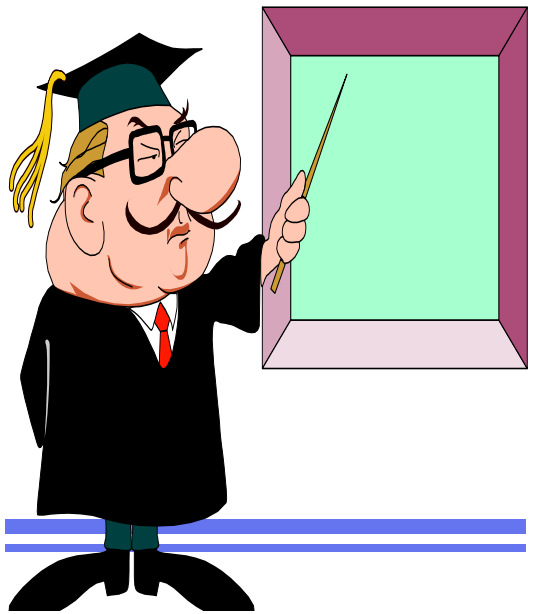
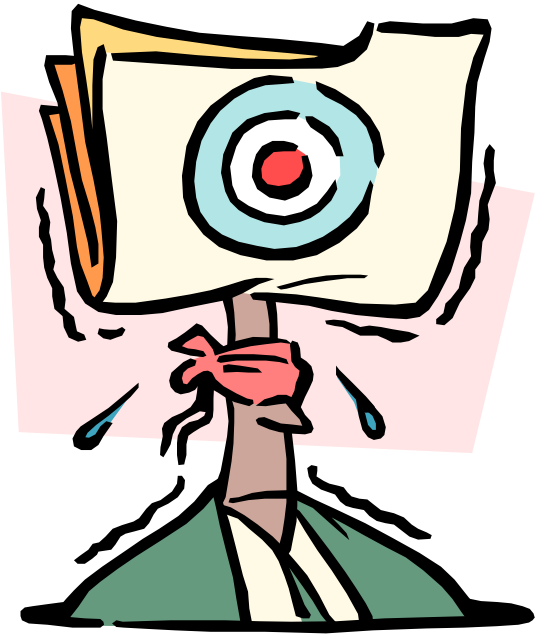
Fatigue, Decision Making, and the Fire Line



- The ability to make decisions is critical when fighting wildland fires.
- Some level of stress and perhaps fatigue can bring about clarity and concentration. Too much fatigue and stress however – will disrupt decision making capabilities.
- People perceive and process information differently. How does fatigue influence how we interpret and process information?

Key Terms

- **Arousal:** level of physiological and psychological activity at any given moment; occurs on a continuum
- **Stress:** physiological and psychological response to a challenge that requires some form of adjustment
- **Anxiety:** negative end of arousal; characterized by worry, nervousness, and apprehension



