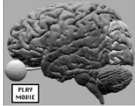


AUTISM AND SPECIAL NEEDS SEMINAR
presented by FAMILY TIME MAGAZINE
November 2013

BEYOND GENES - MAXIMIZING POTENTIAL

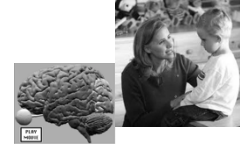
Valerie Scaramella-Nowinski, Psy.D.
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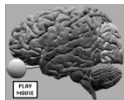
Life - A Complicated Process

E.O. Wilson



"TO EXPLORE AND AFFILIATE WITH LIFE IS A DEEP AND
COMPLICATED PROCESS IN MENTAL DEVELOPMENT"

Advances in Brain Science



- Brain is a dynamic organ
- It changes throughout development

- Human behavior is dynamic
- It changes throughout development



Goal of development???

THE ABILITY TO DEVELOP
IN OUR ENVIRONMENTS
WITH HEALTH
AND WELL-BEING



Developmental Influences



Brain-Behavior DEVELOPMENT is DEPENDENT
UPON NATURE and NURTURE



(positive influences /



negative influences)

Brain-Behavior Development



Genetic Predisposition
and
Environmental influences
upon
Brain Structure

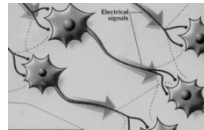


Electrical/Chemical influences among cells
Full Body Health

Messages are interrupted in ASD

- When we experience something through our senses, brain cells send electrical/chemical messages to other brain cells - building synapses
- In Autism Spectrum Disorders (ASD) this process is interrupted

(suspect link with Neurexin -
the protein that helps build synapses)



Increased understanding of how we develop, learn and adapt is advanced through:

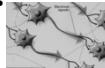
Advanced technology (MRI, fMRI, EEG, MEG, PET, DTI, HDFT) correlated with neuropsychological evaluation of brain behaviors and the patterns among brain pathways

and

Direct working relationship with the individual and their family over time

What have we learned?

- The brain is a dynamic, organized system in which all parts connect and communicate with each other and can change throughout development
- Environmental influences affect the brain to create and change human behaviors throughout development



Recent Advances and The Working Brain

Behavioral/Anatomical Interactive Model of Development: The Working Brain

Three Systems

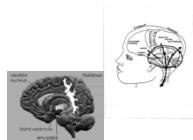
- I. Alertness-Attention
- II. Reception - Analysis - Storage
- III. Expression - Plan - Verification



All human behavior depends on how these brain systems communicate

Differences in Brain Connections

- Individuals having autism or related pervasive developmental conditions experience
 - MILD-EXTREME DIFFERENCES in brain connections
 - resulting in DIFFERENCES in behaviors
- Can occur with all levels of intellectual function



Differences in Behavior

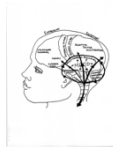
- Current ASD diagnostic criteria emphasizes major differences in:
 - Social interaction
 - Verbal and NonVerbal communication
 - Repetitive behaviors



ALL in the TIMING

• Inefficient timing:

- “Switch ons” and/or “switch offs”
- affecting WHOLE BRAIN COMMUNICATION



Brain Behaviors

MULTISENSORY ATTENTION

- ASD: Sensorially overwhelmed - affects fight/flight behaviors
- Brain sensory pathways too “on” and/or too “off”



Brain Behaviors

MEMORY

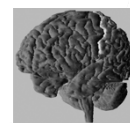
- Working memory difficulty
- Can have superior rote memory or long term memory



Brain Behaviors

MOVEMENT

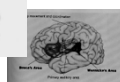
- Increased or decreased repetitive movements - i.e. flapping or “freeze”



Brain Behaviors

SPEECH/LANGUAGE

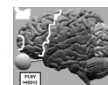
- Heightened differences in Verbal and/or NonVerbal Language
- Receptive/Expressive Language - i.e echolalia, selective mutism
- Internal speech guiding behaviors is inefficient



Brain Behaviors

EXECUTIVE FUNCTION/PLANNING

- Difficulty organizing/planning day to day life
- Can organize well-learned behaviors

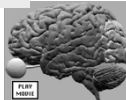


Brain Behaviors



MOOD/SOCIAL

- Generalized anxiety/depression mild or acute
- Heightened perseverative/routine/obsessive ideas
- Affects fight/flight behaviors
- Much difficulty with social adaptation



Environment Counts



- Environmental influences change brain and brain behaviors beyond genes, injury or illness



