

Migraine, Stress and Peanut M&Ms



Diagnosis of Migraine



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Diagnosis of Migraine

Symptoms associated with your headaches

	Yes	No
• Usually one-sided	<input type="checkbox"/>	<input type="checkbox"/>
• Moderate or severe pain	<input type="checkbox"/>	<input type="checkbox"/>
• Throbbing pain	<input type="checkbox"/>	<input type="checkbox"/>
• Pain aggravated by routine activity	<input type="checkbox"/>	<input type="checkbox"/>
• Nausea or vomiting	<input type="checkbox"/>	<input type="checkbox"/>
• Aversion to light or sound	<input type="checkbox"/>	<input type="checkbox"/>

If you checked 3 or more of the YES boxes, you have several of the diagnostic criteria for migraine. You should talk to your doctor about diagnosing and treating your headaches.



Migraine and Stress

Migraine is an inherited disorder occurring in people who have both an undue tendency to seek stress and at the same time a deficiency in their physiological adaptation to stress.

John R. Graham (1952)



Migraine and Stress

Background...

- Stress is the #1 “cause” of migraine
 - ✓ Graham, 1952
 - ✓ Henryk-Gutt and Rees, 1973
 - ✓ Levor et al, 1986
 - ✓ Amery and Vandenberg, 1987
 - ✓ Kohler and Haimerl, 1990
 - ✓ Holm et al., 1996
 - ✓ Wacogne et al, 2003

Stress

Definition...



**And you thought
there was stress
in your life !**



Stress

Definition...

- a specific adaptive and defensive physiological reaction by the sympathetic nervous system (SNS) to a wide variety of physiological and/or psychological stimuli.



Migraine and Stress

Background...

- Numerous formal studies have shown that subjective ratings of stress are significantly higher in migraineurs than in age-matched controls.



Migraine and Stress

Wacogne et al., 2003...

- Stress, anxiety and depression measures were obtained in a sample of migraineurs (n = 141) and a control group (n = 109).
- Stress and anxiety measures were higher in the migraine group than in the control group
- *The highest scores of migraineurs were reported for 'morning fatigue', 'intrusive thoughts about work', 'feeling under pressure', 'impatience' and 'irritability'*



Migraine and Stress

Holm et al., 1997...

- In one study, between 50% and 70% of migraineurs showed *significant, substantial and meaningful* temporal correlations between their daily stress and their daily migraine activity



Migraine and Stress

Key question...

Why?



Migraine and Stress

Current answer...



Migraine and Stress

Nonetheless...

- Stress management is required to manage migraine optimally



Stress Treatment Options

However...

- stress management may be one of the most difficult tasks in medicine
- disappointingly little effort has been devoted to stress management in migraine



Stress Treatment Options

Non-pharmacological approaches...

- Relaxation
- Exercise
- Meditation
- Biofeedback

Stress Treatment Options





Stress Treatment Options

Raskin, 1988...

- periods of exhilaration can induce a dramatic remission of headache disorders



Stress Treatment Options

Raskin, 1988...

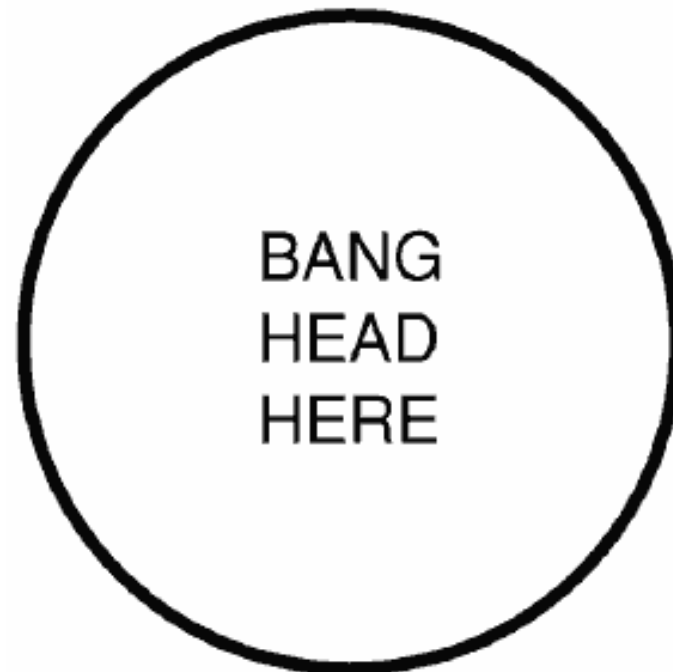
- periods of exhilaration can induce a dramatic remission of headache disorders
- *“falling in love is by far the most common circumstance”*

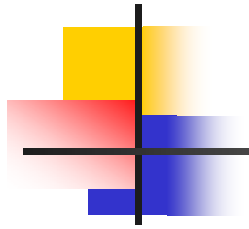


Final Treatment Option

ANTI-STRESS KIT

1. PLACE ON A FIRM SURFACE
2. FOLLOW DIRECTIONS IN CIRCLE
3. REPEAT UNTIL YOU ARE UNSTRESSED
OR BECOME UNCONSCIOUS





Migraine and Stress:

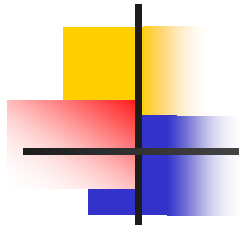
Practical Applications



The Biology of Stress

A practical clinical example...

