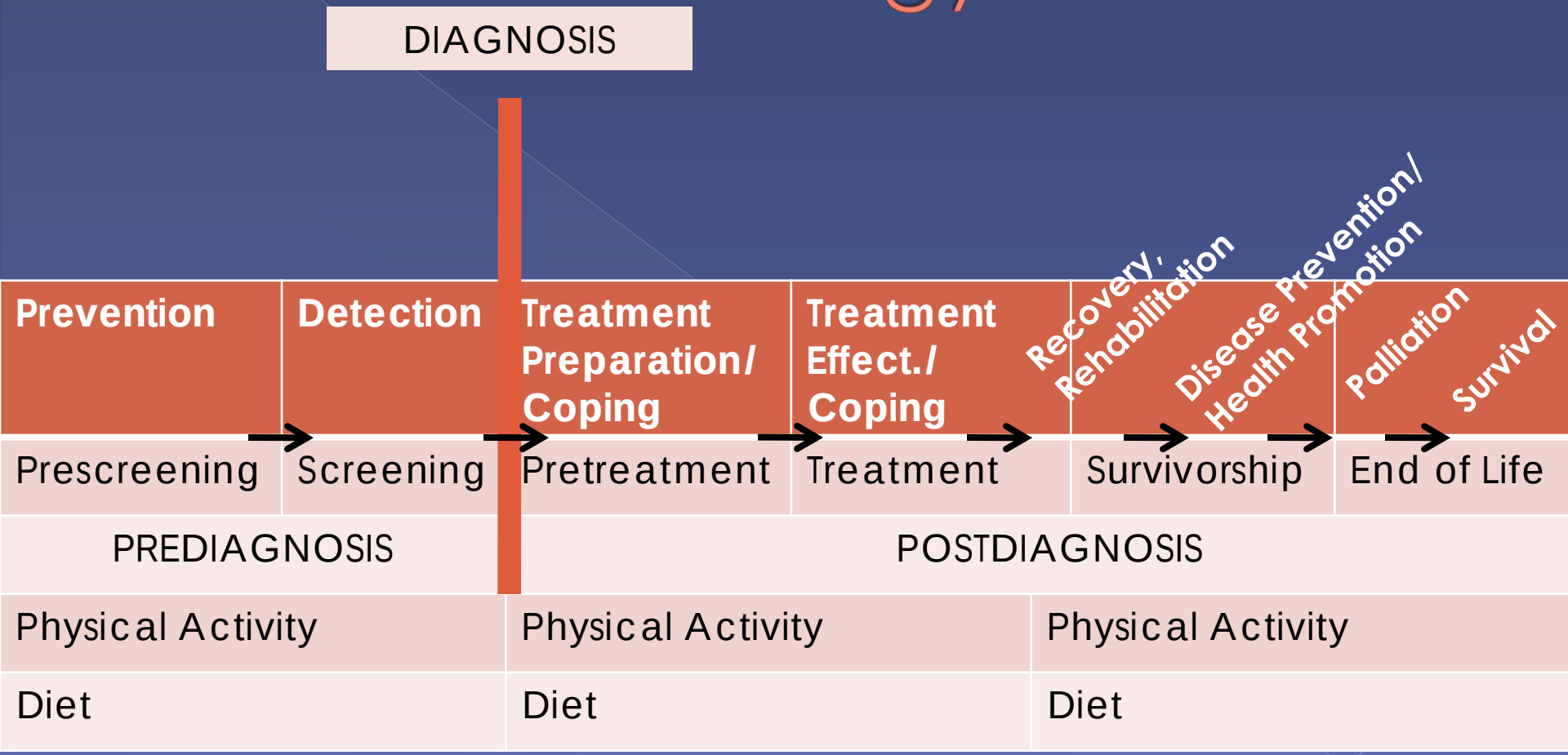
Causes of Cancer Mortality



- Tobacco
- Adult Obesity/Diet
- Sedentary Lifestyle
- Alcohol
- Salt/Food Additives
- Ionizing/UV Radiation
- Occupational Factors
- Viruses/Biologic Events
- Family History of Cancer
- Perinatal Factors/Growth
- Reproductive Factors
- SES
- Environmental Pollution
- Prescription Drugs/Medical Proc.

