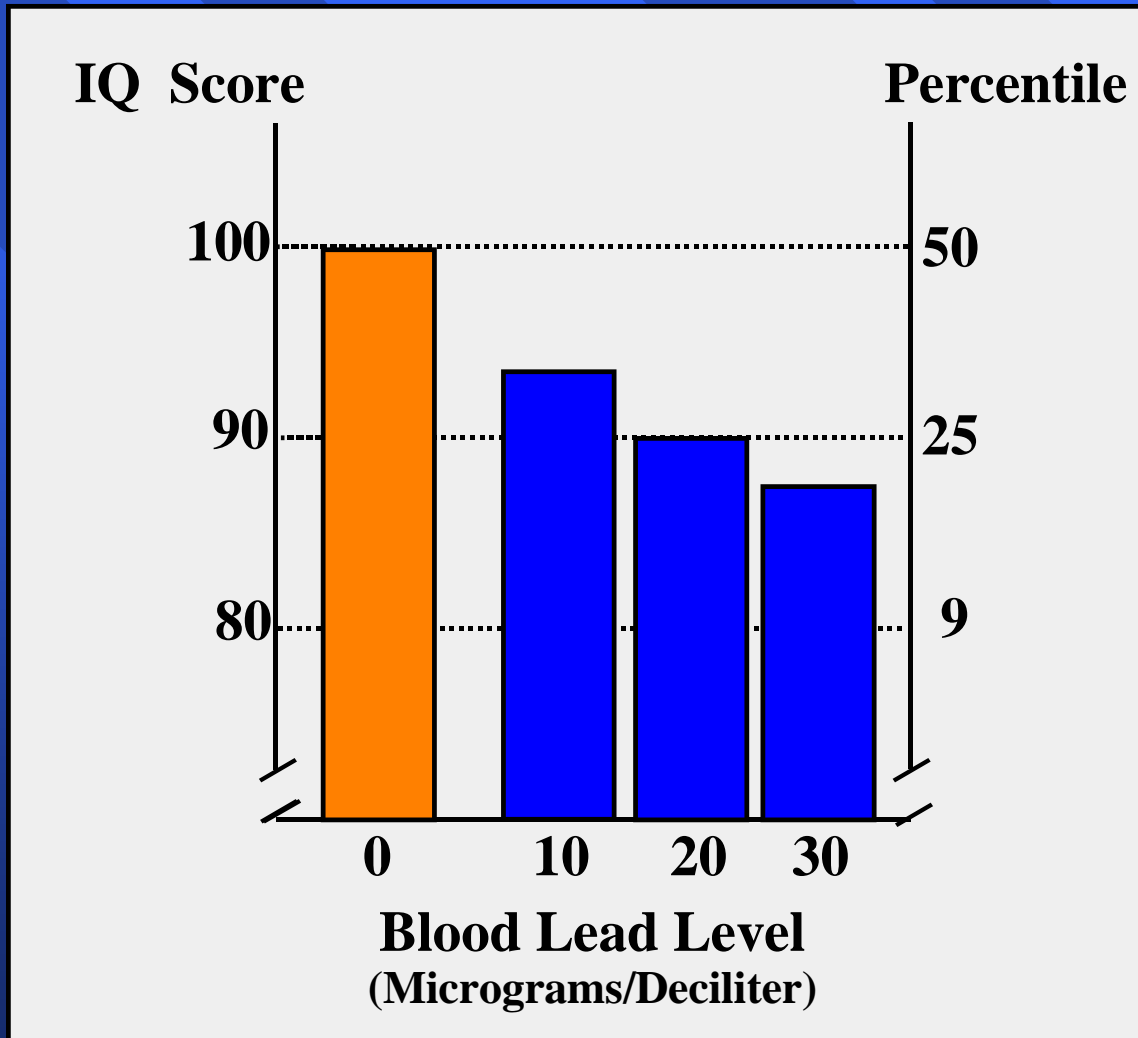


Assessing the Neurocognitive  
Effects of Brain Injury: Why  
Schools Fail  
Lead Poisoned Children