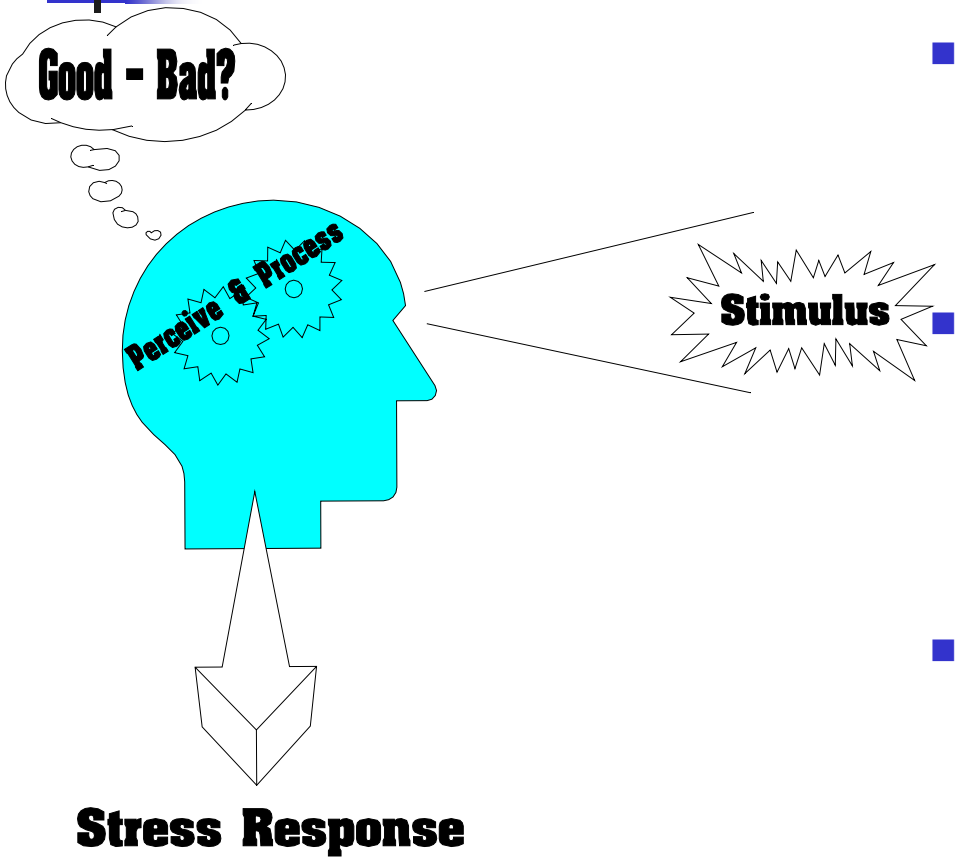
Key Terms

- **State Anxiety:** describes the level of anxiety at any given moment; moment-to-moment anxiety; ever-changing mood
  - **Cognitive State Anxiety:** the negative thoughts and worries one has in an anxious moment
  - **Somatic State Anxiety:** how the physiology responds in anxious moments – real or perceived
- **Trait Anxiety:** one's predisposition to perceive challenges; acquired behavioral tendency
- **Decision Making**: the process of considering and selecting alternatives
- **Fatigue:** decreased capacity to complete work; physical or mental weariness

Understanding Stress

- Lazarus's Cognitive Theory of Stress
  - Suggests that it is one's perception of a stressor that causes stress – not the stressor itself
- What Causes Negative Stress?
  - A perceived imbalance between the challenge (physical or psychological) placed on an individual and their ability to overcome the challenge.

Lazarus's Cognitive Theory of Stress



- Primary Appraisal
  - Person determines if event or stimulus is negative, positive, or neutral.
- Secondary Appraisal
  - Person evaluates their level of control, coping resources available, and considers options.
- Stress Response
  - How the person reacts physiologically, emotionally, and behaviorally.

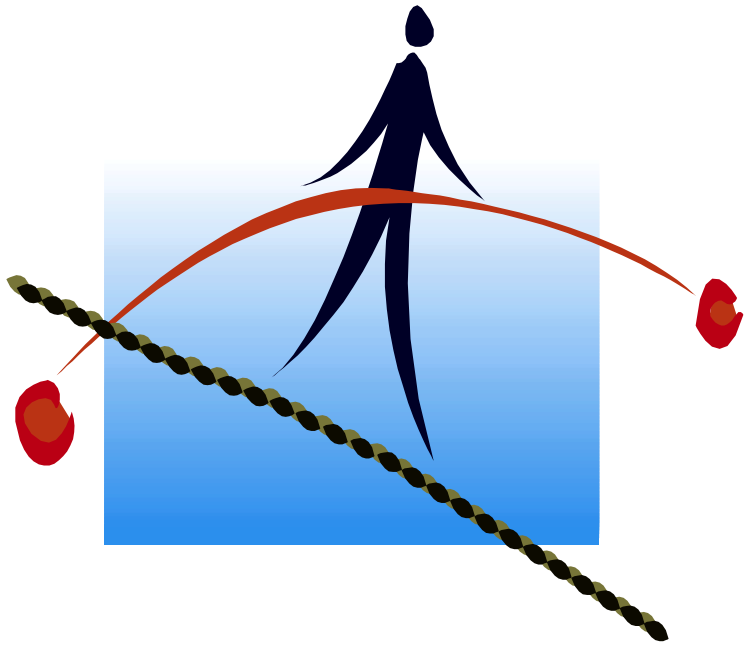
How People Will React Is Not A Given

- ***"Men are disturbed not by things but by the views which they take of them"***
  - ***Epictetus 55-135 A.D.***