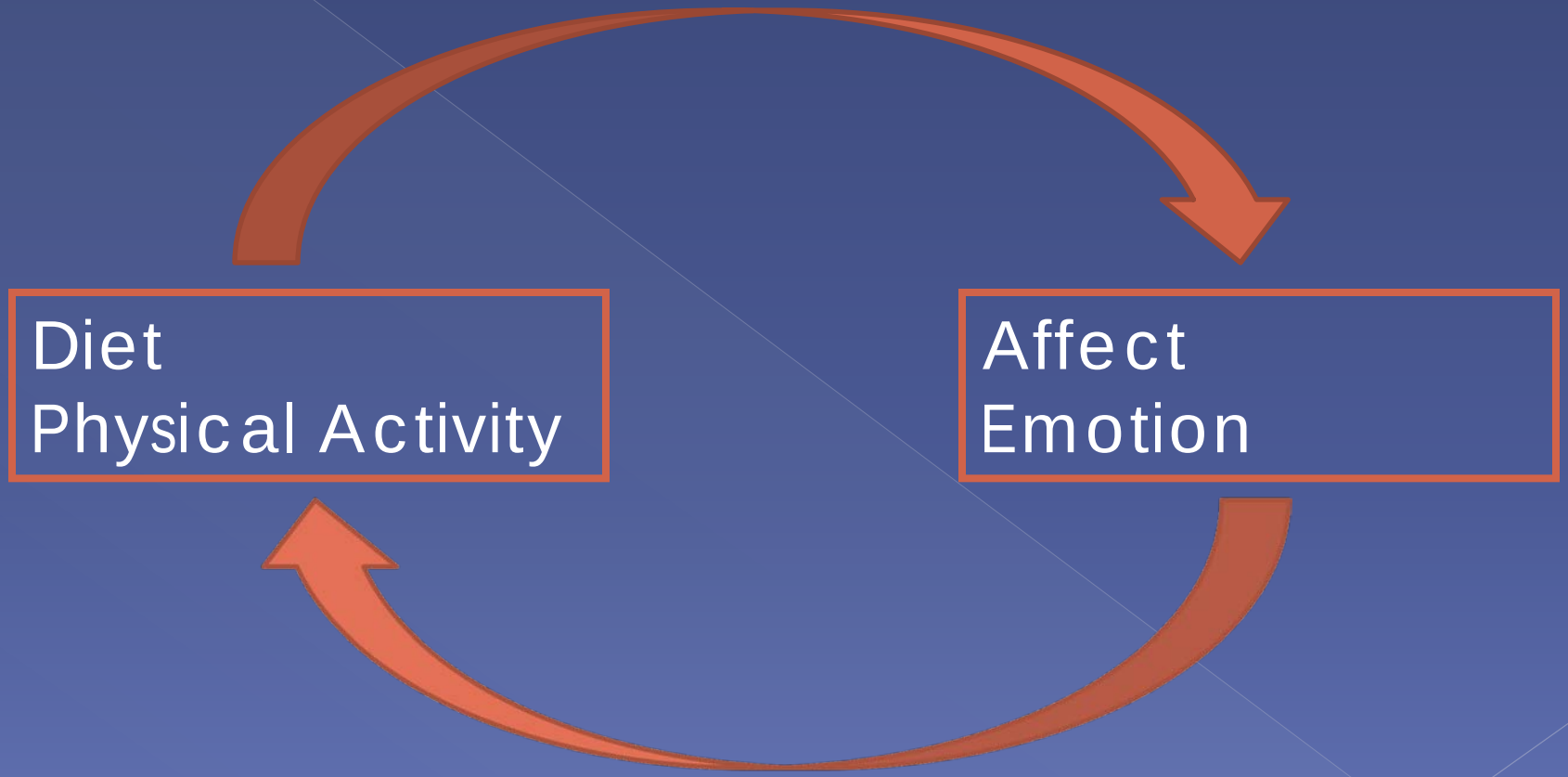
AACR, Cancer Progress Report, 2011

Cancer Control Continuum: The Role of Energy Balance



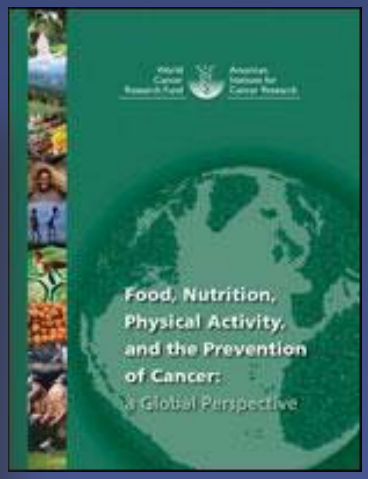
Adapted from *Courneya & Friedenreich, 2007*

