Myths and Facts about Chemobrain

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Perspective from the Patient: “Chemobrain”

• “You have to fight to make yourself remember numbers, words, places that you go. Sometimes I would leave the house to go somewhere and I really couldn’t remember how to get there... it almost made me break down because of the fact that you think you’re losing your mind.”

• “What I have to do sometimes is have my son come over and pay my bills. Can you imagine? It really makes me feel bad...I’ve been so independent and here I am at 55 years old and I can’t pay my bills. And the money’s there.”
Typical concerns reported by patients with ‘chemobrain’

• Memory lapses
• Difficulty concentrating or staying focused on a task
• Trouble remembering details such as names, dates, or phone numbers
• Difficulty multi-tasking such as carrying on a conversation and following a cooking recipe
• Slower processing speeds
• Difficulty with word retrieval
Cognitive Domains Affected

- Attention/Concentration
- Verbal memory
- Visual memory
- Visual/Spatial
- Speed of processing information

** Old memories generally NOT impacted
How Common is “Chemobrain”?

- Not everyone develops cognitive problems after cancer treatment.
- Up to 75% experience difficulties during treatment.
- Up to 35% have symptoms that persist for months of years after treatment.
How long does cognitive dysfunction last after cancer treatment?

- Researchers are not exactly sure
- Most people gradually regain their mental capacity within 6-9 months
- Best estimate:
  - About 20% of cancer survivors have long-term cognitive changes (Ahles and Saykin, Nature, 2007)
Is Chemobrain Real?

Twin Study: A is patient with breast ca and B is her identical twin without breast ca.

Ferguson et al. JCO 2007
Trajectories of cognitive change.

Ahles T A et al. JCO 2012;30:3675-3686

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What Causes “Chemobrain”? 
Direct Brain Damage (Radiation, chemo)
Direct Brain Damage (Radiation, chemo)

Genetic Vulnerability
Direct Brain Damage (Radiation, chemo)

Genetic Vulnerability

Hormonal changes (premature menopause)
Direct Brain Damage (Radiation, chemo)

Genetic Vulnerability

Hormonal changes (premature menopause)

Other Medical Problems (Hypothyroidism, etc)
Direct Brain Damage (Radiation, chemo)

Genetic Vulnerability

Hormonal changes (premature menopause)

Other Medical Problems (Hypothyroidism, etc)

Pain
Direct Brain Damage (Radiation, chemo)

Genetic Vulnerability

Hormonal changes (premature menopause)

Other Medical Problems (Hypothyroidism, etc)

Pain

Medication Side Effects
Direct Brain Damage (Radiation, chemo)
Genetic Vulnerability
Hormonal changes (premature menopause)
Other Medical Problems (Hypothyroidism, etc)
Pain
Medication Side Effects
Poor Sleep
Can lack of sleep affect cognition?
Colored tracers penetrate more deeply into a mouse’s brain when it’s asleep (left, red tracer) than awake (right, green tracer). The finding indicates that channels between brain cells open up during sleep and allow cerebrospinal fluid to wash debris out of the brain. **No evidence** that **sleeping pills** is as effective with this “glymphatic system” as natural sleep.

Natural Circadian Rhythm
Direct Brain Damage (Radiation, chemo)
Genetic Vulnerability
Hormonal changes (premature menopause)
Other Medical Problems (Hypothyroidism, etc)
Pain
Medication Side Effects
Depression & Anxiety
Poor Sleep
Direct Brain Damage (Radiation, chemo)

Genetic Vulnerability

Hormonal changes (premature menopause)

Other Medical Problems (Hypothyroidism, etc)

Pain

Medication Side Effects

Chronic Stress & Loneliness

Depression & Anxiety

Poor Sleep

Depression & Anxiety
Direct Brain Damage (Radiation, chemo)
Genetic Vulnerability
Hormonal changes (premature menopause)
Other Medical Problems (Hypothyroidism, etc)

Pain
Medication Side Effects
Poor Nutrition
Chronic Stress & Loneliness
Depression & Anxiety
Poor Sleep
Obesity is linked with lower brain volume

- higher BMI was associated with brain volume deficits in frontal, temporal, parietal, and occipital lobes
Obesity Trends* Among U.S. Adults: BRFSS, 1985

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 1986
(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)

No Data        <10%          10%–14%
Obesity Trends* Among U.S. Adults
BRFSS, 1987

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 1988

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 1989

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults

BRFSS, 1990

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 1991
(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 1992

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults

BRFSS, 1993

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 1994

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 1995

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 1996

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)

No Data        <10%        10%–19%

[Map showing obesity trends across the United States]
Obesity Trends* Among U.S. Adults

