



The University of Texas at Austin  
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# Neurodiversity and Its Relationship to Behavior and Learning

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# Learning Objectives

1. Understand examples of Neurodiversity.
2. Identify ways to promote inclusion and acceptance.
3. Identify actions that support neurodiverse individuals and families.

Disclosures: No financial conflicts of interests.

# NeuroDiversity

- ★ Coined by Australian Autistic advocate & sociologist, Judy Singer in 1998 honors thesis
- ★ A term to be used for social analysis



## NeuroDiversity

*The Birth of an Idea*

NeuroDiversity word cloud including terms: asperger, ethnicityModel, theory, disability, spectrum, movement, history, minority, identity, feminist society, normalcy, model, wiring, computers, autism, internet, diversity, research, people, kanner, difference, autistics, oppression, mothers, socialConstruct, deal, inclusion, personal, prosthetic, neurodiversity, medicalModel, biodiversity, psychotherapy, socialModel, neurodiversity, model, wiring, computers, autism, internet, diversity, research, people, kanner, difference, autistics, oppression, mothers, socialConstruct, deal, inclusion, personal, prosthetic, neurodiversity, medicalModel, biodiversity, psychotherapy, socialModel.

## JUDY SINGER

The ground-breaking sociology thesis that prefigured the last great liberation movement to emerge from the 20th century

# NeuroDiversity

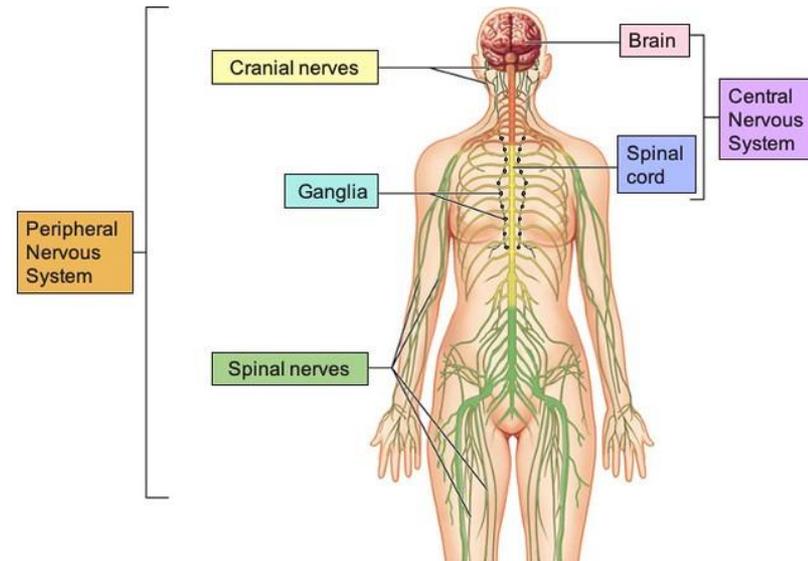
- ★ “Civil rights” movement for “neurological minorities”
- ★ Encourages recognition of strengths, gifts, and needed supports / accommodations
- ★ Championed by Autism Self-Advocacy Movement
  - Some may identify as “Autistic,” “On the Autistic Spectrum” or “High Functioning Autistic / HFA”
  - Some advocates may protest against functioning and severity labels
- ★ Term has now widened to include a range of variations in humans

# Neuro: The Nervous System

## ★ Brain, Spinal Cord, Networks of Nerves

- Messenger system

## ★ Tiny cells (neurons) carry messages back and forth from the brain throughout the body.



## ★ Development depends on:

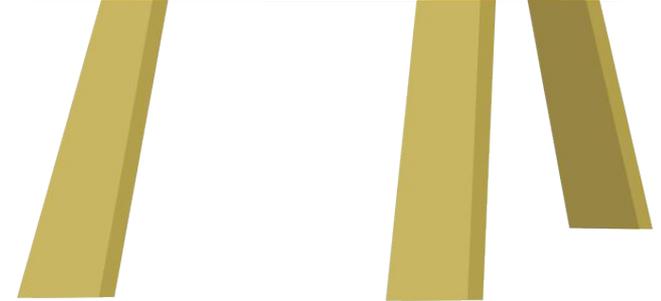
- genes
- nutrition, starting in pregnancy
- exposure to toxins or infections
- experiences (trauma, nurturance, etc)

# Diversity: Temperamental Differences

- ★ Biases in brain structures and molecules (neurotransmitters) that across neurons.
  - Possibly thousands of variations.
  - Effects the “excitability” of our brains
  - No temperament is ideal under all circumstances
  
- ★ Some measurable qualities in babies
  - **Inhibited:** quiet, shy, fearful tendencies
    - Excitable brain response to new experiences
    - Related to introversion later in life
  
  - **Uninhibited:** bold, sociable, outgoing
    - Low reactivity when introduced to new experiences
    - Related to extraversion later in life

# Diversity: Temperamental Dimensions

1. Activity level
2. Regularity (sleep, eating, etc.)
3. Approach - Withdrawal
4. Adaptability
5. Sensory Threshold
6. Reaction Intensity
7. Mood
8. Distractibility
9. Persistence



# Diversity: Highly Sensitive Persons

- ★ Thought to have an increased or deeper central nervous system sensitivity to physical, emotional, or social stimuli.
  - “Sensory processing sensitivity”
  
- ★ Tendency to be overly reactive to a variety of stimuli
  - Emotions of others or violence
  - Deeply moved by experiences in art or nature
  - Overwhelmed by loud noises or bright lights
  - May need extra down time away from others
  - Deep thinker with strong feelings
  
- ★ May be inherited, acquired through experience (e.g., trauma), or through dyadic experiences with others.