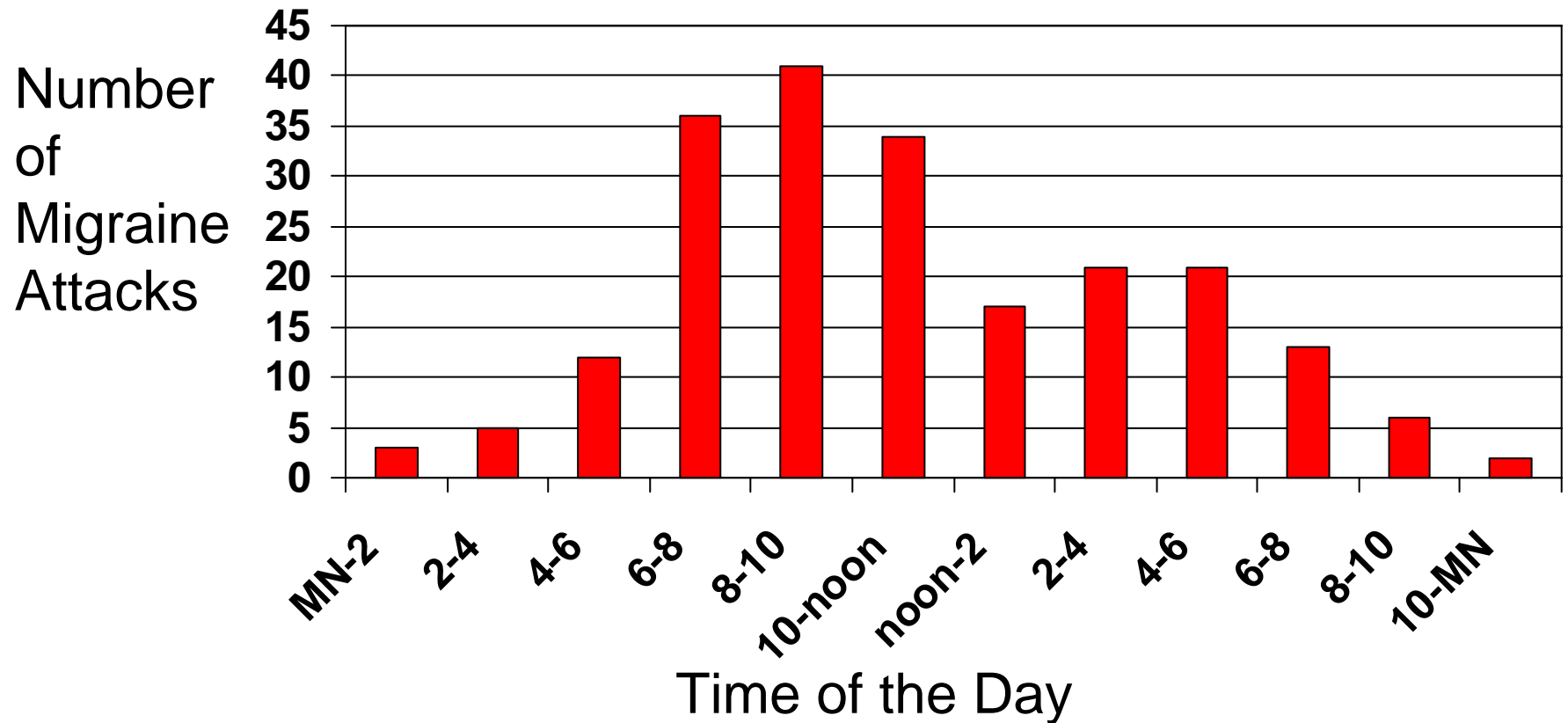
- The most likely time to experience an acute attack is in the morning



Migraine Background Information

Migraine frequency is highest in the morning

(Adapted from Solomon, *Cephalalgia* 11:178-180, 1991; Solomon, 1992)





Morning Stress

Physiology...

- Mental stress due to awakening
- Physiological stress (e.g. orthostatic changes)
- Overnight fast
- Bright light
- Increased auditory stimulation



Morning Stress

Physiology...

- Getting ready for work



Morning Stress

Physiology...

- Getting ready for work
- Getting to work



Morning Stress

Physiology...

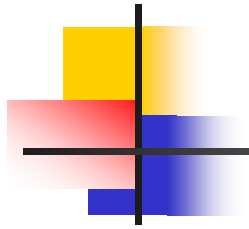
- Getting ready for work
- Getting to work
- Work



The Biology of Stress

A practical clinical example...