# **The Cognitive Effects of Lead**

# Effects of Lead on IQ



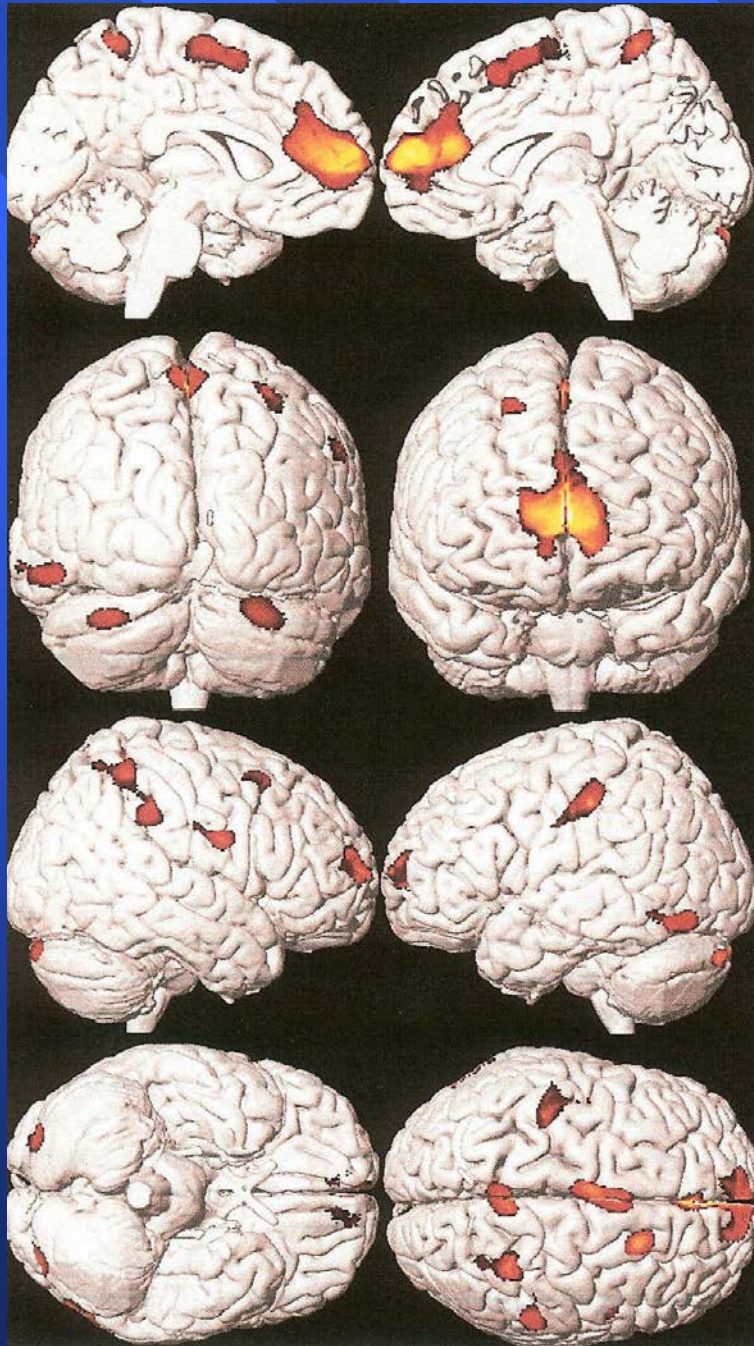
# **IQ Loss is Just the Tip of the Iceberg**



- 1) IQ scores are insensitive to focal impairments
- 2) Many important functions not measured by IQ tests

## Reduced Tissue Volume After Lead Exposure

- 1) Damage is often focal
- 2) Impairments reflect focal injury



# IQ is insensitive to brain injury because:

- Brain injuries typically cause problems in a limited number of processes
- An IQ score is a single number derived from individual subtests that tap multiple unrelated functions – weaknesses in one or a few areas are obscured by normal performance in other areas

Many important aspects of language, memory, attention and executive functioning are either unmeasured or poorly measured by IQ tests.



