

# **Brain Injury & Neurological Lyme Disease**

## **Top Ten Reasons to Think Spirochete**

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## **Post-Concussion Syndrome & Neurological Lyme Disease: Similarities**

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- **Diagnosis**
- **Course**
- **Symptoms**

# DIAGNOSIS

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- Overlooked
- Misdiagnosed
- Undetected
- Co-Morbid

## COURSE

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- Early full recovery
- Chronic long term
- Degenerative

# SYMPTOMS

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- Neurological
- Physical
- Somatic
- Cognitive
- Confusional state
- Emotional-Behavioral
- Interpersonal

# PRESENTATION OBJECTIVES

- Educate practitioners
- Think “SPIROCHETE”
- Understand diagnostic procedures
- Review neuropsychological findings

# FACTS ABOUT LYME DISEASE

- Fastest growing vector-borne disease in US.
- Accounts for more than 95% of all vector-borne disease in US.
- Underreported by a factor of 10 nationwide.
- Found in all 50 states and more than 80 countries.
- Serious national health crisis.
- Affects children, adolescents and adults.
- Ixodes tick attaches itself to deer, small animals and migratory birds.

# TRANSMISSION: TICK BITE TO HUMAN

- Most common method of transmission is a tick bite that transmits the *Borrelia Burgdorferi* bacterium. The tick habitat is:
  - Animals
  - Woodlands
  - Shrubbery/Lawns
  - Grasses

# TRANSMISSION: HUMAN TO HUMAN

- In utero
- Breast milk
- Blood transfusion
- Sexually transmitted (???)

# LYME SYMPTOMS: PHYSICAL

Bull's-eye rash (Erythema Migrans) in approx. 40% of cases.

- Arthritis
- Flu-like symptoms
- General malaise
- Muscle pain
- Tendonitis
- Sensitivities
- Headaches
- Bell's Palsy
- Meningitis
- Seizures

## LYME SYMPTOMS: PHYSICAL (CON'T)

- Hearing music others cannot hear
- Numbness and tingling
- Cardio-vascular problems
- Allergies
- Repeated infections
- Irritable Bowel symptoms
- Asperger's-like/autistic behaviors

# LYME SYMPTOMS: NEUROPSYCHOLOGICAL

- Cognitive impairment
- Attention and memory loss
- Slow processing speed
- Word finding difficulty
- Confusion/“Brain Fog”
- Auditory processing difficulties
- Depression, anxiety and mood swings
- Rages
- Suicidal and homicidal ideation

# MULTI-SYSTEM DISEASE

- Central nervous system
- Musculoskeletal system
- Cardio-vascular system
- Respiratory system
- Gastrointestinal system
- Endocrine system
- Ocular and auditory systems
- Other organs and skin

# MORE THAN INFECTION (J.J. Burrascano Jr., M.D.)

- Immune system
- Neurotoxins
- Hormonal disturbances
- Tissue damage
- Nutritional disturbances
- Metabolic effects
- A national health crisis that affects children and adults.

# LYME DIAGNOSIS

- The “New” Great Imitator
- Differential Diagnosis (partial list):
  - Multiple Sclerosis
  - Parkinson’s Disease
  - Rheumatoid Arthritis
  - Juvenile Arthritis
  - Attention Deficit Disorder
  - Chronic Fatigue Immune Deficiency Syndrome
  - Crohn’s Disease/Irritable Bowel Disease
  - Amyotrophic Lateral Sclerosis
  - Alzheimer’s Disease

# CLINICAL DIAGNOSIS

- Patient history
- Clinical symptoms
- Environmental exposure
- Laboratory tests (Elisa, Western Blot, PCR)
- Imaging studies (SPECT, PET)
- C6 Burgdorferi Elisa Kit (less false positives)

# DIAGNOSTIC DILEMMAS

- CDC criteria
- Laboratory: Lyme expertise and accuracy
- “Masking”
- Undulating course of symptoms
- Spirochete life cycle
- Spirochete cystic form
- Spirochete diffuse form
- Re-infection
- Tick-borne (TBD) co-infections
- Babesiosis
- Bartonella
- Mycoplasma
- Anaplasma (Ehrlichiosis)
- STARI

# MEDICAL TREATMENT CHOICES

- Type of antibiotic
- Dosage
- Antibiotic delivery system
- Duration of treatment
- IVIG
- Herbal remedies
- Complimentary interventions
- Nutritional and exercise regimens
- Oriental medicine

# NEUROPSYCHOLOGICAL STUDIES

- Westervelt and McCaffrey (2002): Impairments in:
  - Verbal fluency
  - Mental flexibility
  - Fine motor dexterity
  - Speed of information processing
  - Language
  - Oro–motor functioning
  - Memory especially free recall list learning tasks.
  - Frontal and sub-cortical abnormalities on neuroimaging.