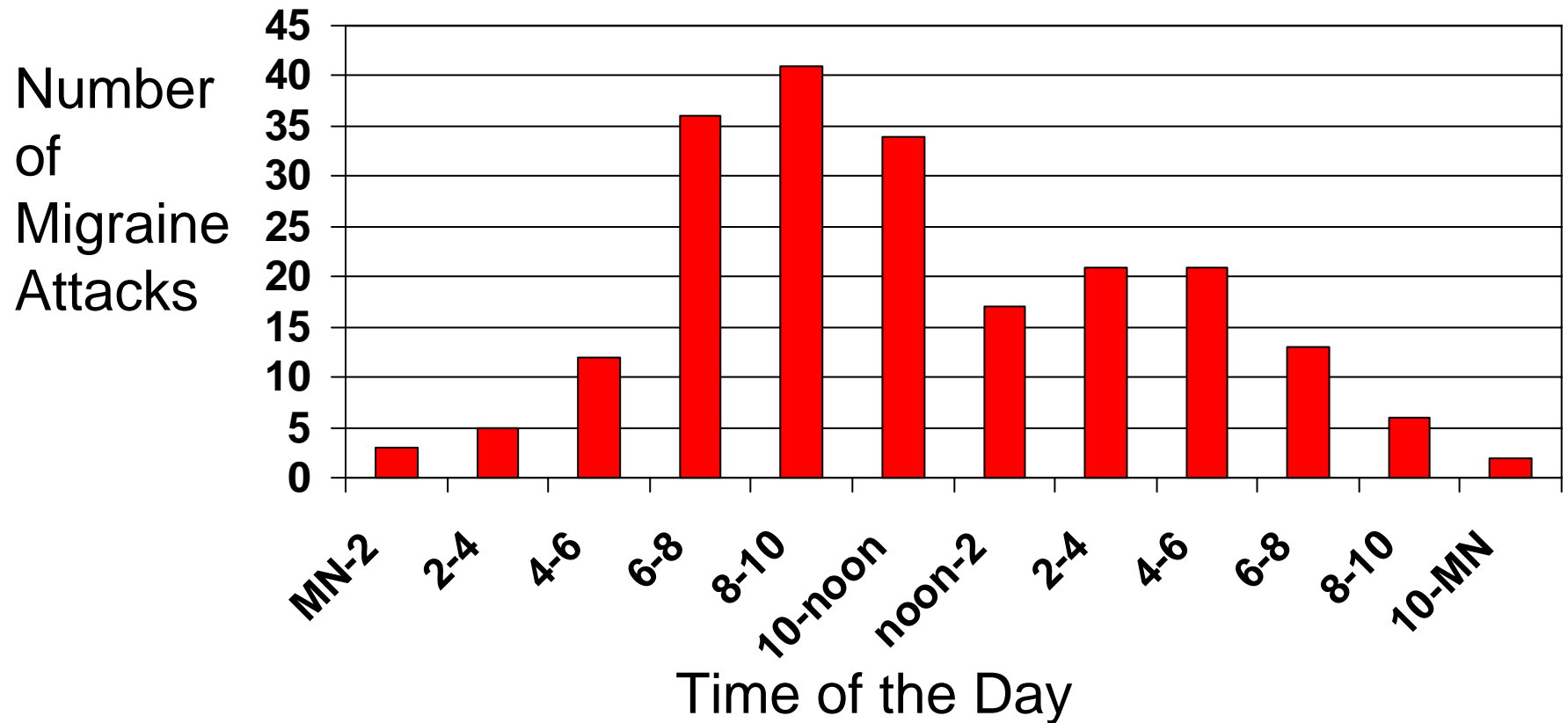
- The most likely time to experience an acute attack is in the morning
- The second most common time is late in the afternoon

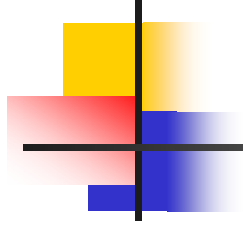


Migraine Background Information

Migraine frequency is highest in the morning

(Adapted from Solomon, *Cephalalgia* 11:178-180, 1991; Solomon, 1992)





Food for Thought:
Diet and migraine



A long recognized problem

- Dietary factors have often been implicated in migraine
- However, “elimination diets” in which certain “trigger” foods are avoided have *not* been found to be very useful in the management of migraine

Elimination Diets Have Failed





An unappreciated dietary problem

- 67% of migraines occur after 5 hours of “fasting”
- “Missing a meal” is one of the most common reasons cited as an cause of migraine (by approximately 50% of patients)

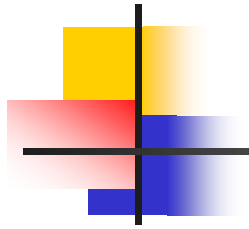


Yom Kippur Headache

Mosek and Korczyn, Neurology 45: 1953-1955, 1995

- A 25 hour religious fast in Israel induced a headache in:
 - 66% of headache sufferers
 - 29% of non-headache sufferers ($p < 0.000002$)