# Orchids in a Tulip and Dandelion World

- ★ Most children are like dandelions. They tend to grow well in most environments.
- ★ Tulip children can be thought of as “moderately” affected by the environment
- ★ Orchid children are more sensitive & biologically reactive to non-native environments.
- ★ Given supportive, nurturing conditions, orchid children can thrive in their non-native environments.

[Thomas Boyce, MD's and Elaine Aron's work](#)



# Models

★ **Neurotypical** - Most of the population, despite the many, many differences within this group

★ **Medical** - Sorted by 3Ds - Deficit, Disease, & Dysfunction

- Psychiatric & psychological disorders
- Neurodevelopmental Disorders (NDDs)

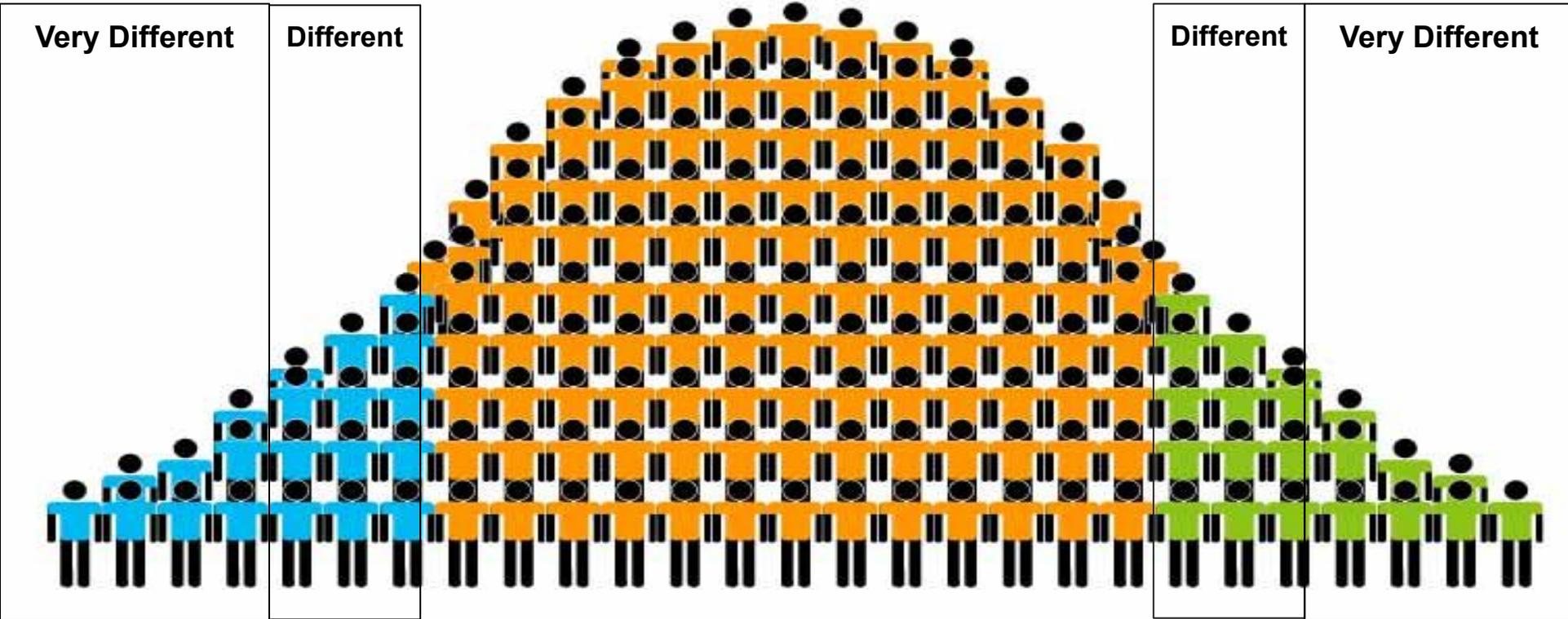


★ **Neurodiverse** - Differences that affect social ability, communication, thinking, and feeling.