# NEUROPSYCHOLOGICAL STUDIES

- Tager and Fallon et. al. (2001): Study of children 8-16 with chronic neurological Lyme. Deficits in:
  - Auditory and visual processing
  - Attention
  - Working memory
  - Mental tracking
  - Perception and Organization

# NEUROPSYCHOLOGICAL STUDIES

- Rissenberg and Chambers (1998): Adult study. Impairments seen in:
  - Memory
  - Receptive and expressive language
  - Visual-spatial processing
  - Abstract reasoning
  - Speed of information processing

# NEUROPSYCHOLOGICAL STUDIES

- Keilp et. al (2006): Adult study. Impairments in:
  - Processing speed
  - Auditory and visual memory

# NEUROPSYCHIATRIC STUDY

- Fallon and Nields (1994): Adult study. Found psychiatric reactions associated with Lyme disease:
  - Paranoia
  - Dementia
  - Schizophrenia
  - Bi-polar disorder
  - Panic attacks
  - Major depression
  - Anorexia Nervosa
  - Obsessive compulsive disorder

# QUALITATIVE DIAGNOSIS STUDY

- Drew and Hewitt (2006): Qualitative study of becoming diagnosed with Lyme disease. Themes:
  - Frustration: Diagnostic process
  - Exhaustion: Diagnostic process is lengthy and exhausting
  - Stress: Financial stress and the impact on family
  - Need for self-validation

## NEUROPSYCHOLOGICAL EVALUATION AND TREATMENT SERVICES

- Patients from all over the country
- Children, adults and families
- Environments where ticks are a way of life
- High incidence of ADD
- Erratic school attendance and declining academic performance
- Inability to perform professional responsibilities
- Delayed diagnosis and treatment

# N-E-T-S PRELIMINARY FINDINGS

N=21, Ages 7-15, 11 males, 10 females

## WISC-IV / WIAT-II / WRAML-2

- Verbal Comprehension Index > Perceptual Reasoning Index
- Processing Speed Index  $\neq$  1 SD below Verbal Comprehension Index
- Processing Speed Index  $\neq$  1 SD below Perceptual Reasoning Index
- Working Memory Index  $\neq$  1 SD below Verbal Comprehension Index
- Working Memory Index  $\neq$  1 SD below Perceptual Reasoning Index