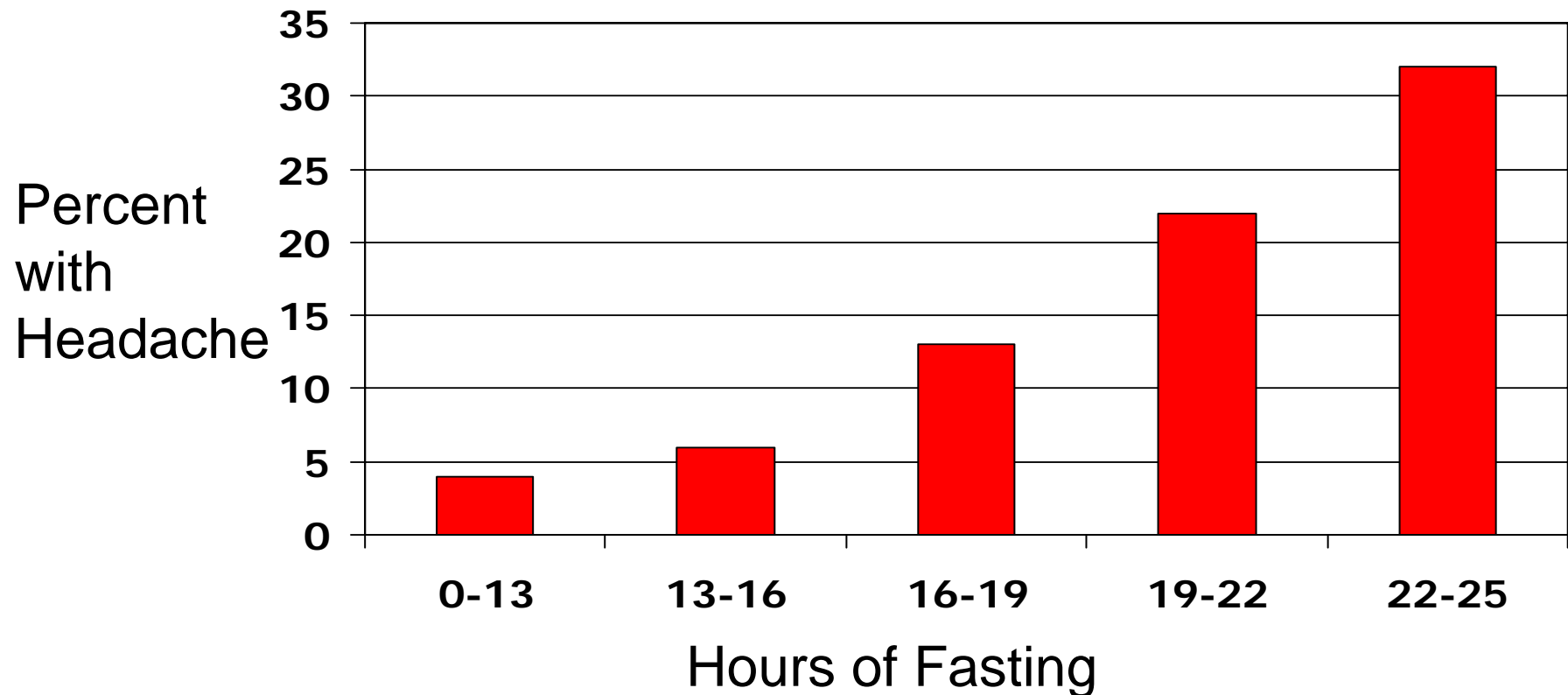
- Only 7% of non-fasters developed a headache during this same time period ($p < 0.000001$)



Yom Kippur Headache

Mosek and Korczyn, Neurology 45: 1953-1955, 1995

A direct relationship exists between the duration of the fast and headache frequency





Brain Nutrition Background

➤ Key facts

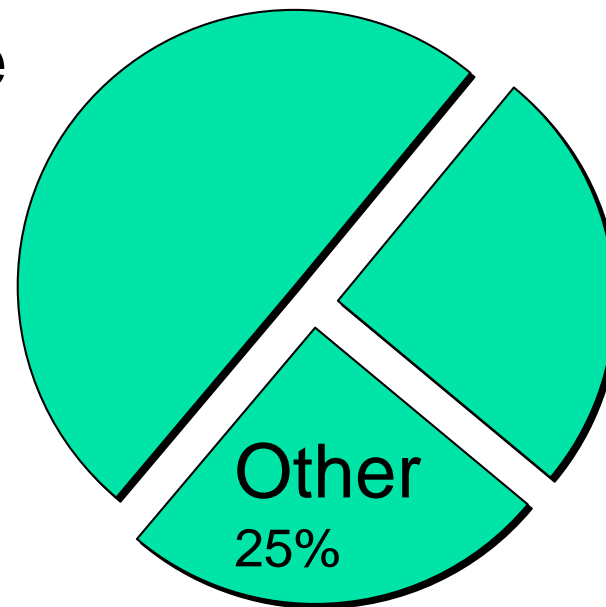
- ✓ The brain is 2.5% of a human's body weight but uses 25% or more of daily energy
- ✓ The brain is 100% dependent on glucose for its energy needs
(requiring 4-5 g glucose/hour)
- ✓ Dietary carbohydrates are the primary source of glucose and can be stored as glycogen in the liver



Nutrition Background Information

*Average daily energy needs
(2000 calorie total)*

Muscle
50%



Brain
25%
(glucose only)

Other
25%

The brain requires ~100-120 g glucose per day



Brain Nutrition Background

Carbohydrates are the most powerful ingested “drugs” that affect human brain function, yet they are rarely “dosed” properly in the modern diet.