- From highly intellectually gifted to profound limitations



# Variations in Humans



Bell Curve

# Medical Model

*Normal,  
Bell-shaped Curve*

Percentage of cases in 8 portions of the curve

.13%    2.14%    13.59%    34.13%    34.13%    13.59%    2.14%    .13%

Standard Deviations	-4σ	-3σ	-2σ	-1σ	0	+1σ	+2σ	+3σ	+4σ							
Cumulative Percentages		0.1%	2.3%	15.9%	50%	84.1%	97.7%	99.9%								
Percentiles			1	5	10	20	30	40	50	60	70	80	90	95	99	
Z scores	-4.0	-3.0	-2.0	-1.0	0	+1.0	+2.0	+3.0	+4.0							
T scores		20	30	40	50	60	70	80								
Standard Nine (Stanines)		1		2	3	4	5	6	7	8	9					
Percentage in Stanine		4%		7%	12%	17%	20%	17%	12%	7%	4%					

# Intervention Framework

★ **Neurotypical** - Status quo

★ **Medical** - Fix? Cure? Change?



★ **Neurodiversity** - Awareness, acceptance, and support



<https://www.etsy.com/shop/creativerags>

# Realm of Neurodiversities

## ★ Attention-deficit hyperactivity

- Inattentive
- Hyperactive/impulsive
- Combined

## ★ Autism spectrum

- Associated genetic or other conditions

## ★ Communication

- Receptive
- Expressive
- Pragmatic (social)

## ★ Intellectual

- Varying degrees of adaptive skills
- Associated genetic conditions

## ★ Motor

- Dyspraxia
- Stereotypic movement

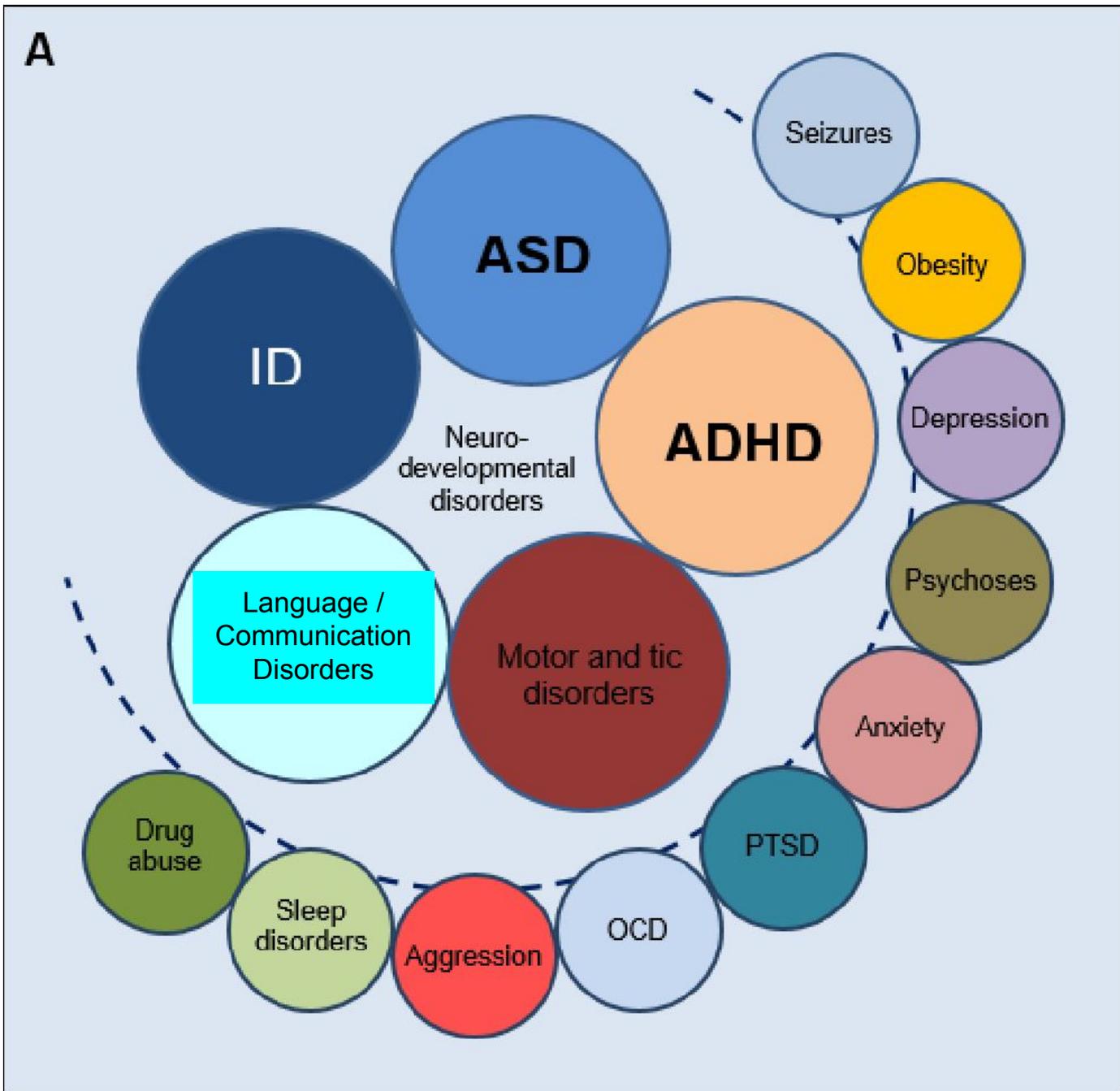
## ★ Learning

- Dyslexia
- Dysgraphia
- Dyscalculia

## ★ Tic

- Vocal
- Motor
- Tourette's

## ★ Deafness, Blindness, psychotic disorders, others?



Adapted from Figure 1. Homberg, J.R, et al (2016). *Neuroscience & Biobehavioral Reviews*, 65, 292-312