Affect and Energy Balance Behaviors: Feedback



Energy Balance and Affect: Dietary Intake

Obesity and Cancer Risk



BODY FATNESS, AND THE RISK OF CANCER

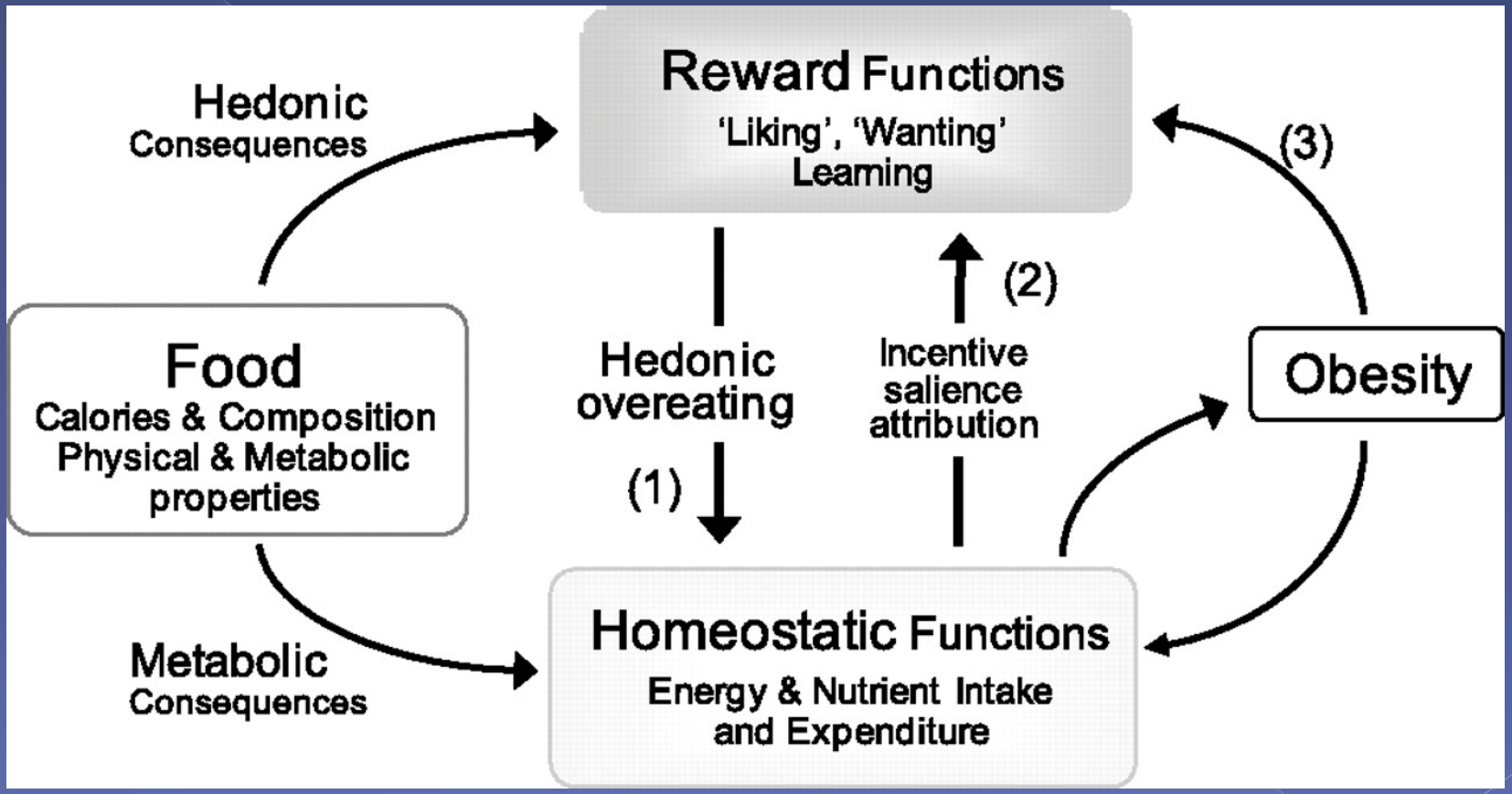
In the judgement of the Panel, the factors listed below modify the risk of cancer. Judgements are graded according to the strength of the evidence.