Brain Nutrition Background

- The supply of glucose for the brain...
 - ✓ *serum glucose* (2 hours; ~20 g)
 - ✓ *liver glycogen* (2 -12 hours; max = ~100 g)
 - ✓ *gluconeogenesis* (glucose production from fat and protein stores)
 - requires activation of the sympathetic nervous system (i.e., a “stress response”)



The biology of eating

Energy stores of a 155 pound human

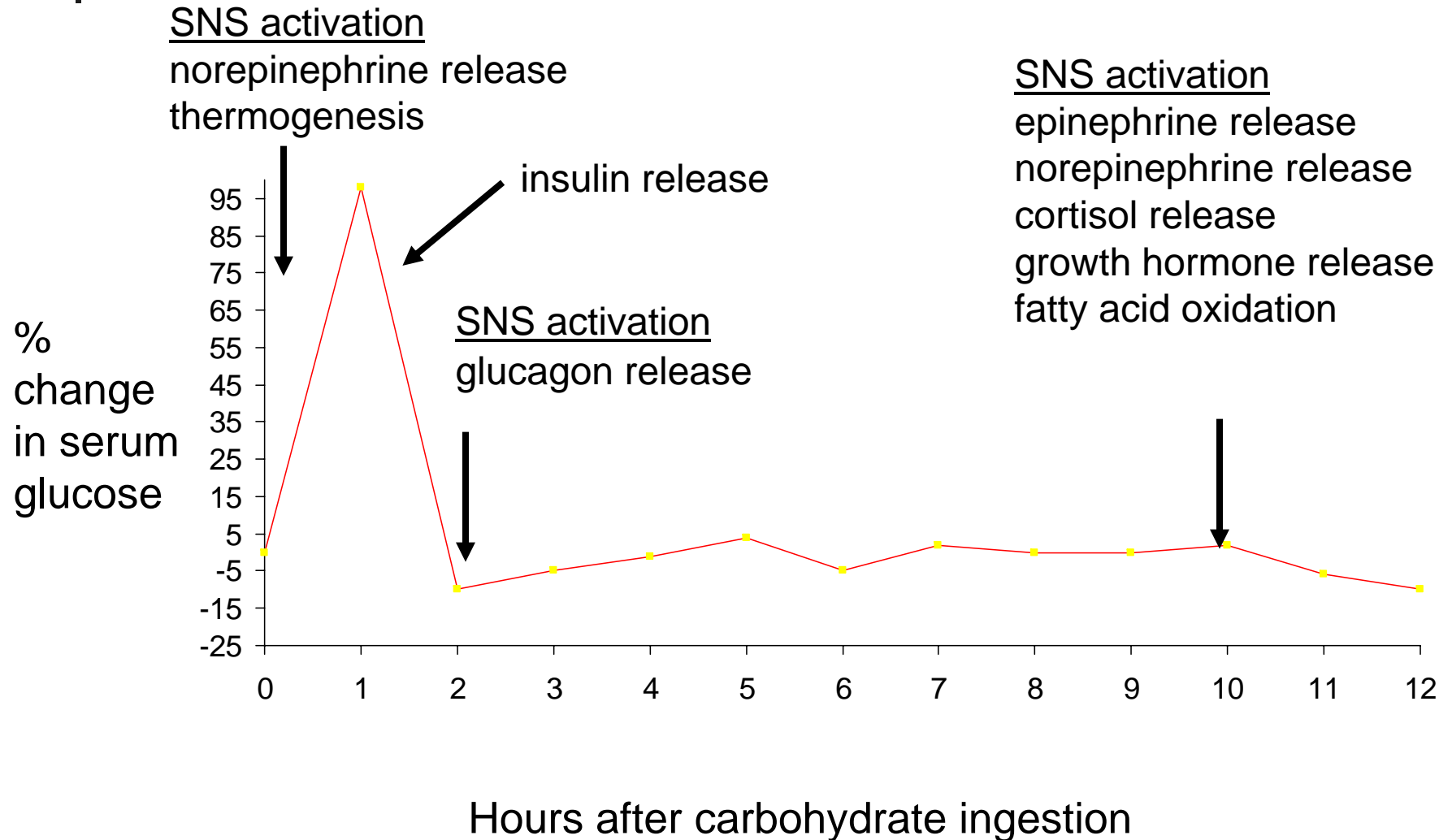
	<i>Grams</i>	<i>Calories</i>	<i>Supply Time</i>
carbohydrate	400	1,600	0.8 days
protein	6,000	24,000	12 days
fat	12,250	110,000	55 days



The biology of eating

The act of eating, although necessary for the provision of energy, is a particularly disruptive event in a homeostatic sense.

The biology of eating

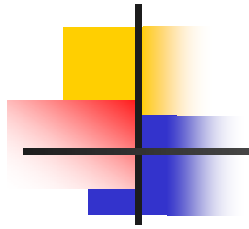




Migraine and Diet

Therefore...

- “Fasting” for more than a few hours can lead to activation of sympathetic nervous system (SNS) (i.e., a “stress response”)
- Rapid *changes* in serum glucose also lead to an immediate activation of the SNS
- Activation of the SNS is a physiological “stress” that can trigger and/or worsen a migraine attack



Migraine and Diet

Therefore...

how can a dietary program be developed that minimizes “dietary stress”?