# Autism as an Example

## ★ Infancy

- Many infants later diagnosed with autism showed more reactivity, were hard-to-soothe, and had low positive affect

## ★ Early Childhood

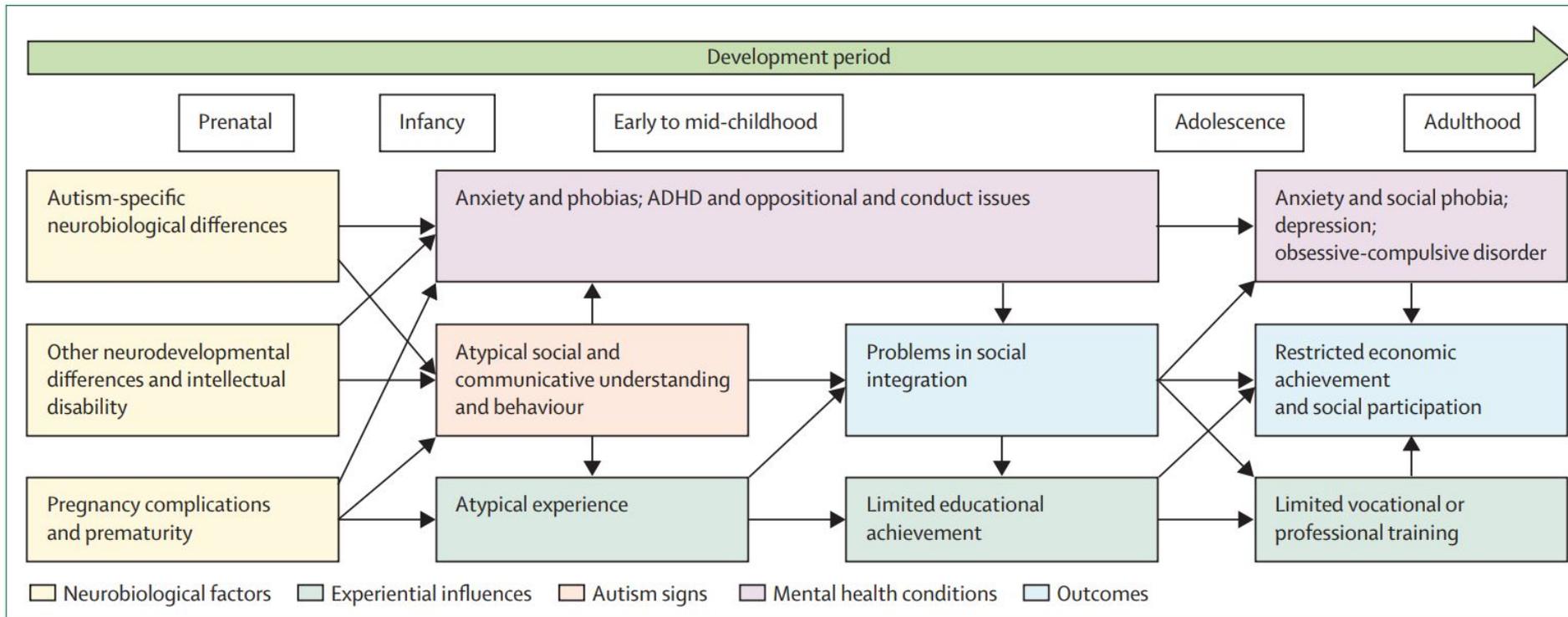
- More reactivity, more self-injurious behavior, and physical aggression

## ★ Middle Childhood / Adolescence

- More intense moodiness, including tantrums (>8 years old), uncontrolled outbursts, and aggression

## ★ Young Adulthood

- 80% have a diagnosed psychiatric disorder (mostly anxiety and depression)
- Suicidality can be as high as complex psychiatric populations



**Figure 2: Neurobiological and experiential influences on signs of autism, mental health, and life outcomes across development**

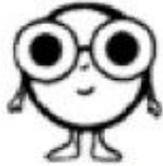
# Common Co-Occurring Psychiatric Symptoms

- ★ Anxiety
  - Social evaluation; fear of specific objects / situations, separation from caregivers, worry/anxiety about a number of areas
- ★ Attention-deficit/hyperactivity & impulsive behaviors
  - Increases the likelihood of a second co-occurring disorder
- ★ Oppositional/defiant behaviors
  - Tantrums, anger/irritability, and aggressive behavior
- ★ Obsessive-compulsive behavior
  - Repetitive, complex rituals; persistent/inflexible and ruminative thoughts
- ★ Mood-related difficulties
  - Low mood, mood swings, suicidality

# Appreciating All Differences



# Sensory Differences



visual  
(sight)



auditory  
(hearing)



gustatory  
(taste)



smell  
(olfactory)