	DECREASES RISK		INCREASES RISK	
	Exposure	Cancer site	Exposure	Cancer site
Convincing			Body fatness	Oesophagus[1] Pancreas Colorectum Breast (postmenopause) Endometrium Kidney
			Abdominal fatness	Colorectum
Probable	Body fatness	Breast (premenopause)	Body fatness	Gallbladder[2]
			Abdominal fatness	Pancreas Breast (postmenopause) Endometrium
			Adult weight gain	Breast (postmenopause)
Limited — suggestive			Body fatness	Liver
			Low body fatness	Lung
Substantial effect on risk unlikely	None identified			

1 For oesophageal adenocarcinomas only.
2 Directly and indirectly, through the formation of gallstones.

For an explanation of all the terms used in the matrix, please see chapter 3.5.1, the text of this section, and the glossary.

Relationship Between Metabolic and Hedonic Controls of Food Intake and Energy Balance



Berthoud H et al. Am J Physiol Regul Integr Comp Physiol 2011;300:R1266-R1277

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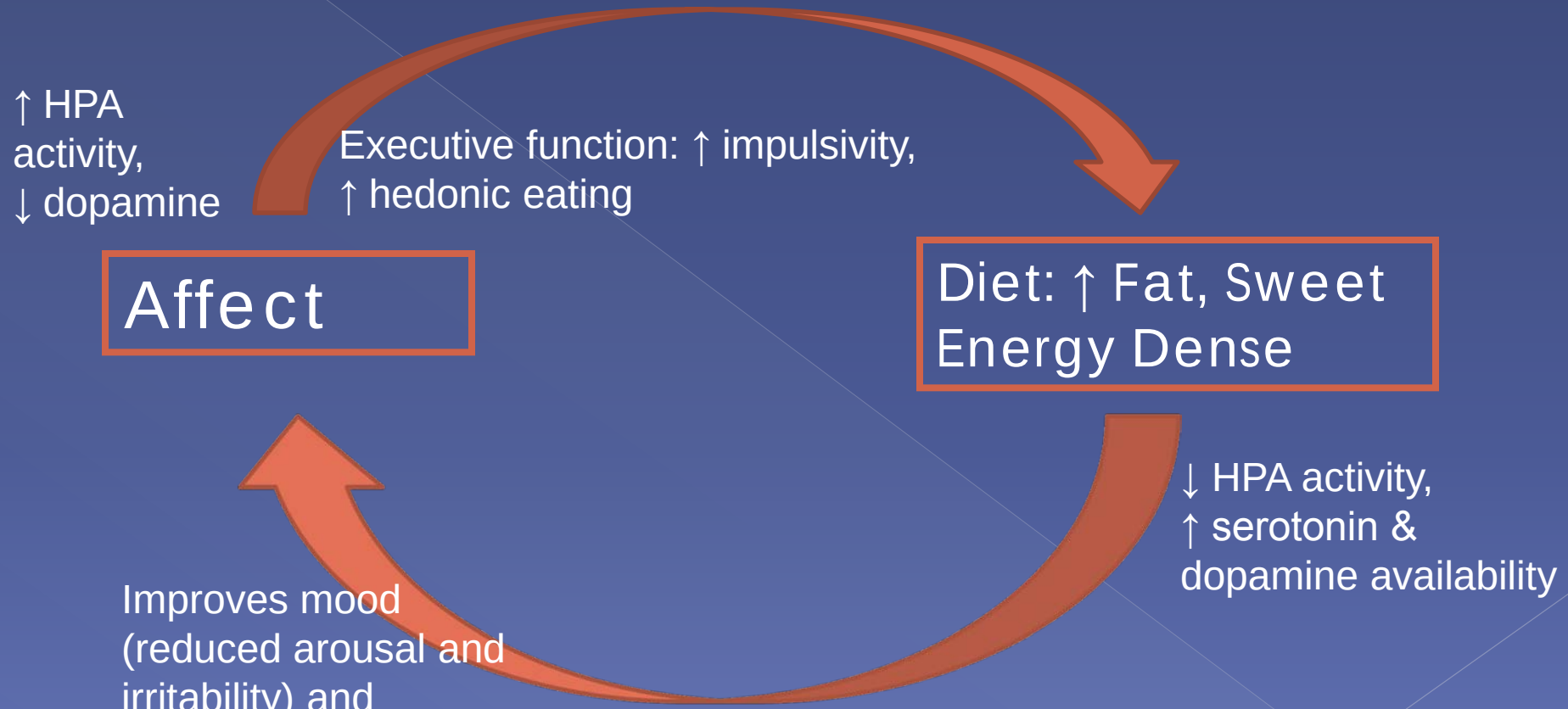
Emotion, Eating Behavior & Obesity