ASD: Many Causes, Many Responses

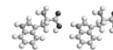


- ASD - multiple causes, multiple variations of behaviors depending on the level of ASD
- Many different responses to a variety of treatments
 - Syndromic Autism - secondary to another condition
 - i.e Chromosomal Disorders - Fragile X - current research = 1/3 ASD
 - Non-Syndromic Autism - primary in nature - no known underlying condition



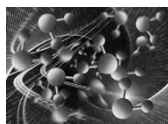
Molecular Research

- Cells have 4 large molecules - energy fields that play a role in health/disease
 - Sugars (polysaccharides)
 - Fats (lipids)
 - DNA/RNA (nucleic acids)
 - Proteins - we are protein machines with greater than 100,000 proteins



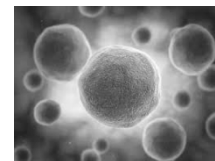
Molecular Research

- Shape shifting of cell activity propels life beyond genes
 - Can occur thousands of times per second
- Movement among cells shifts the shape of all cell activity affecting electrical/chemical connections and brain-behavior development



Molecular Research

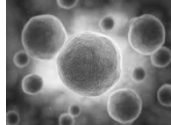
- Humans move!
 - All sensory pathways are associated with movement



Molecular Research

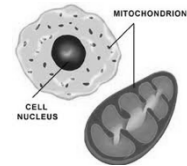
In ASD

- Cellular activity is inefficient
- Electrical/chemical connections are out of sync
- Brain-behavior development is out of sync



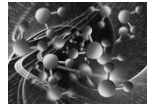
Molecular Research

- **ASD**: suspect possible mitochondrial disease/disorder
- Every cell has 100's to 1,000's of mitochondria - takes chemistry in body and converts to energy
- Energy throughout the body in autism is inefficient



Molelecular Research

- Complex human behavior is a community of cells
- Community of cells survive better than single cells doing all of the work
- Environment does influence cellular survival and behavioral survival
- Must help people with ASD not only survive, but thrive with health and well-being



ASD

Advances in Technology

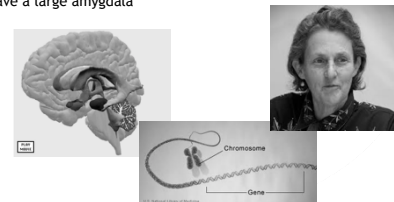
Hottest News!!!

- Genetic
- MRI, fMRI
- EEG, MEG
- PET
- DTI (diffusion tensor imaging)
- HDFT (high definition fiber tracking)



Genes Don't = Forever

- Variations in brains or brain behaviors don't imply cause
- i.e. Temple Grandin - just because you're anxious doesn't mean you have a large amygdala



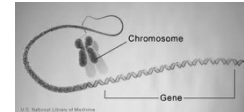
Genetic Research

- Many research findings in those with ASD are also found in control subjects
- Differences become a concern when the differences impede the ability to adapt with health and well-being

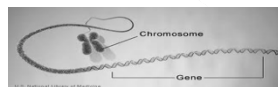


Genetic Research

- Genes lay a blueprint - environment does the construction
- Genes can be understood as physical memories of an organism's learned experiences over time



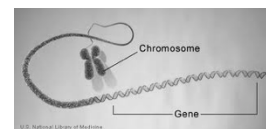
Genetic Research



- No one isolated gene (long time association with Chromosome 15)
- Suspect multiple genes and multiple mutations
- Suspect multiple Copy Number Variations (CNV)
 - Hundreds of CNV identified in ASD - i.e. CNV changes in length and position
 - 4x more likely on father's side in older aged fathers
 - Severe ASDs related to variations on both mother's and father's sides

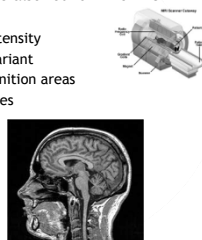
Genetic Research

- Human Genome Project
 - Human - Approx 25,000 genes - 50,000,000,000 single cells
 - Round worm has 24,000 genes - 1,000 cells
 - Fruit flies - 15,000 genes
 - Lab mouse - 25,000 genes (same as humans)



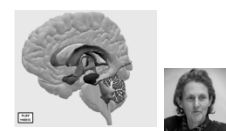
MRI/fMRI

- People with ASD but without syndrome
 - 48% had brain variants (all were also found in non-ASD)
- Significant variants
 - Especially white matter hyper-intensity
 - Heightened temporal/auditory variant
 - Atrophy to right side facial recognition areas
 - Asymmetry of the two hemispheres
- Mild variants
 - Hippocampal shape
 - Cerebellar atrophy
 - Ventricular dilation
 - Arachnoid cysts