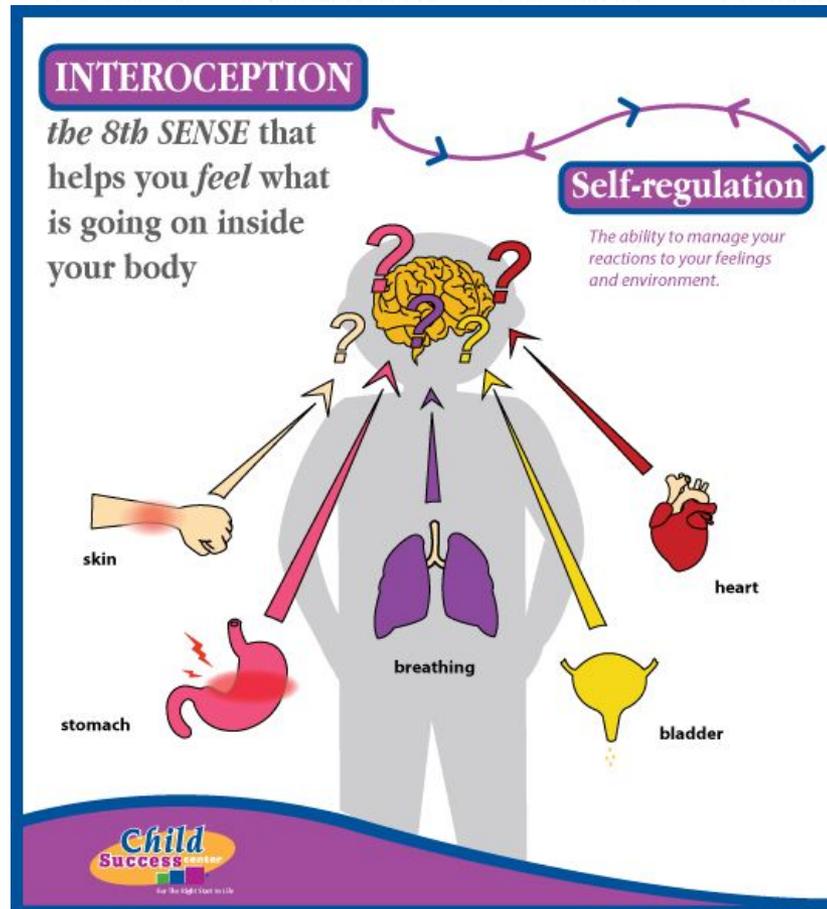
touch  
(tactile)



vestibular  
(balance)



proprioception  
(body awareness)



\*When we experience an emotion there usually corresponding feelings in the body

# Some Possible Hypersensitivities

1. **Hearing** – Covers ears, requests headphones or wears hoodies
2. **Visual** – Attentive to very small details; may look at things out of the corner of their eyes (peering), may avoid eye contact or avoid looking at some textures.
3. **Proprioception** - Avoids fine motor activities like holding utensils, writing, or being close to others.
4. **Taste** – Refuses new foods or spit out foods or medicines
5. **Vestibular** – Can become car sick easily, avoids swinging, heights or play equipment.
6. **Olfactory** – Distress from certain smell, environments like the cafeteria, coffee shops or certain people
7. **Tactile** – Refuses clothes due to labels, seams or certain fabrics; refuses teeth brushing, hair washing, baths, hugs, medical procedures, etc.
8. **Interoception** - Attentive to areas of the body; withdraws from emotional experiences; may avoid bowel movements

# Hypersensitivity & Anxiety Overlap

- ★ Anxiety Hyperarousal: increased restlessness, feeling “keyed up” or “on edge”, muscle tension, and insomnia.
- ★ Some evidence in adult women with generalized anxiety.
  - Autonomic nervous system involvement (heart rate) and central nervous system (prefrontal cortex of the brain involved in decision making)
- ★ Some evidence with separation anxiety and insistence on sameness
  - Could difficulties coping with sensory input lead to anxiety?
  - Could difficulties dealing with uncertainty in the environment lead to anxiety?

# Some Possible Hyposensitivities

1. **Hearing** – Banging things, seeks out sounds.
2. **Visual** – Difficulties attending in a busy environment, catching a ball, or walking down stairs; looks at something visually appealing out of the corner of the eye
3. **Proprioception** –Seeks deep pressure/compression, stands close to others
4. **Taste** – Seeks strong flavors, eats inedibles, licks objects
5. **Vestibular** – Rocks, spins, flaps hands, jumps off high surfaces to stimulate sense of movement and balance.
6. **Olfactory** – Sniffs objects and people; may not notice strong smells, even on themselves.
7. **Tactile** – High pain threshold; may not notice changes in temperature; engages in self-harm to gain tactile input
8. **Interoception** - May have urinary or bowel accidents; may seem fearless because they do not recognize the internal signs of fear

# Executive Functions: The Brain's CEO

## Cognitive skills that coordinate thinking & behavior

- ★ Regulation of effort, alertness, motivation, and speed of information processing, and impulses
- ★ Focusing, sustaining, and managing attention to task
- ★ Use short-term & working memory to perform an action
  - Verbal working memory related to internalized speech
- ★ Managing emotions, frustrations, and inhibiting impulses
- ★ Planning, organizing and initiating tasks while flexibly changing strategies when needed

