

# **NEUROCOGNITIVE EFFECTS OF RADIATION THERAPY FOR CANCER**

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# Therapeutic Radiation for Cancer

- **Primary Brain Tumors**
- **Metastatic Brain Tumors**
- **Head and Neck Cancers**
- **CNS Prophylaxis for SCLC, ALL**
- **Non-CNS sites (e.g., prostate cancer)**

# Effects of Cerebral Radiation Treatment

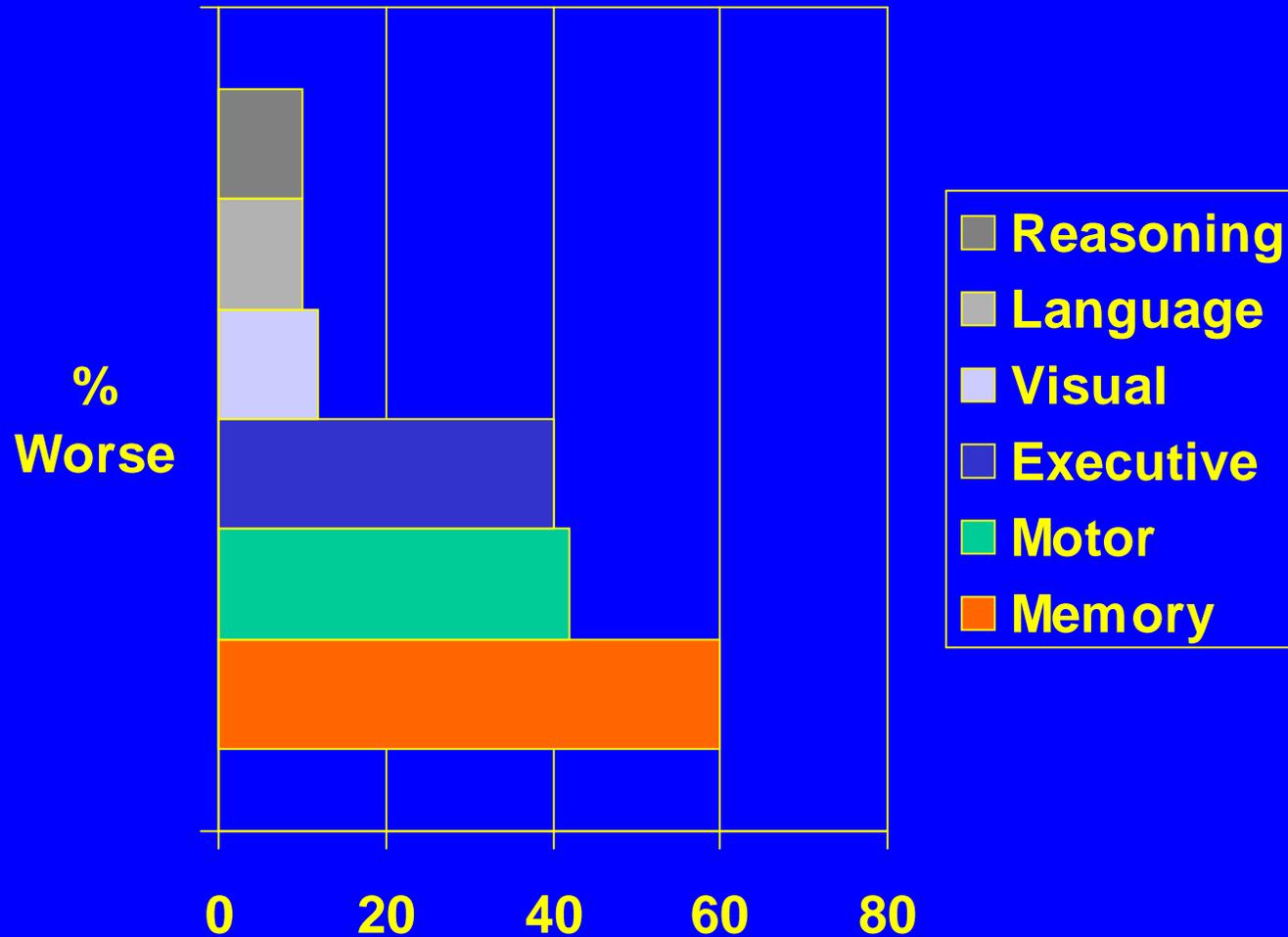
## Subcortical White Matter

- Neurobehavioral slowing
- Apathy
- Fine motor control
- Memory
- Executive functions (mental flexibility)

# Radiation-Induced Lesions in Adult Monkeys (60Gy WBXRT)

Wks from Rx	% Subjects	# Lesions
0-24	0	----
33	33	190
52	67	426
104	67	547

# Change in Function Following TID XRT for Primary Brain Tumors (mean = 8 mo., N = 64)



# Incidental Radiation for Paranasal Sinus Tumors

- **50% impaired new learning rate**
  - **80% accelerated forgetting**
  - **33% behavioral slowing**
  - **33% impaired executive functions**
  - **33% impaired fine motor control**
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- **10% impaired reasoning**
  - **5% impaired attention**

# Correlates of IRT-induced Dysfunction

- Doses greater than 60 Gy
- Time elapsed since treatment

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- Total brain volume not related
  - Chemotherapy not related

# Prophylactic Cranial Irradiation

- **Reduces the occurrence of brain relapse**
- **Controversy about risk vs. benefit**
- **Retrospective studies show significant cognitive sequelae in long term survivors (50%)**
- **Pre-treatment deficits common**
- **Median survival affects analysis of long-term effects**

# Radiation Therapy to Non-CNS Sites

## Fatigue

- **Physical**
  - Muscle weakness, stamina
- **Mental**
  - Vulnerability to distraction
  - Impaired complex information processing
  - Problems with organization, divided attention, multi-tasking

# Central Mechanisms of non-CNS XRT-induced Fatigue

- **Proinflammatory cytokines?**
  - Post-Q fever fatigue syndrome, chronic fatigue syndrome, and chronic daytime sleepiness associated with increased IL-6
  - Fatigue correlates with IL-6 ( $r=.65$ ) and IL-1RA ( $r=.54$ ) in patients with AML/MDS
  - TNF levels high in chronic fatigue syndrome

# Interventions Strategies for XRT-Induced Symptoms

- **Stimulants**
  - methylphenidate
  - Dexedrine
  - amantadine
  - modafinil
- **Cytokine antagonists**
- **Anti-inflammatory agents**