# Effects of Lead in Siblings

		IQ 135	IQ 133
Language	Expressive	Dark Blue	Dark Blue
	Receptive	Light Blue	Light Blue
Motor	Dexterity	Dark Blue	Light Blue
	Construction	Dark Blue	Light Blue
Attention	Focus	Light Blue	Light Blue
	Impulse control	Dark Blue	Light Blue
Memory	Verbal Semantic	Dark Blue	Dark Blue
	Aud Working Mem	Light Blue	Light Blue
	Visual Working Mem	Light Blue	Dark Blue
	Visuospatial	Dark Blue	Dark Blue
Executive	Concept Formation	Light Blue	Light Blue
	Abstract Reasoning	Light Blue	Light Blue
	Cognitive Flexibility	Light Blue	Dark Blue
	Planning	Dark Blue	Light Blue



How are the behavioral effects of  
brain damage assessed?

# Neuropsychological Testing

- Very tightly focused tests that target behavioral functions of specific brain systems (i.e. neuropsychological functions)
- Objective
- Valid
- Reliable
- Reference Baseline

# Neuropsychological Tests Do Not Assess Information Learned in School

- No reading
- No arithmetic
- No questions about history, science or other academic subjects

# Neuropsychological Functions

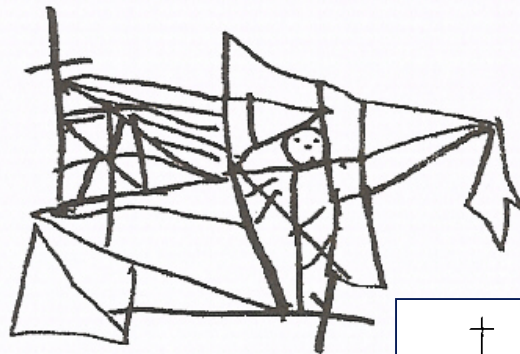
- Fine motor
- Attention
- Memory & Learning
- Executive Functions
  - Concept Formation
  - Planning
  - Cognitive Flexibility

# **Examples of Lead's Effects on Neuropsychological Test Performance**

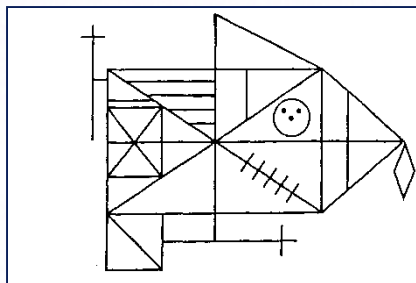
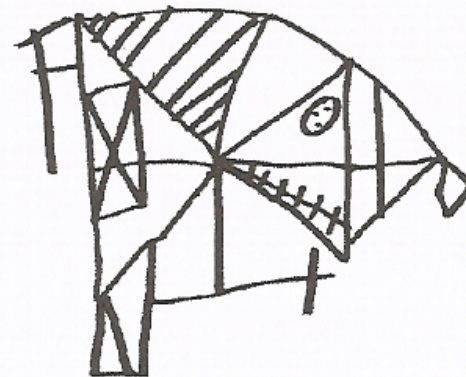