- It is not cut & dry how people will respond in the fire setting. Experience will impact appraisal – but how?
- How people will respond is difficult to understand.
  - Emergency workers often do not want to participate in research.
  - Fear is not always reliable – we never really know where *"the edge"* is.

Positive Appraisals Even In Extreme Circumstances???

- A new sense of meaning or feeling good about one's contribution in a disaster response (Anderson, et al., 1991).
- Exhilaration, sense of occupational achievement, enhanced appreciation of life, and a sense of control (Moran and Colless, 1995).

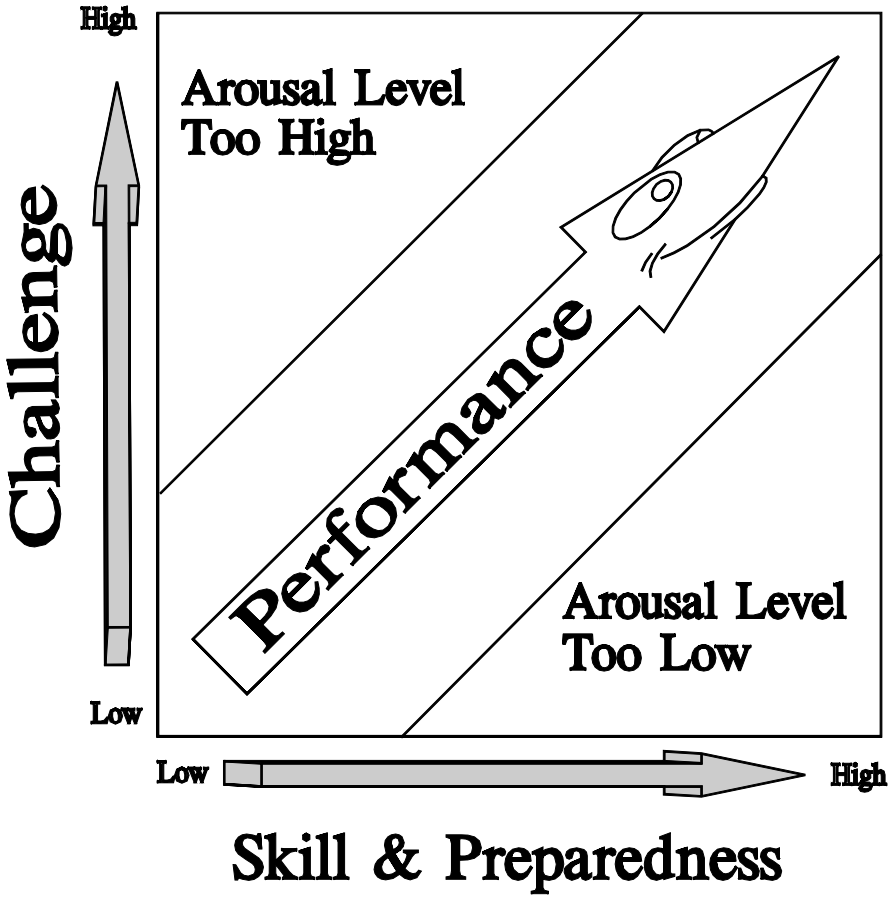


Arousal, Anxiety, and Performance

- How does arousal (physically or psychologically) and anxiety affect performance (positively or negatively)?
- A number of theories have been developed to help explain the connection.
  - Drive Theory
    - Linear relationship between arousal and performance
  - Inverted-U Hypothesis
    - Maximum performance is at a midpoint of arousal
  - Catastrophe Model
    - There is a threshold between anxiety and performance
  - Reversal Theory
    - Depends on a person's interpretation of their arousal.