# N-E-T-S PRELIMINARY FINDINGS

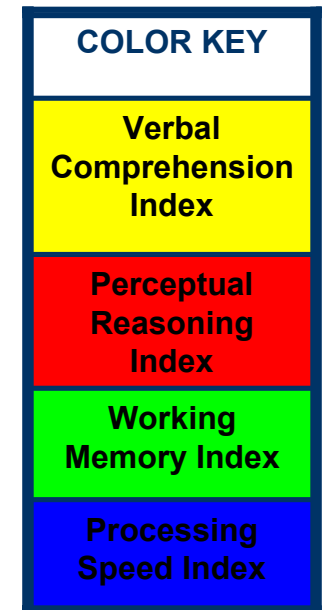
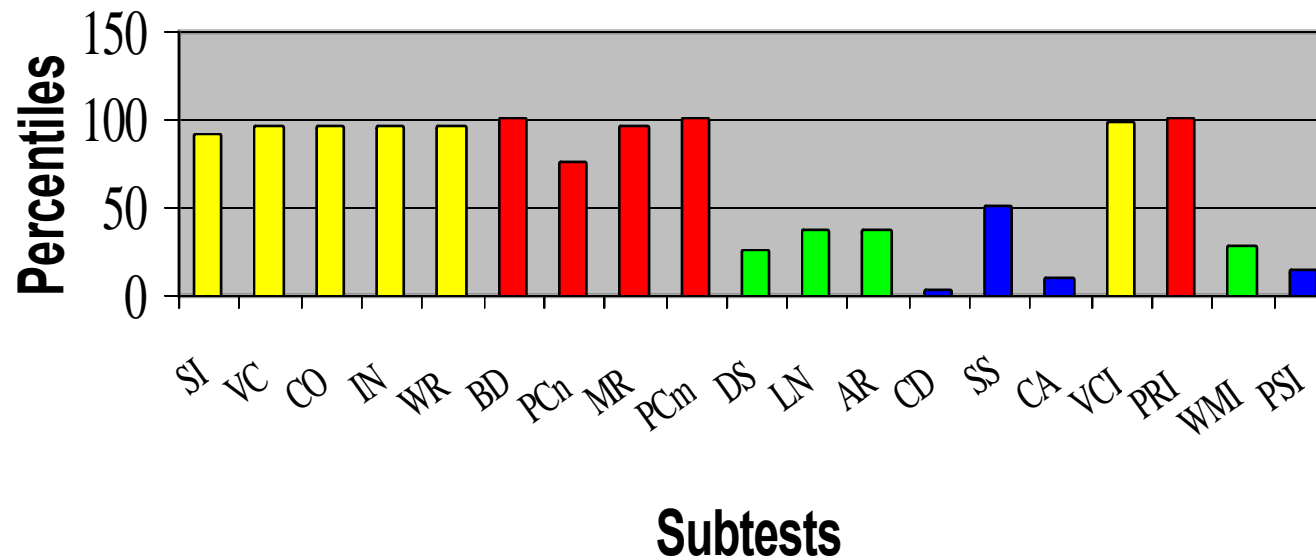
N=21, Ages 7-15, 11 males, 10 females

## WISC-IV / WIAT-II / WRAML-2

- Verbal Comprehension Index  $\geq$  1 SD above WIAT-II Reading Composite
- Verbal Comprehension Index  $\geq$  1 SD above WIAT-II Math Composite
- Verbal Comprehension Index  $\geq$  1 SD above WRAML-2 Attention/Concentration
- Perceptual Reasoning Index  $\geq$  1 SD above WRAML-2 Attention/Concentration

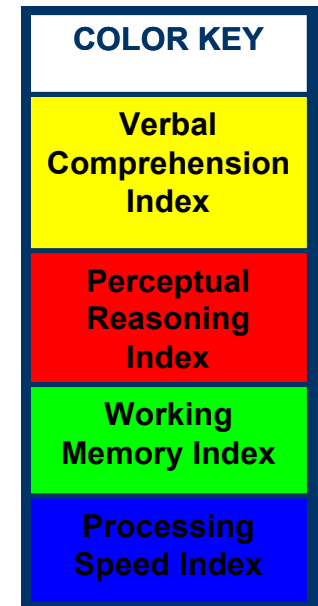
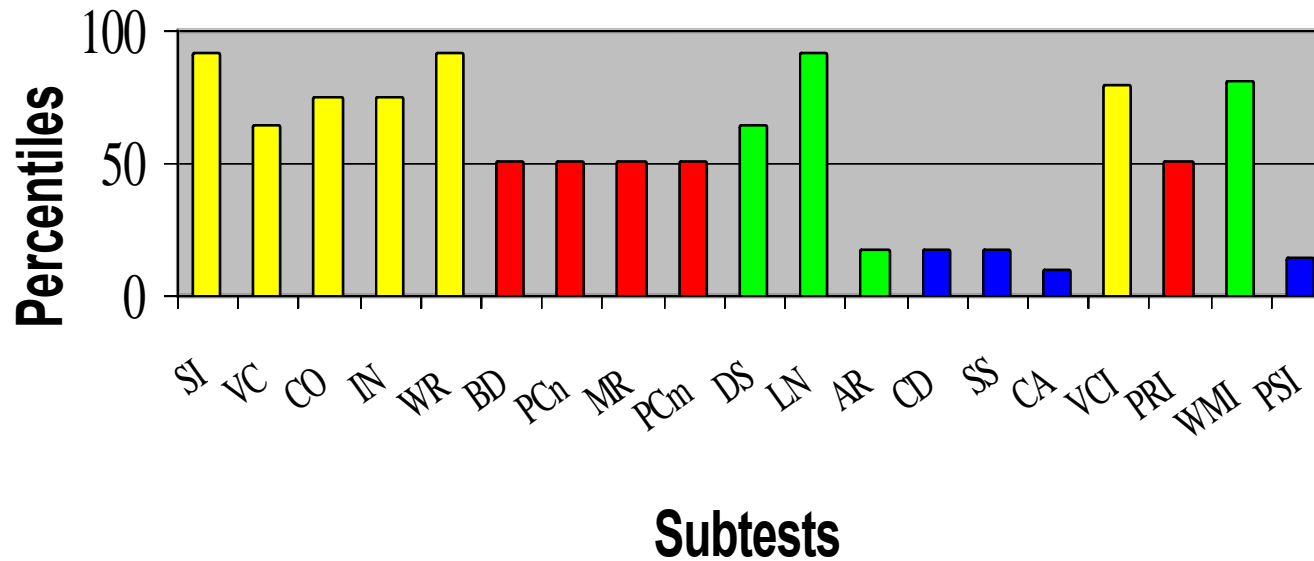
# N-E-T-S PRELIMINARY FINDINGS