# Executive Dysfunction

Some examples of executive dysfunction include:



**Focusing too much on just one thing.**



**Being easily distractible.**



**Daydreaming or "spacing out" when you shouldn't be.**



**Struggling to switch between tasks.**



**Problems with impulse control.**



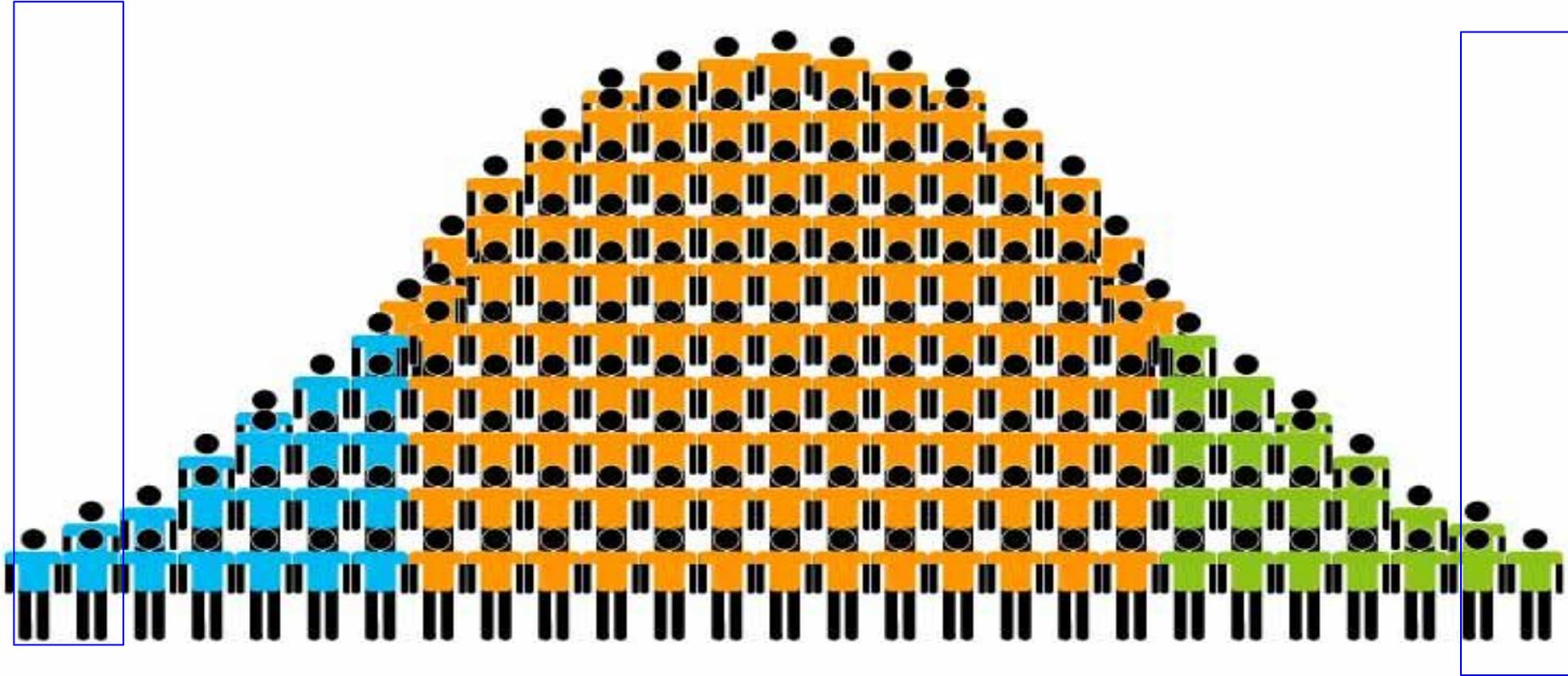
**Trouble starting difficult or boring tasks.**

- ★ Difficulties following directions
- ★ Blurts out answers
- ★ Puts hands on others' things
- ★ Stops a task half-way through
- ★ Hard time thinking of options
- ★ Loses track of thoughts in conversation
- ★ Does not know how to check work
- ★ Easily overwhelmed by a project
- ★ May appear lazy because of difficulties with initiation
- ★ Loses things
- ★ Flies off the handle over minor mistakes

# How Executive Dysfunction Impacts Individuals

- ★ Mental health
  - Substance use; conduct; depression; OCD; schizophrenia
- ★ Physical health
  - Substance use; eating habits; treatment adherence
- ★ School readiness
  - More predictive than IQ, reading and math entry scores
- ★ Occupational success
- ★ Romantic relationships
- ★ Public safety
  - Crime, reckless behavior, emotional outbursts

# Extreme Variations



Bell Curve

# The “Twice Exceptional”

- ★ Term used in education for intellectually gifted youth who have significant other areas of difference or disability.
  - Uneven social-emotional development
  - Uneven daily living skills
  - Motor clumsiness
  - Significant areas of academic underachievement
  