Achieving a Balance Between Demand and Abilities

- Perhaps the best model to strive for is the Flow Model. Achieving "flow" has to do with one's level of *preparedness.*



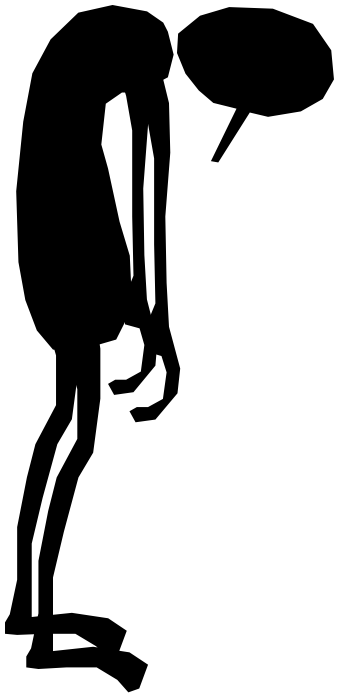
Causes of Fatigue

- Energy System Depletion
  - Phosphocreatine
  - Glycogen
  - Blood Glucose
- Accumulation of Metabolic By-Products
  - The role of lactic acid
  - Failure of contractile fiber recruitment
- Central Nervous System Involvement
  - Neuromuscular Fatigue
  - Fatigue of the CNS (*"central fatigue"*)
- Environmental Temperature
  - Increased energy demands
- Nutritional Influence
  - Type of calorie
  - Timing of intake

Effects of Progressive Dehydration

- 1% body weight loss = thirst
- 2% body weight loss = increased thirst, loss of appetite, discomfort
- 3% body weight loss = impatience, decreased blood volume
- 4% body weight loss = nausea, slowing of physical work
- 5% body weight loss = difficulty concentrating, apathy, tingling
- 6% increased body temp, pulse, and respiration rate
- 7% body weight loss = stumbling headache
- 8% body weight loss = dizziness, labored breathing
- 9% body weight loss = weakness, mental confusion
  10% body weight loss = muscle spasms, indistinct speech
- 11% body weight loss = kidney failure, poor circulation due to decreased blood volume

Fatigue and the Willingness to Take Risks



- There is some evidence (anecdotal and risk analysis) suggesting that fatigue and other negative emotions have an impact on decision making and risk taking. Example: When do most industrial accidents occur?
- Analytic processing can be reduced, information may not be processed completely, and this can increase the chance of risk choices being made.
- Ultimately, who is taking the risk?

Characteristics That Affect Risk Taking

- People may be at risk because of too much experience or too little experience.
- Risk Taking Characteristics:
  - State Fatigue
  - State Anxiety
  - Familiarity
  - Importance
- Changes in fatigue show the greatest affect on risk behavior.

Developing Preparedness

Are You Prepared to Make Good Decisions?

- Years of Experience
  - Sensitizing or Desensitizing Effect
- Critical Incident Involvement
  - What is being passed on?
  - Who are you modeling?
  - *"We've survived so it must work."*
  - How close to the edge are you?
- Training
  - Adequate or Inadequate
- Skill Acquisition
  - What more could we do?

Skill Determination and Acquisition

- The first step toward becoming a good decision maker on the fire line is to recognize that fatigue hampers your ability to make appropriate decisions – fatigue affects everyone.
- Training should include simulation to help people anticipate events and predict how they will react.
- Emergency workers tend to be optimistic which may make them more vulnerable (Taylor, 1989).
- Take the necessary steps to prevent and minimize fatigue.
- Determine your skill strengths and identify skill weaknesses. Actively work on improving your skill base.