Male 8 - Age 10



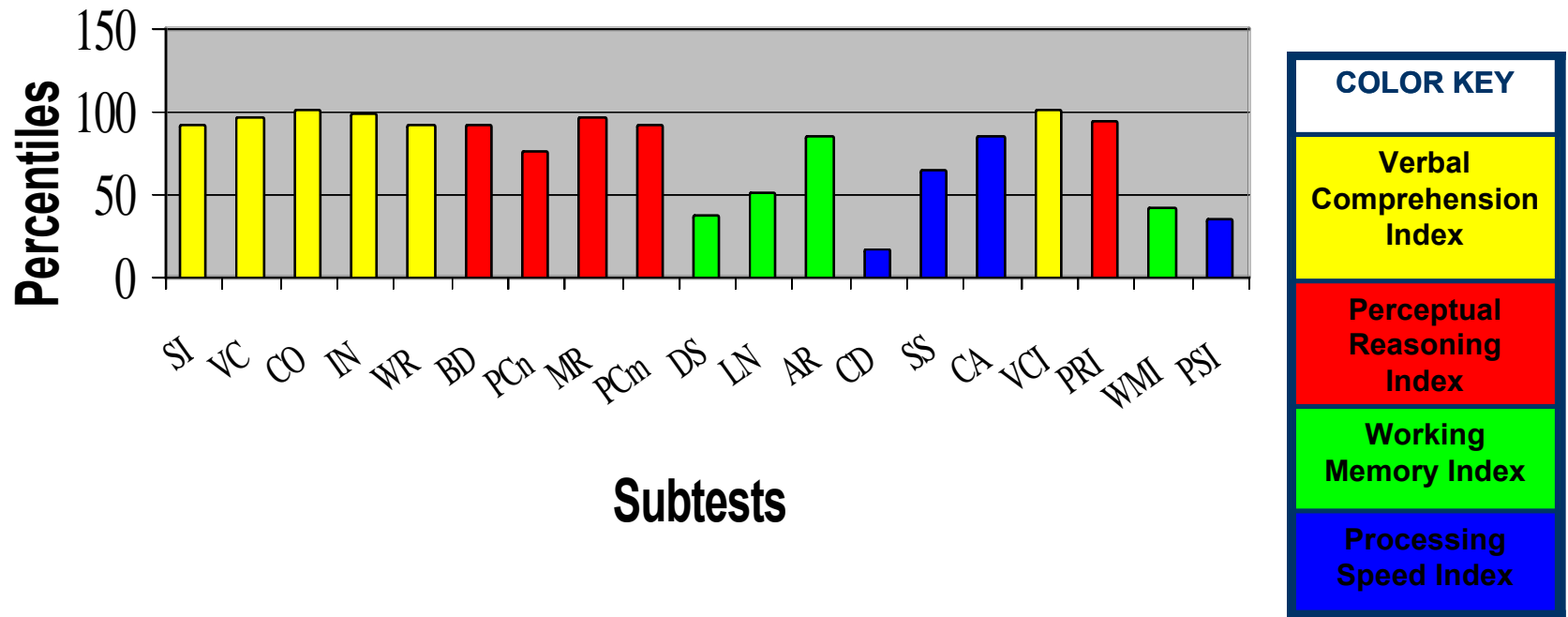
# N-E-T-S PRELIMINARY FINDINGS

Male 11 - Age 11



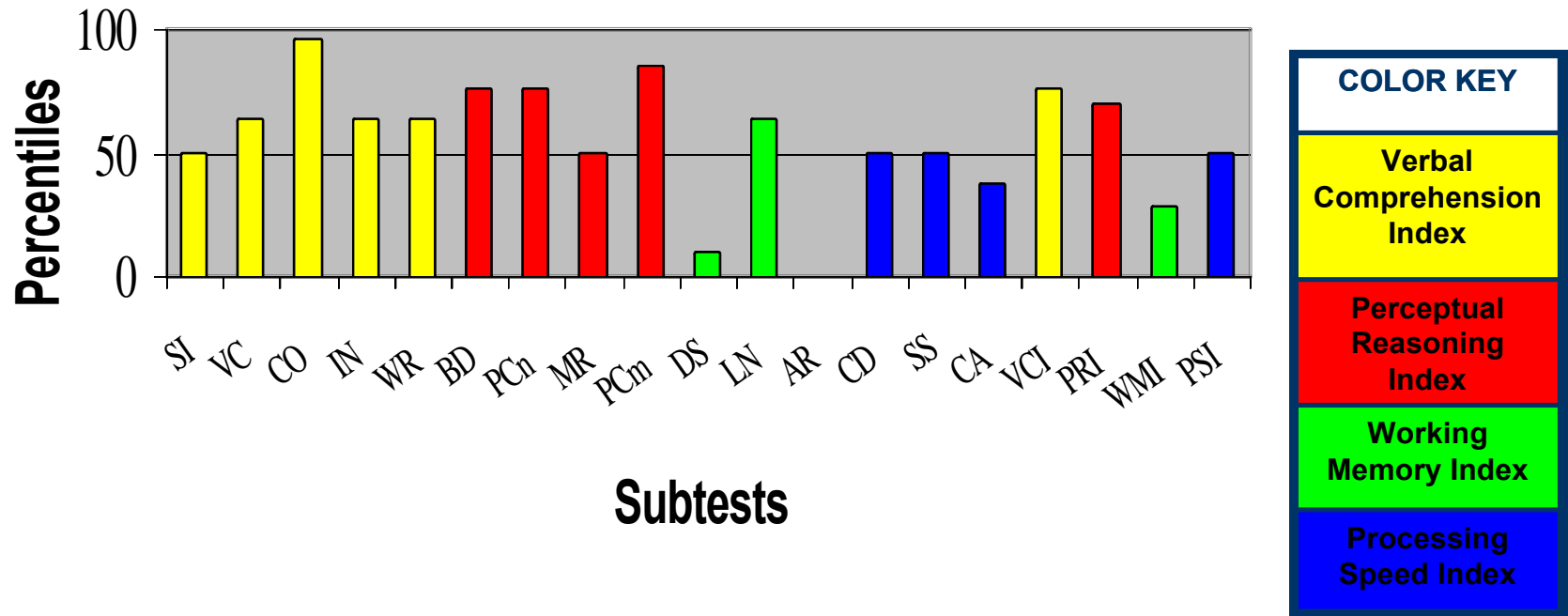
# N-E-T-S PRELIMINARY FINDINGS

Male 20 - Age 14



# N-E-T-S PRELIMINARY FINDINGS

Female 21 - Age 15



# TOP TEN REASONS TO THINK SPIROCHETE

10. A weekend in the Hamptons or Nantucket or family camping trip
9. Deer in back yard, living in tick infested area
8. Summer flu
7. Bell's Palsy
6. Persistent fatigue

# TOP TEN REASONS TO THINK SPIROCHETE

5. Recurring infections/allergies
4. Emotional changes/rages
3. Decline in cognitive functioning
2. Recurrent or persistent joint pain
1. **Bull's-eye rash!!!**

# THANKS AND APPRECIATION

- N-E-T-S patients and families.
- Lyme-literate medical and mental health colleagues.
- National Research Fund for Tick-borne Diseases.
- Lyme Disease Association of Southeastern Pennsylvania.