# Visuospatial Construction

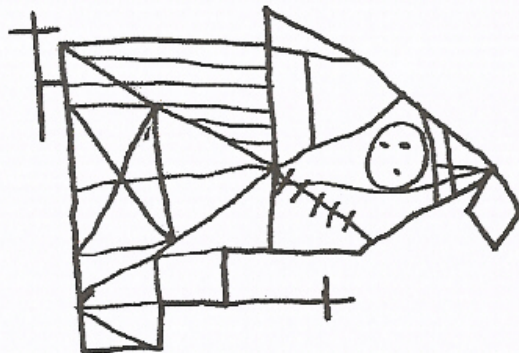
A. 6-year-old



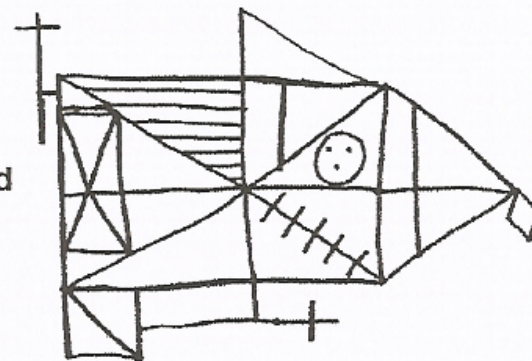
B. 8-year-old



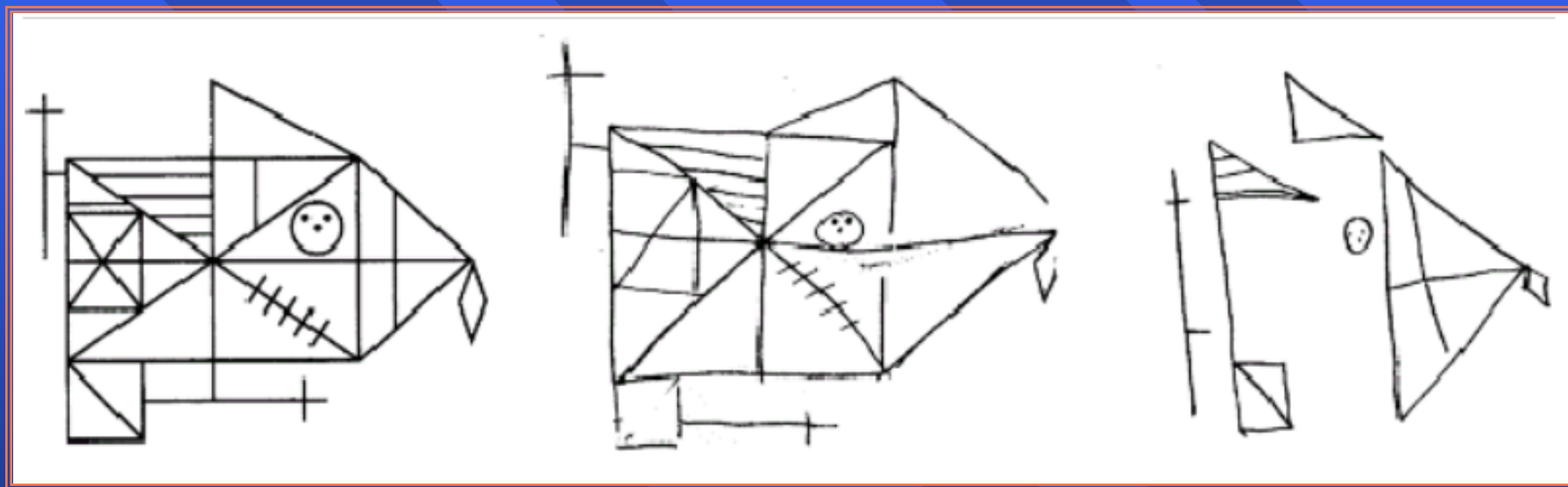
C. 10-year-old



D. 12-year-old



# Effect of Lead on Visual Memory



Complex Figure

Normal Child

Lead Poisoned Child

# Lead's Effect on Verbal Memory

Donna, / a fourth grader, / went to Disneyland /  
with her Mom, / Dad, / and brother, / Mark. /

It was near Christmas time, / and the park / was crowded. /

Donna / loved to see / all the people / rushing around. /

Her favorite thing to do / was visit the toy shops /  
on Main Street. / Poor Mark / was too short / to see /  
the toys. / The top / of his head / barely reached /  
the countertops, / and it seemed like all he could see /  
in the busy / crowd / were knees / and legs / rushing, /  
rushing everywhere. /

# Lead's Effects on Neuropsychological Functioning

- All functions are at risk (e.g. attention, memory, executive functioning)
- Lead also affects social judgment
- There is no signature injury
- The “lag effect”

**Lead**



**Brain Damage**



**Neuropsychological Impairments**



**Academic Difficulty**



**Problematic Behavior**

**Solutions**

1. Primary prevention
2. Stimulate Plasticity??
3. Intervention



# Why Schools Fail Lead Poisoned Children

- Unaware that child had been poisoned
- Unaware that lead poisoning causes brain damage
- Services not provided because child's IQ is "normal"
- No access to neuropsychologists or neuropsychological testing

# 1. Identification of Children at Risk

- Investigate history (medical, environmental) to identify children with history of probable lead exposure
- Vigilance to detect emerging problems
- Periodic formal objective screening for academic and/or behavioral problems