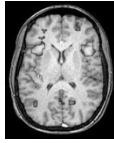


MRI/fMRI

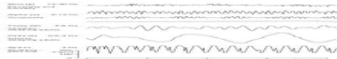
- Temple Grandin has:
 - Amygdala 20% larger on right than norms
 - Left brain 57% larger left (norm 15% larger left)
 - Cerebellum - 20% smaller than the norm



EEG, MEG



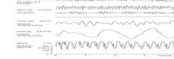
- Documented with spectrum disorders
- Heightened epileptiform activity
 - MEG - 82%
 - Sleep deprived and extended time ambulatory EEG - 60%
- 1/3 of ASD will experience clinical seizure activity by teen years - Especially if regression symptoms - ie Landau-Kleffner - epileptic language disorder



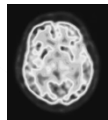
EEG, MEG



- Evidence shown for mirror neuron dysfunction in ASD
 - Mirror neuron theory (ability to imitate) associated with EEG frequencies of 8-13 hz (alpha waves)
 - In norms, 8-13 hz is reduced and more active frequencies are seen when performing a task - including imitating someone
 - ASD showed decreased 8-13 hz for self-performed tasks but not for imitation of observed tasks
 - (bouncing a ball, moving their own hand, imitate observing a moving hand)

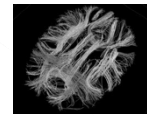


PET



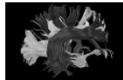
- - measures glucose metabolism
- Full spectrum (high or low function ASD) had reduction in glucose metabolism especially:
 - anterior and posterior cingulate gyrus (associated with emotion)
- Additionally post mortum studies have also shown these changes to the
 - cingulate gyrus as well as hippocampus, amygdala, and the septum.

DTI



- Diffusion Tensor Imaging
- Measures movement of water molecules through white matter (where brain connections are made)
- Control subjects = higher degree of movement at 6mos than 24 months
- Temple Grandin
 - More movement of water molecules in frontal-occipital cortex
 - Overall brain size = 15% greater than norm (People with ASD often have larger brain size)

HDFT

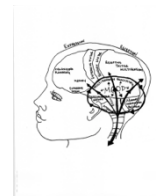


- High Definition Fiber Tracking (new version of DTI)
 - Fibers are like connective cables in the brain
- Temple Grandin
 - Visual fiber tracking - 400% of connectedness compared to controls
 - Auditory Fibers - 1% of connectedness compared to controls
 - She states, "I think in pictures".



Maximizing Potential

- Be sure to look at Whole Brain-Whole Person
- Attention
- Memory
- Movement
- Speech/Language
- Executive Function
- Mood/Social



Maximizing Potential

- The Brain can change - behaviors can change
- The Brain learns throughout life

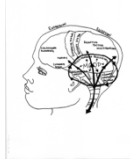


Maximizing Potential

- Laying the early foundation
 - IN EARLY YEARS, THE DEEPER BRAIN AREAS NEED healthy interconnectedness from biological and environmental influences (ascending brain fibers/tracks)
 - Multisensory Attention
 - Multisensory Motor
 - Multisensory Memory
 - Mood



Maximizing Potential



- As children grow-
 - the higher brain (their thinking, belief systems, their IQ predispositions, literacy development, motor development, long term memory) (descending tracks)
 - strengthens the lower brain
 - higher brain works with lower brain

Maximizing Potential



- In human behavior:
 - The better the connections between higher and lower brain work together = better brain-behavior development
 - Better connectedness of brain and behavior = better development of executive function (highest level of human development allowing us to adapt with health and well-being)

Maximizing Potential

- Many research findings in those with ASD are also found in control subjects



- Differences become a concern when the differences impede the ability to adapt with health and well-being

Maximizing Potential

- Interdisciplinary services help them be all they can be:
 - Biological - Whole brain-body connection
 - Psychological/developmental - brain training, counseling/behavior plans, whole-brain connectivity, allied health services, whole brain-behavior
 - Educational/Vocational - bridge with brain science
 - Spiritual focus

Maximizing Potential

• EMBRACE

- Whole-Brain Whole-Person
- Interdisciplinary Support



Maximizing Potential

EMPOWER

- Individuals
- Parents
- Families