BRFSS, 1997

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 1998

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults

BRFSS, 1999

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults

BRFSS, 2000

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 2001

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 2002

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 2003

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 2004

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 2005

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 2006

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 2007

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults

BRFSS, 2008

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 2009

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults

BRFSS, 2010

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Dangers of Visceral Fat

- Linked to
  - Cardiovascular disease
  - Type II Diabetes
  - Cognitive impairment!
  - Some cancers including breast cancer, colon cancer
  - Higher mortality rate

- These risks exist even if normal Body Mass Index

- At menopause, estrogen production decreases and may contribute to development of visceral fat
Practical Omega Recommendations

• If you eat meat, look for grass-fed to avoid the animal fat
• If you eat seafood, try to consume at least 2 servings of fatty fish each week
• Enjoy eggs.
  ○ Whites are pure protein and fat free
  ○ Yolks do contain omega-6, cholesterol but also a big source of choline, zinc, phosphorus, vitamin A/D
• Use olive oil as your main oil
• Eat more fruits, vegetables, and legumes
• Focus on foods that contain omega-3 fatty acids to balance the omega-6 in our diets
BAD Fat for our Brains: Trans Fats

• Increase your chance of stroke and heart attack
• Trans fats: baked goods, snacks such as potato chips, salad dressings, margarine, packaged food
  ○ Some cities and states banning trans fats in restaurants!
• FDA now requires disclose trans fats on labels!
  ○ Also called “partially hydrogenated vegetable oil” or “shortening”
Mediterranean Diet Linked to Preserving Memory

• 19% less likely to develop problems in thinking and memory
• Diet:
  o Omega-3 in diet
  o Fish
  o Olive oil
  o Legumes
  o UNREFINED cereals
  o Fruits
  o Vegetables
  o Moderate dairy
  o Moderate wine consumption
  o Modest amounts of meat

Tsivgoulis G et al., *Neurology*, 2013
Direct Brain Damage (Radiation, chemo)

Genetic Vulnerability

Hormonal changes (premature menopause)

Other Medical Problems (Hypothyroidism, etc)

Loss of muscle mass and inactivity

Poor Nutrition

Chronic Stress

Depression & Anxiety

Poor Sleep

Pain

Medication Side Effects
Fig. 1. Effect sizes for the different process-task types reflecting the four theoretical hypotheses concerning the process-based specificity of the benefits of fitness training. Parenthetical notations on the x-axis indicate the number of effect sizes contributing to the point estimates for each task type in the exercise (E) and nonexercise (C) groups. Error bars show standard errors.
Hippocampus shrinks in late adulthood, leading to impaired memory.

Randomized trial of 120 older adults (no cancer) to exercise and stretching.

Also increased levels of BDNF

Erickson KI, et. al, PNAS, 2010
The brain can change its own structure and function through thought and activity.
Direct Brain Damage (Radiation, chemo)

Genetic Vulnerability

Hormonal changes (premature menopause)

Other Medical Problems (Hypothyroidism, etc)

Cytokines

Pain

Medication Side Effects

Loss of muscle mass and inactivity

Poor Nutrition

Chronic Stress & Loneliness

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What are Cytokines?
Direct Brain Damage (Radiation, chemo)

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Cytokines
EMERGING FROM THE HAZE™: A 6-Week Workshop in Strategies to Combat “Chemobrain”

WEEK 1 – Introduction & Overview
Neuroplasticity: the Brain’s Ability to Change Itself

WEEK 2 - Mood, Automatic Thoughts
Stress Management
Effects of Loneliness on the Brain

WEEK 3 - Cognitive Strategies: Attention
Optimal Exercise for the Brain

WEEK 4 - Cognitive Strategies: Memory
Optimal Sleep for the Brain

WEEK 5 - Cognitive Strategies: Executive Functioning, Coping & Adjustment
Optimal Nutrition for the Brain

WEEK 6 – Coping & Pacing: Putting it all together; Summary & Review
Other Practical Tips

• Make lists on a notepad; cross off completed items
• Use a planner; mark important appointments on a calendar
• Organize your surroundings; keep things like keys or glasses in a designated place
• Eliminate distractions whenever you have a task to accomplish; have conversations in quiet places
• Don’t multitask; focus on one thing at a time
• Try to note when your ‘chemobrain’ is taking place in your planner
Direct CNS Toxicity
(Radiation, chemo)

Genetic Vulnerability

Hormonal changes
(premature menopause)

Other Medical Problems
(Hypothyroidism, anemia, COPD, etc.)

Pain

Medication Side Effects

“CHEMO-BRAIN”

Cytokines

Loss of muscle mass and inactivity

Poor Nutrition

Chronic Stress & Loneliness

Depression & Anxiety

Poor Sleep
Questions/Comments?

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