Fatigue Prevention

- Regular Exercise Routine
  - Increased Energy Level
  - Improved Self Esteem
  - Better Glycogen Storage
  - Improved Recruitment of Muscle Fibers
  - Better Response to Accumulation of Metabolic By-Products
  - Reduction in Central Fatigue

Fatigue Prevention

- Hydration and Temperature Control
  - Energy Preservation
  - Heat Acclimatization
  - Improved Muscle Activity – Less Cramping
  - Reduction in Central Fatigue
- Sport Drinks, Water, and Electrolytes
  - Pros and Cons
  - Sodium and Glucose Most Important
  - Amount and Frequency
  - How To Drink More

Fluid Intake Information

- Fluid Recommendations for Active People:
  - 16 ounces of fluid up to 2 hours before event
  - 4 to 8 ounces 5 to 10 minutes before event
  - 8 to 10 ounces (or more as tolerated) every 15 to 20 minutes during activity
- Are You Drinking Enough?
  - Urine Color
  - Quantity of Urine
  - Weigh Yourself Before and After
  - How Do You Feel?
    - chronically fatigued
    - headache
    - lethargic

Fatigue Prevention

- Nutritional Strategies
  - Sound Diet
  - Body's Preference For Fuel – Carbohydrates
  - High CHO Diet vs. Low CHO Diet
  - Glycogen Storage and Your Energy Reserves
  - Timing of Intake