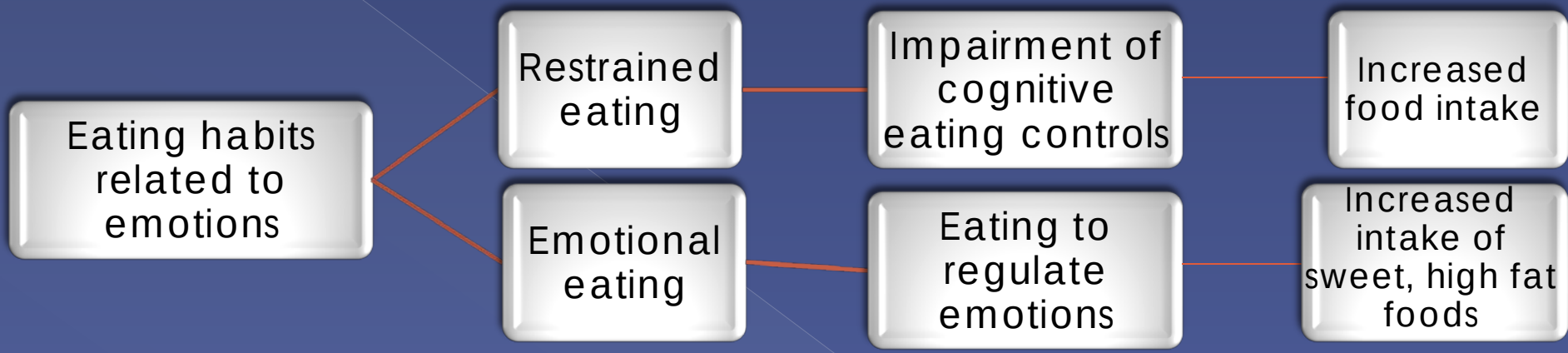
- Emotion (positive and negative) has a major impact on cognitive and psychological functions.

- Negative emotion enhances the shift in food choice from healthier foods to comfort foods. Emotions can increase the quantity of food consumed as well.