- ★ Interestingly, genetic variations for autism overlap broadly with alleles for high intelligence.
  - “Disorder of high intelligence” theory
    - High number in STEM occupations
    - High SES
    - “Assortative mating” - Partnering with similar individuals

# Examples of Very Significant Neuro Differences

## ★ Rett Syndrome

- Genetic condition that causes progressive loss of motor skills and speech. 1 in 10,000 girls.
- May or may not have severe intellectual delays

## ★ Profound Autism

- Typically nonverbal
- May not be able to participate in IQ testing
- Requires the highest level of support for daily living
- Can be associated with self-injurious behavior and aggression
- Often requires 24/7 supervision
- Some parent advocates champion a separate category for these individuals

# Inclusion

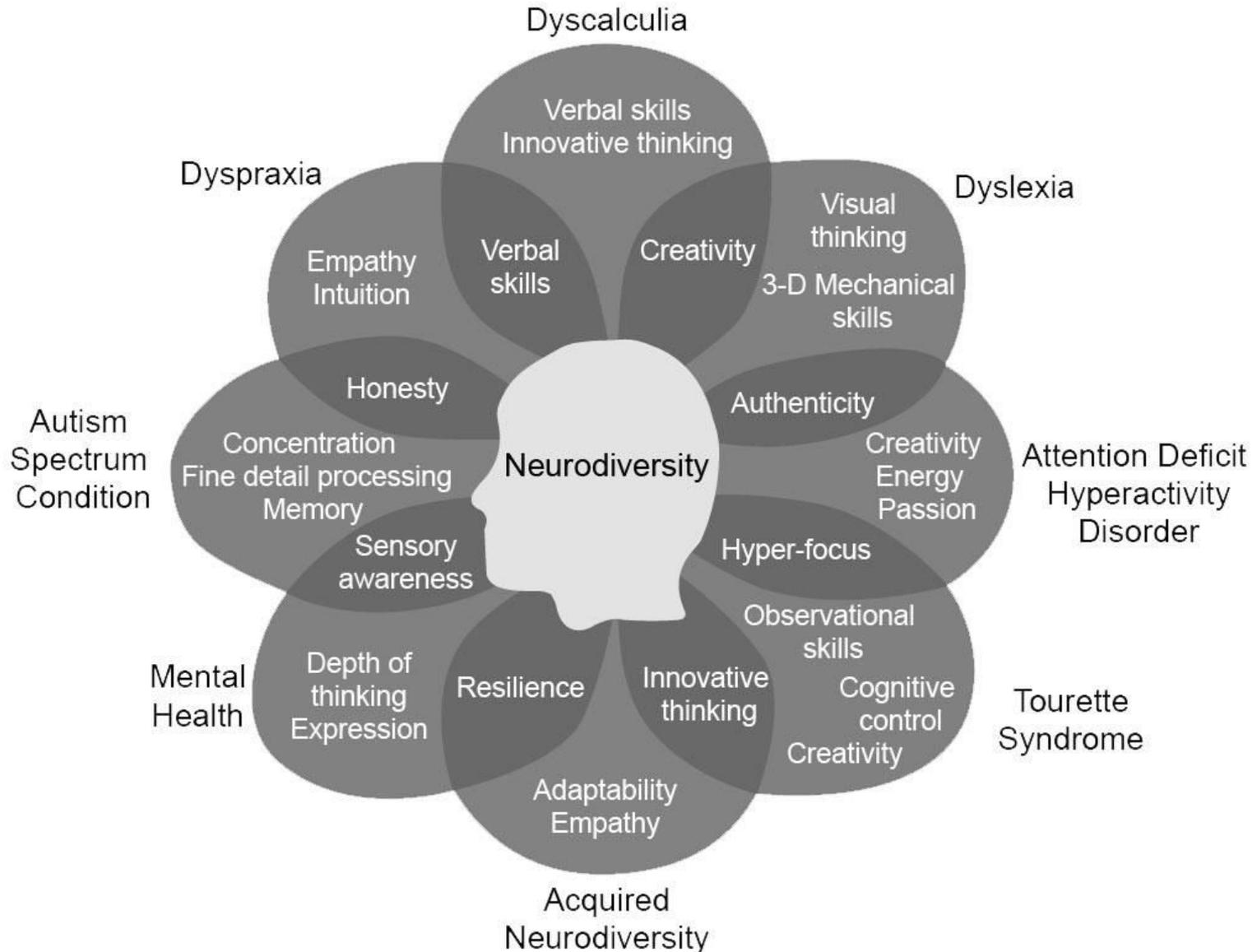


# **Inclusion in Families, Schools, & Communities**

“The aim of Positive Psychology is to catalyze a change in psychology from a preoccupation only with the repairing the worst things in life to also building the best qualities in life.”