## 2. Understand the Nature of the Child's Academic Difficulties

- IQ test results do not indicate academic potential in a lead poisoned child
- Academic difficulties are direct result of neuropsychological impairments
- Neuropsychological assessment is an indispensable component of the evaluation

# Effects of Lead in Siblings

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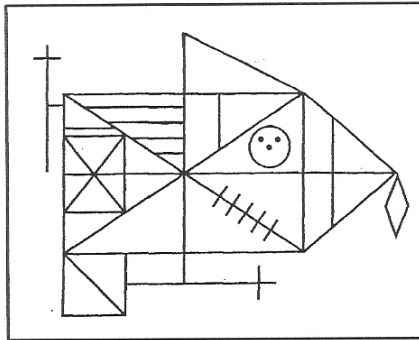
# No Signature Injury

Pb	Motor	Fluency	Attention	Verbal memory	Visual Memory	Planning	Concept Form	Cog, Flex
5					■			
6		■		■	■	■		
7	■			■	■			
7					■			
9	■				■			■
10	■				■	■	■	■
10	■			■	■			■
12	■		■		■			
12			■	■	■			■
12	■				■			
13		■			■			■
13	■				■			
14	■	■		■				■
14			■		■		■	
14	■	■			■	■		
14				■	■			
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15			■		■			
15	■		■					
15		■			■			

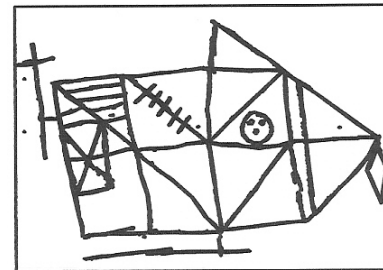
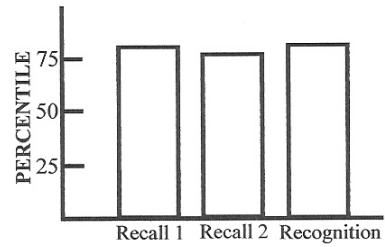


# Visual memory

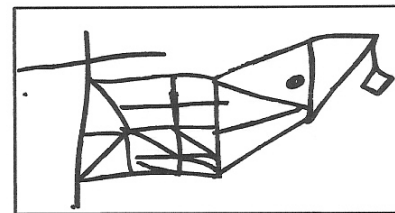
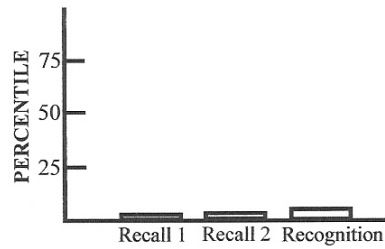
Model



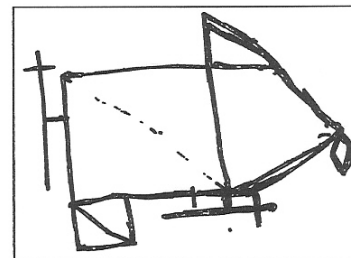
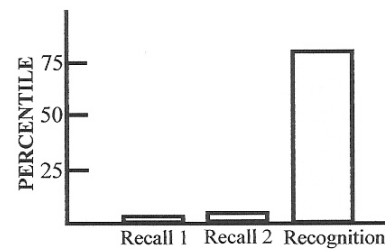
A



B



C



### 3. Understand the Nature of the Child's Problematic Behavior

- Damage of brain areas that control social judgment
- Problems with impulse control
- Behavior problems can precede academic difficulties
- The effects of academic failure on social development
- The reactions of adults (lazy, not working up to potential)

## 4. Intervene

- Psychoeducational evaluation
- Comprehensive neuropsychological evaluation
- 504 plan based on findings from neuropsychological & psychoeducational findings
- Counseling (whether or not behavioral problems are present)

# Long-term

- Neuropsychological functioning should be re-assessed periodically to identify emerging cognitive impairments throughout a child's academic career
- Educational and vocational counseling appropriate to a child's strengths and weaknesses

# Contact Information

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