The Glycemic Index

- “the most fascinating and promising area in nutrition research today”

Simon Liu

Nutritional epidemiologist

Harvard Medical School

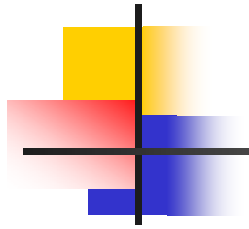
Science News Online

April 8, 2000



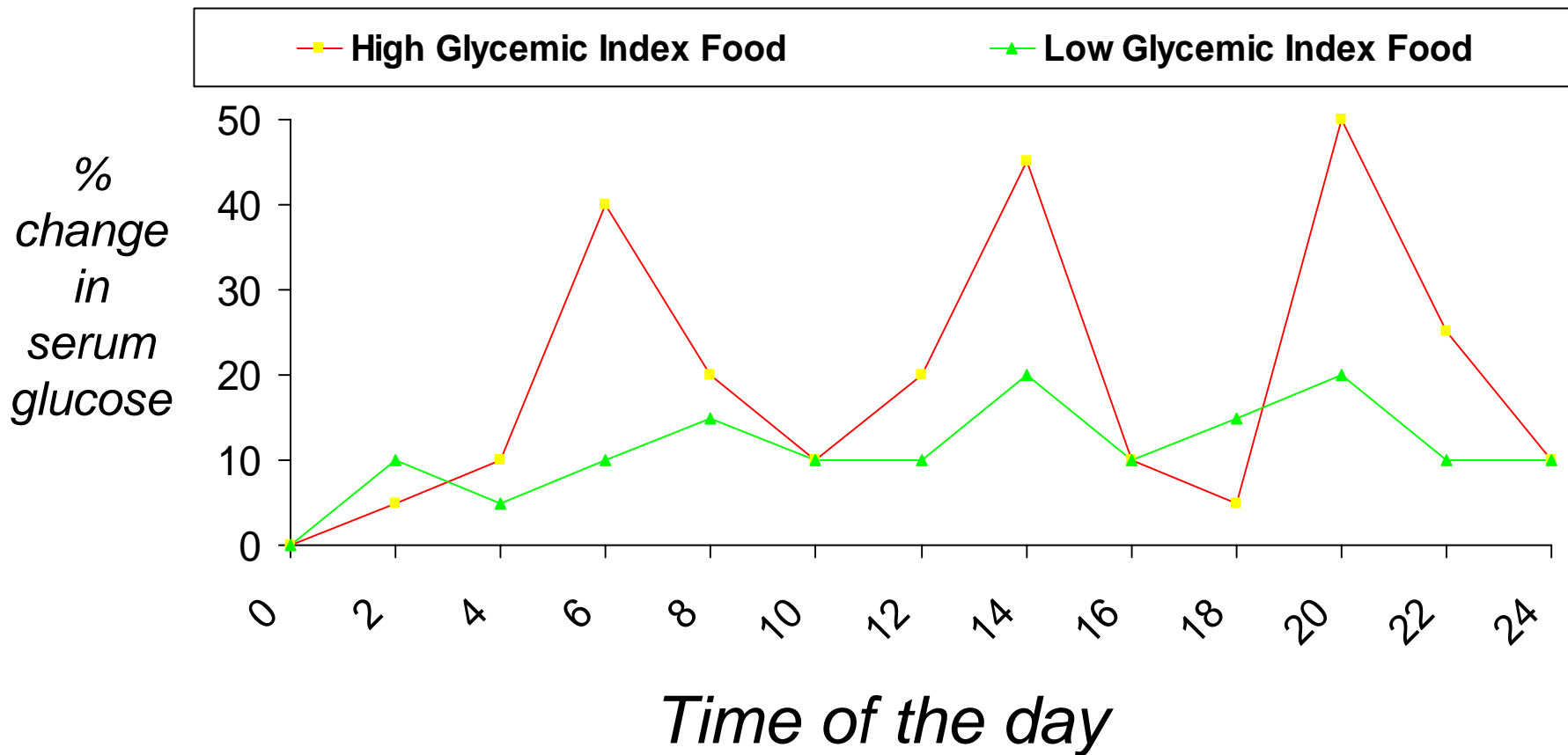
The Glycemic Index

- A quantitative measure of the serum glucose increase caused by the ingestion of carbohydrates, based upon the *area under the serum glucose curve* following ingestion of a standard meal (usually 50 g glucose).
- The higher the GI of a food, the higher will be the serum glucose changes.