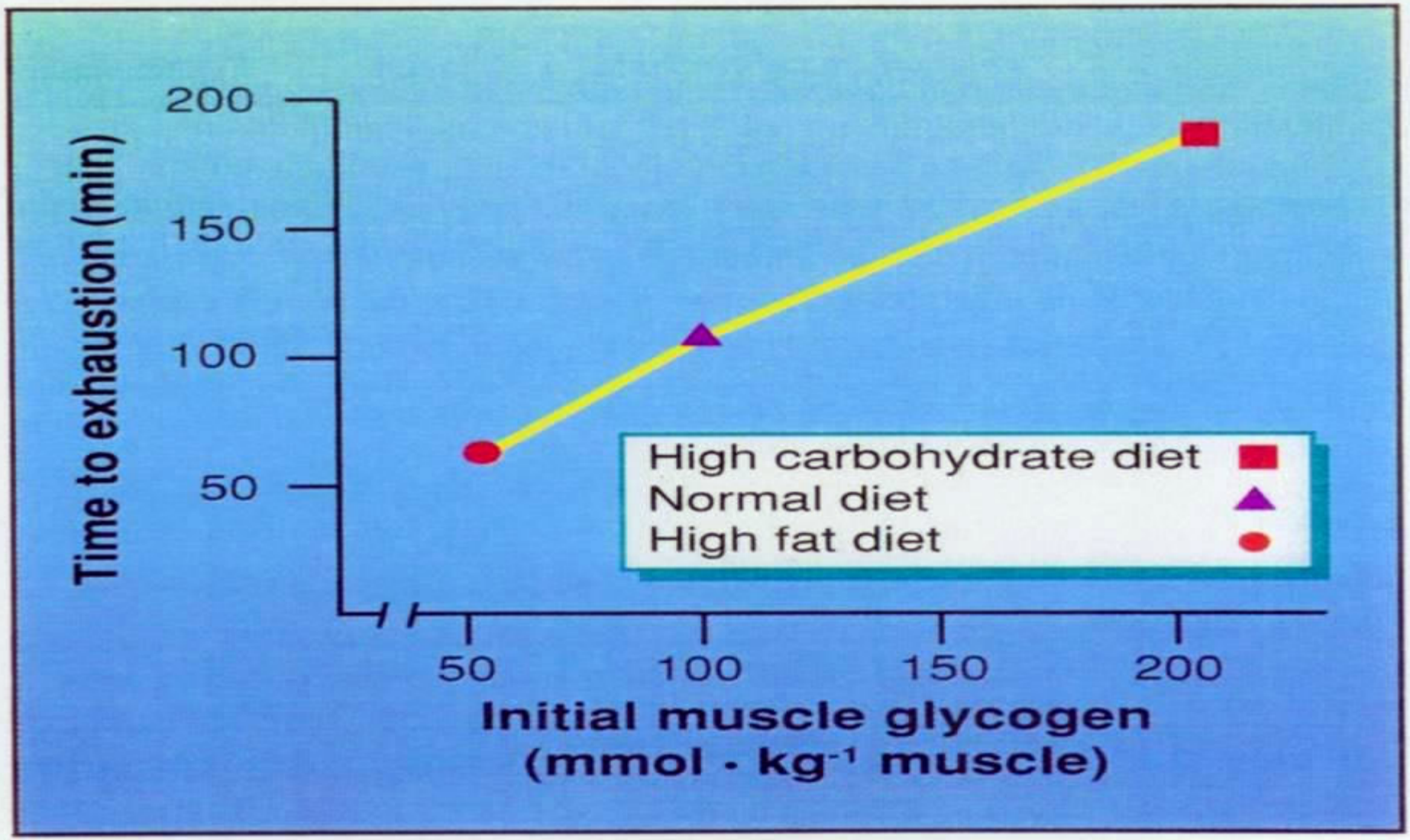


Figure 15.2 The relationship between muscle glycogen content and exercise time to exhaustion.