Affect, Eating Behaviors and Energy Balance: Feedback

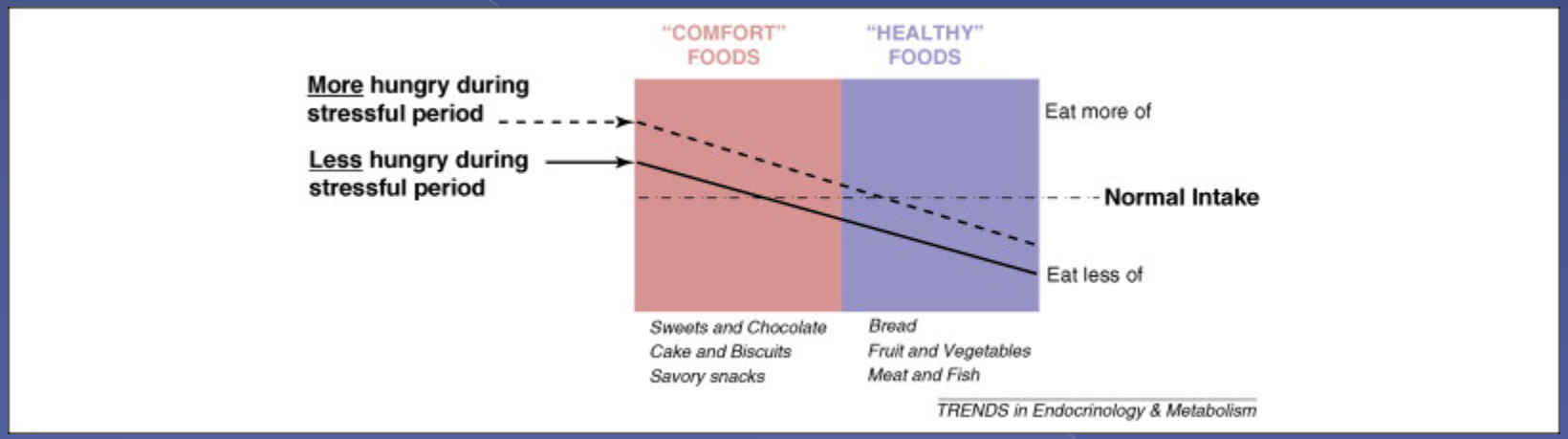


Emotion and Eating Behavior



- Limited capacity hypothesis: when restrained eaters cognitive capacity to maintain restricted food intake is limited by positive or negative emotional stimuli, food intake increases.
- Emotional eating theory: ability to regulate negative emotions by eating high fat, and carbohydrate "comfort foods".

Stress and Eating Behavior



Filling the Gaps: How affective science can inform eating behavior research

- What extent can a high fat diet protect from stress-induced anxiety and depressive-like symptoms? What is the underlying mechanisms?
- What is the relationship between timing of a high fat diet and the emotional effects of eating?
- What are the effects of positive emotions on eating behaviors? Are different hormones/neurotransmitters involved?

Filling the Gaps: How affective science can inform eating behavior research

- Are there other emotions that are sensitive or not sensitive to modulation by diet? What is the mechanism?

- What specific therapeutic interventions could impact/change dietary intake during the prevention, treatment, and post-treatment of obesity and cancer?

Energy Balance and Affect: Physical Activity

Existing evidence: Affect → Physical Activity (PA)

- Mood disturbance (Clinical)
  - Very low levels of PA
  - Very high degree of sedentary behavior
  - Low "predicted" fitness and exercise tolerance
- Negative affect (non-clinical)
  - Low levels of PA
  - High degree of sedentary behavior
  - Low exercise tolerance
- Cancer Survivors
  - Low levels of PA during treatment
  - Treatment & negative affect related to PA

Existing evidence: Physical activity ⟶ Affect

Exercise and Affect Studies Summary (1st generation studies)

Mode:

Aerobic & weight training appear equally effective

Frequency:

Mental health improvement limited after 3bouts/wk.

Duration:

Mood effects with as little as 5 minutes; 30min optimal

Intensity:

Moderate/low intensity better than high

Program Length: Longer program related to better effect

Newer Generation Studies

Focus on affect reactivity to exercise and exercise adherence,

Focus on positive affect rather than alleviation of negative affect

Measurement of general emotional response (i.e., good/bad) to exercise versus distinct emotions

Do not merge affect with physical state (e.g. “fatigue”).

Intensity based on physiological relevancy (i.e., ventilatory threshold rather than percent of maximum)

Focus on affective response *to exercise session (*during not only delayed pre-post *measurement*

Statistical modeling captures greater individual variability

Acute Affect by Exercise Attributes

Exercise Attribute :	Affect Response
Mode	**n.s.**
Intensity [a] **LOW: < ventilatory threshold (VT)**	**Rated as pleasurable**
Moderate: at VT	**Variable Response** **Self-set: rated as pleasurable;** **Prescribed: Variable response**
Duration (session)	15 – 30 min: limited testing 60+ Min: possibly becomes aversive
Frequency	**n.s.**
Program Length	n.s.