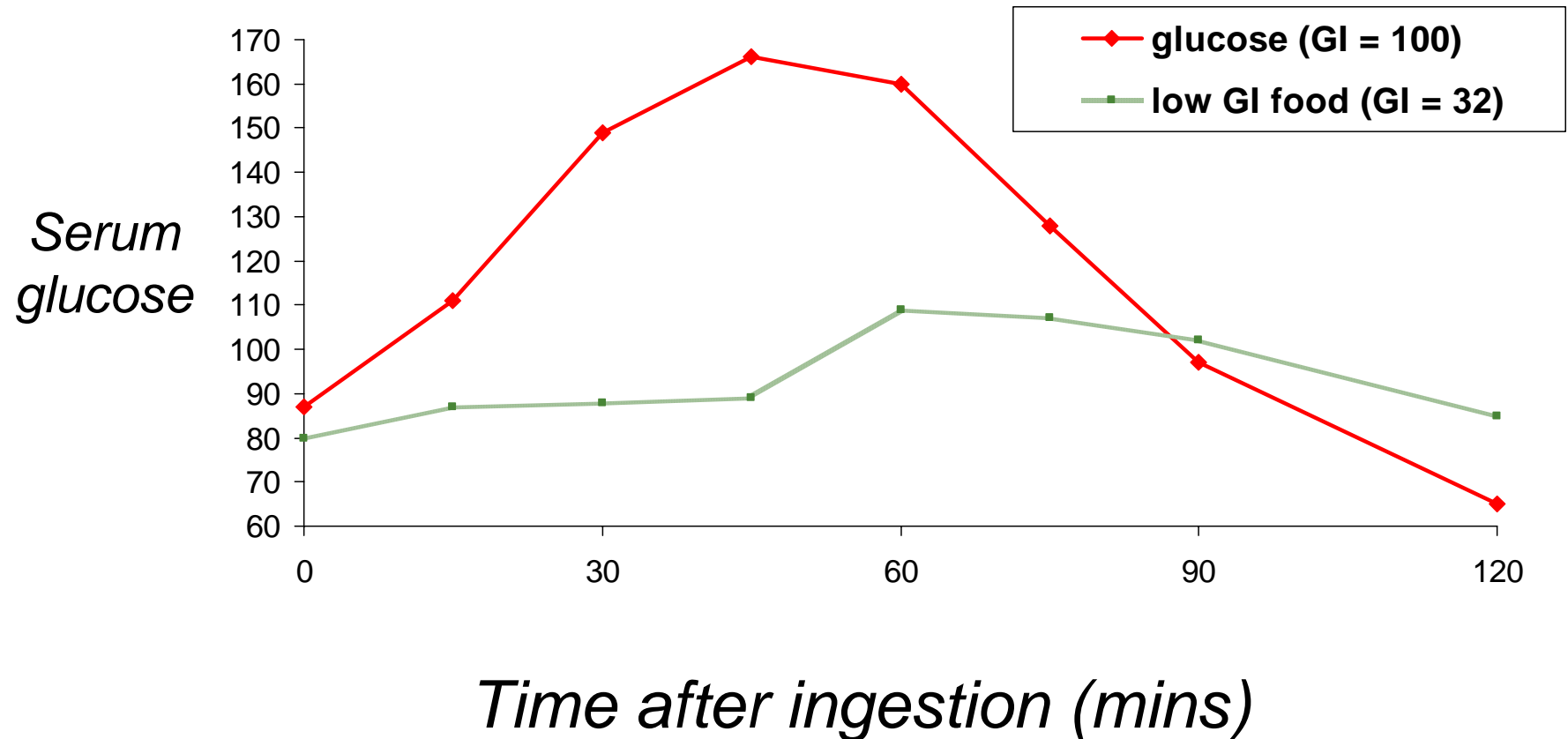
Glycemic Index Patterns

Changes in serum glucose following isocaloric carbohydrate ingestions



Serum Glucose and GI

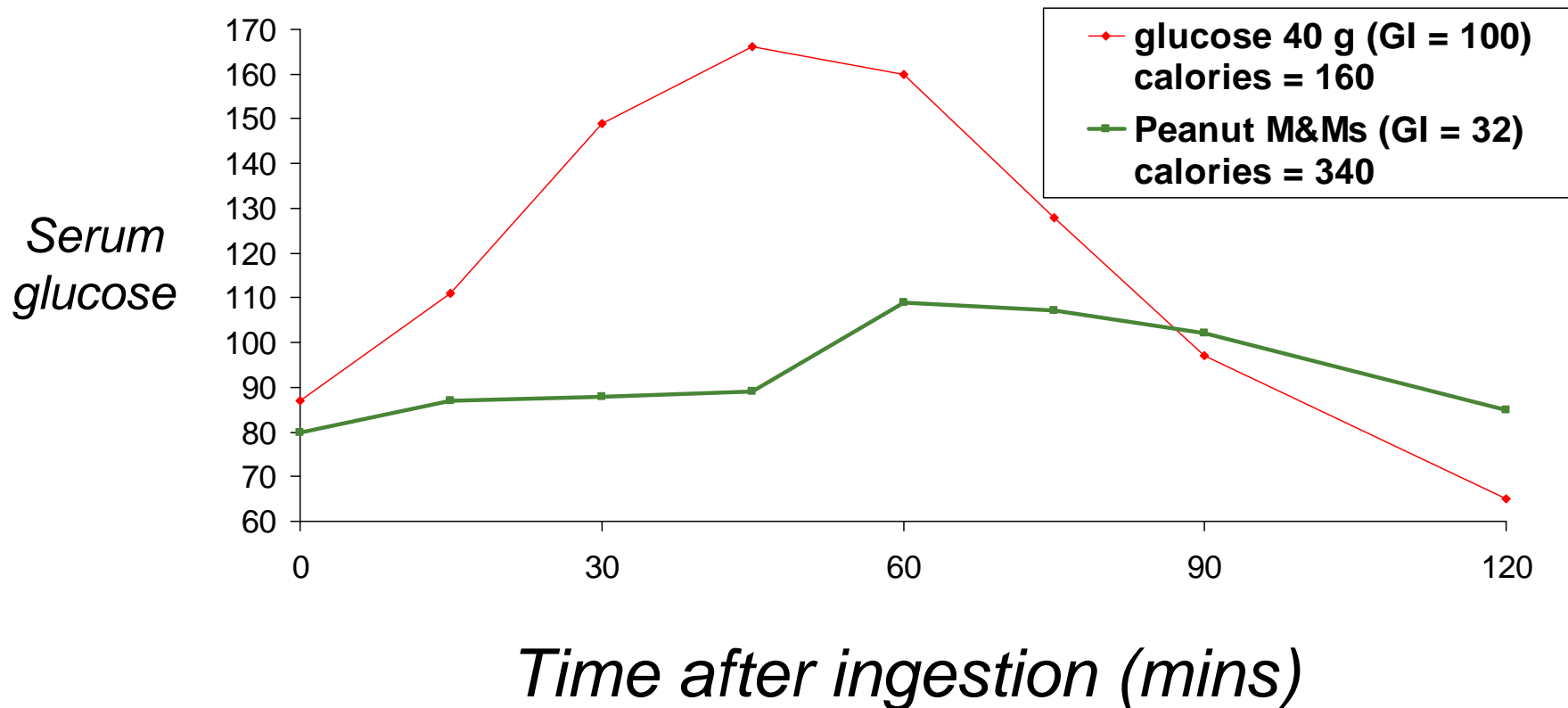
Serum glucose levels following a 40 g carbohydrate ingestion (n = 3)