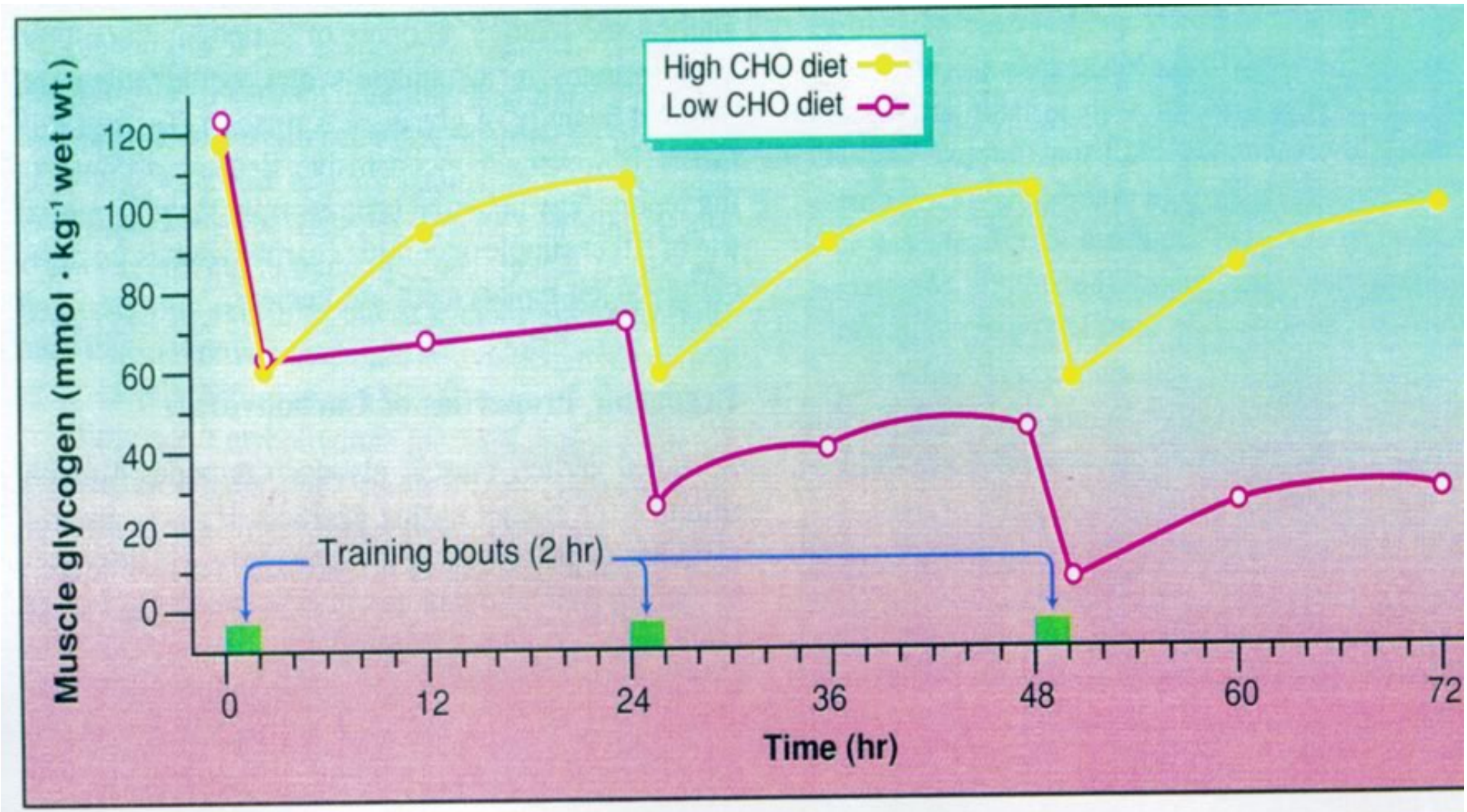


Figure 15.1 The influence of dietary carbohydrates on muscle glycogen stores during repeated days of training. Adapted Costill and Miller (1980).

Fatigue Prevention

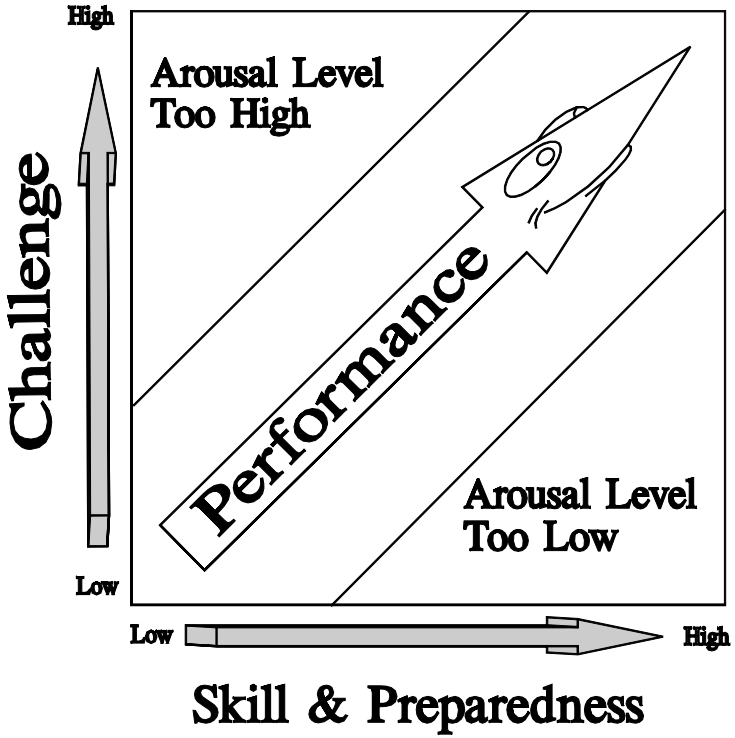
- Prevent Central Fatigue
  - Proper Nutrition
  - Adequate Hydration
  - Carbohydrate Supplementation
  - Take Breaks
  - Mental Rehearsal
  - Work Toward Achieving a Balance Between the Challenge and Skill Level – “Flow”

Striking a Balance Between Skill and the Challenge

- Mental and physical performance is always better when we are in our comfort zone. To get into that comfort zone, there needs to be a balance between our skill – real and perceived – and the challenge or demand.
- Making good decisions on the fire line are more likely if one strives to stay in their zone.

Balance and Your Level of Preparedness

- Are you prepared to meet the challenge? What is your Level of Preparedness?
- Do you have the proper motivation to perform well? What are your primary goals?
- Optimal performance generally stems from a well designed plan. What is the plan? And are you confident in that plan?



Other Skills That Influence Level of Preparedness

- Proper Focus
  - Not too wide – not too narrow
- Concentration
  - Being able to focus on the relevant information
  - Improving Concentration
    - Simulations
    - Trigger Words – attentional cues
    - Specific and Clear Goals
- Reasoning Skills
- Problem Solving
- Positive Self Talk
  - Helps control thoughts, feelings, and in turn – behaviors.
- Communication Skills
  - What type of a communicator are you?
- Arousal Regulation
  - Anxiety Control
- Realistic Goal-Setting
- General People Skills