Adaptation of Dual –Mode (Circumplex) Model

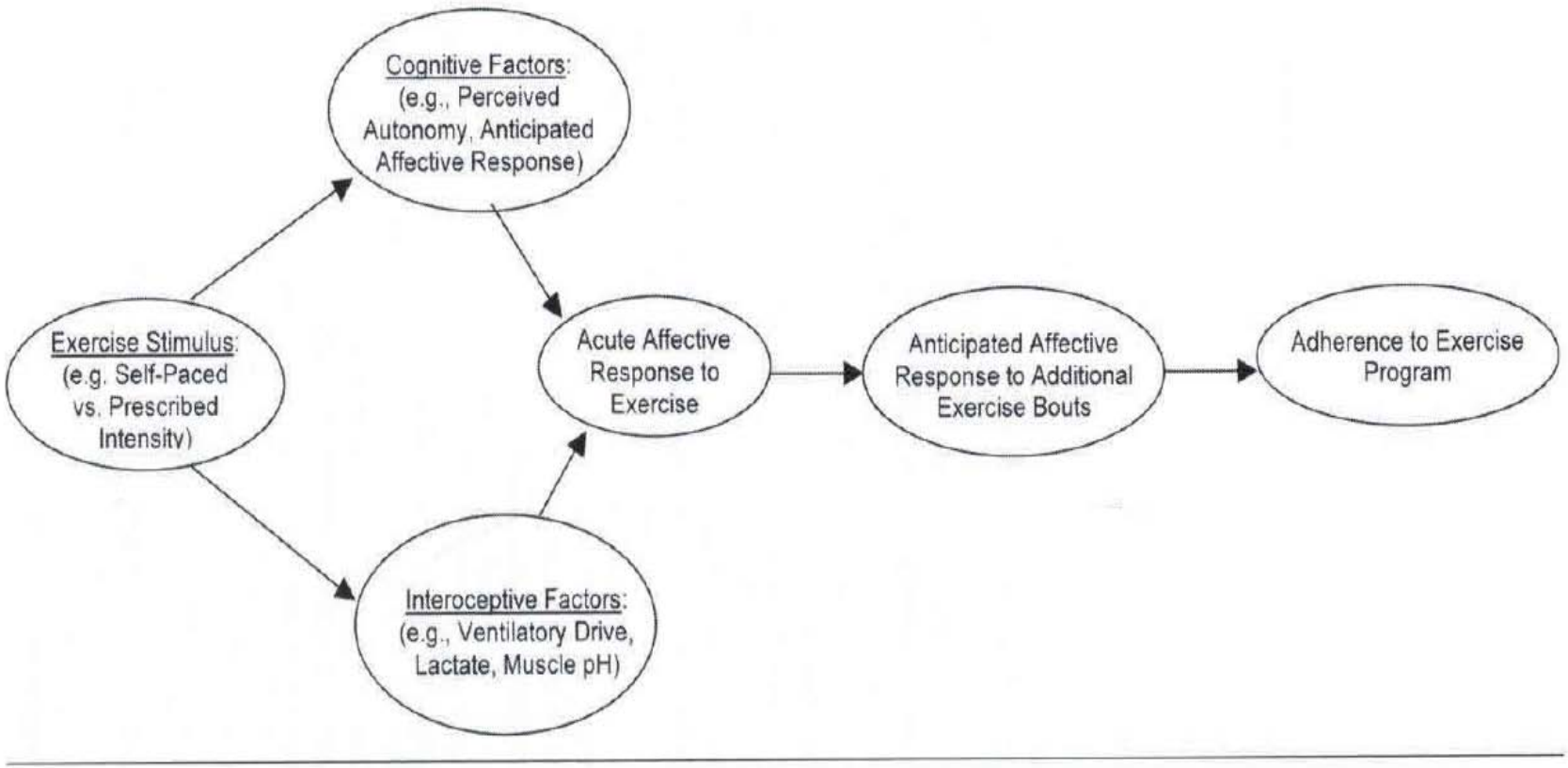


Figure 1 — A model of exercise instensity, affective response, and exercise adherence.

Williams, D.M. (2008). J of Sport and Exer. Psych, 30, 471-496
Ekkekakis et al., (2011). Sports Med., 41, 641 -671

Exercise-Affect and Adherence Studies

Williams et al, 2008 (sedentary, overweight, adults)

- Pleasure (Feeling State [FS]): at 2-min. walk test
- Correlations with minutes of physical activity
  - R = .50 @ 6-month follow-up
  - R = .47 @ 12month follow-up
- I unit increase in FS --> additional 38min of PA

Schneider et al, 2009 (adolescents)

- Pleasure (Feeling State [FS]): 30-min. cycling @ 80% VT
- Participants who reported:
  - ↑ Pleasure: 54min. PA by accelerometer
  - ↓ Pleasure: 40min. PA by accelerometer
- I unit increase in FS --> additional 4.8min of PA

Filling the Gaps: How affective science can inform PA research

- Basic theory-testing related to exercise elicited affect (e.g., self-paced vs. prescribed exercise; social & environmental setting; person-factor interactions…etc).

- Does the acute emotional response to exercise predict later adherence? If so, what are implications for intervention (e.g., triaging, manipulating exercise setting…etc)?

- Are there important distinctions in evoked emotional response to physical activity, exercise, and sedentary behavior? Implications for intervention?

Filling the Gaps: How affective science can inform PA research

- What is role of exercise elicited affect in multiple behavior change paradigm (e.g., smoking)