Serum Glucose and GI

Serum glucose levels following a 40 g carbohydrate ingestion (n = 3)





The Glycemic Index

- Carbohydrates release their glucose at very different rates based on a variety of factors:
 - ✓ fructose vs. glucose
 - ✓ amylose vs. amylopectin
 - ✓ fiber
 - ✓ particle size
 - ✓ food processing
 - ✓ acidity
 - ✓ fat



The Glycemic Index

- ▶ High GI foods (i.e. > 75)
 - ✓ glucose
 - ✓ donuts
 - ✓ waffles
 - ✓ breakfast bars
 - ✓ corn flakes
 - ✓ pretzels
 - ✓ potatoes
 - ✓ rice
- ▶ Low GI foods (i.e. < 50)
 - ✓ fructose
 - ✓ oatmeal
 - ✓ yogurt
 - ✓ milk
 - ✓ many fruits
 - ✓ pasta
 - ✓ sponge cake
 - ✓ Peanut M&Ms



Dietary recommendations

- Individuals with frequent migraine should not go more than 4-5 hours without eating while awake
- Moreover, the *content* of the food eaten must be considered since it can have a significant effect on SNS activity



Dietary recommendations

- Avoid the glucose-insulin-adrenaline roller coaster by proper carbohydrate dosing!
- Three dosing factors must be considered:
 - ✓ the chemical composition of the food (i.e., amount or “dose” of carbohydrate)
 - ✓ the physiological effect of the food (i.e., the GI value)
 - ✓ the timing of the food ingestion (i.e., the frequency of a given dose)



Dietary recommendations

➤ Daily Guidelines

- ✓ Eat a breakfast containing a 4-5 hour dose of carbohydrate soon after awakening
- ✓ Identify and use snacks that provide a 2-4 hour dose of carbohydrate as “bridges” between meals
- ✓ Always have a bedtime snack with the proper carbohydrate dose

Possible migraine snacks



Possible migraine snacks

A novel slow release “drug” delivery system...





Possible migraine snacks

- Peanut M&Ms (24 pieces)
 - GI = 32 (i.e., ~ 10 g carbohydrate per hour)
 - Calories = 250 (30 g carb; 5 g protein; 13 g fat)



Recommended migraine snacks

- Yogurt (with fruit)
 - GI = 33 (i.e., ~ 14 g carbohydrate per hour)
 - Calories = 210 (40 g carb; 9 g protein; 2 g fat)
- Sourdough bread (one slice)
 - GI = 52 (i.e., ~ 13 g carbohydrate per hour)
 - Calories = 110 (25 g carb; 4 g protein; 0 g fat)



Recommended migraine snacks

➤ Banana (one medium)

- GI = 55 (i.e., ~ 14 g carbohydrate per hour)
- Calories = 105 (27 g carb; 1 g protein; 1 g fat)

➤ Apple (one)

- GI = 38 (i.e., ~ 8 g carbohydrate per hour)
- Calories = 80 (21 g carb; 0 g protein; 0 g fat)



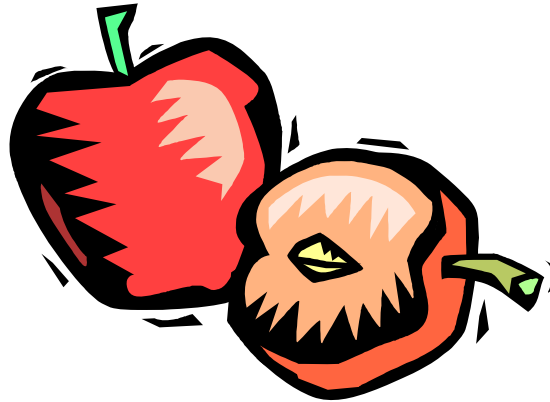
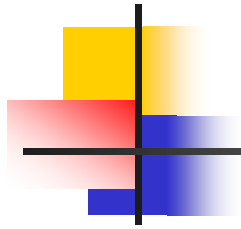
Conclusions

- Proper “dosing” of carbohydrates can eliminate a common physiological “stress” associated with the induction of headache



Conclusions

- Formal studies are needed to confirm the hypothesis that proper “dosing” of carbohydrates can reduce headache frequency



“An apple a day keeps the doctor away”

Cultural myth
or
scientific fact?