Martin Seligman, PhD, University of Pennsylvania  
Positive Psychology Center

# Recognize Strengths and Potential



The Overlapping Skills and Strengths of Neurodiversity Credit: Created by Nancy Doyle, based on work by Mary Colley  
Published in *Neurodiversity* by the [National Cancer Institute Division of Cancer Epidemiology and and Genetics \(2022\)](#)

# Inclusion in Families, Schools, & Communities

“Human beings are happier, more cooperative and productive, and more likely to make positive changes in their behavior when those in positions of authority do things with them rather than to them or for them.”

*Ted Wachtel, International Institute for Restorative Practices*

# Inclusion in Families, Schools, & Communities

- ★ Inclusion - Creating an environment where people feel welcome, understood, and supported to participate in everyday activities to the fullest extent possible
  
- ★ Listen to all voices
  - Neurodivergent individuals
  - Caregivers of individuals across the neurodiversity spectrum (from highly gifted autistics to caregivers of those with profound autism)
  - Educators
  - Health providers
  - Other Stakeholders with youth's best interest in mind

# Inclusion in Families, Schools, & Communities

- ★ Strengthen relationships
  - Plan for regular, one-on-one “youth-led” activities
    - Play/recreational time that the youth enjoys without a lot of questions, instructions, teaching, and criticisms
  
- ★ Repair relationship ruptures when they happen
  - 5:1 ratio
    - For every one criticism, sarcastic comment, or blaming statement
    - 5 positives (praise, affirmations, active listening without judgment, and positive attention with nonverbal communication, etc).

# Inclusion in Families, Schools, & Communities

- ★ Build a supportive team around the individual
  
- ★ Foster relationships that will enhance their life
  - Educators/school staff
  - Therapists
  - Tutor/academic coach
  - Other parents and relatives
  - Peers, younger or older, and family members
  
- ★ Support appropriate healthcare
  - Youth transition to adulthood more successfully with insurance that meets their needs
  - Family-centered care
    - More hours of therapy, although beneficial for the child may be stressful for caregivers

# Emotional/Behavioral Support

- ★ Tell, Model, Rehearse, Provide Feedback
  - ★ May need to explicitly teach the “hidden” social curriculum
  - ★ Practice simulations in a fun way
  - ★ Use video examples of examples and “non-examples”
  - ★ Role play
  - ★ Provide coaching
    - Make “I” statements instead of blaming during coaching
  
- ★ Promote resilience
  - ★ “Positive opposite” caregiver behaviors to combat emotional reactions / stress associated with caring for or teaching individuals

# Promote Resilience with “Positive Opposites”

Emotional Caregiver Behavior	Example of Emotional Behavior	Possible Youth Consequences in the Long Run	Positive Opposite Adult Caregiver Behavior
Criticism	<ul style="list-style-type: none"> <li>● Focusing on challenges and “disorder” with little attention to positives due to adult caregiver’s anxiety</li> </ul>	<ul style="list-style-type: none"> <li>● Low self-esteem</li> <li>● Depressed mood</li> <li>● Behavior problems</li> <li>● People-pleasing at all costs</li> </ul>	<ul style="list-style-type: none"> <li>★ Verbalize empathy</li> <li>★ Reward appropriate effort and behavior</li> <li>★ 5:1 ratio</li> </ul>

# Promote Resilience with “Positive Opposites”

Emotional Caregiver Behavior	Example of Emotional Behavior	Possible Youth Consequences in the Long Run	Positive Opposite Adult Caregiver Behavior
Excessive Modeling of Intense Emotions & Avoidance	<ul style="list-style-type: none"> <li>● Expressing adult worries too much</li> <li>● Aggressive behavior when angry</li> <li>● Refusal to talk about emotions</li> </ul>	<ul style="list-style-type: none"> <li>● More intense emotional reactions</li> <li>● Difficulties expressing emotions</li> <li>● Avoids emotional conversations</li> </ul>	<ul style="list-style-type: none"> <li>★ Model healthy coping</li> <li>★ Schedule family time to openly discuss topics</li> </ul>

# Inclusion in Families, Schools, & Communities

Before we attempt to change the child, we should start with the environment to make it more supportive, less overwhelming, and more understanding.

Summarized from Peg Dawson, EdD, NCSP, *Smart but Scattered Kids*

# Inclusion in Families, Schools, & Communities

## Positive Behavioral Supports

- ★ Use visuals (written, pictorial) and hands on examples
- ★ Use clear verbal communication
  - Talk less, touch more (when appropriate)
- ★ Pay attention to reactions to tone of voice
  - Animated versus quiet versus neutral/matter-of-fact
- ★ Use praise or affirmations that are effective for the individual
  - Specific and geared towards behaviors youth can change
- ★ Allow choice and control as much as possible
- ★ Adjust demands and expectations to flexibly adapt to differences

# Inclusion in Families, Schools, & Communities

- ★ Read positive information from and about neurodiverse individuals
- ★ Share success stories with youth (not just from celebrities)
- ★ Highlight neurodiverse youth in community, school, and religious publications

# Identify Caregiver and Provider Burnout

- ★ Overwhelming fatigue
- ★ Unrelenting sadness
- ★ Feeling hopeless
- ★ Feeling out of control of your own life
- ★ Constant anxiety / waiting for the other shoe to drop

# Caregiver and Provider Burnout Strategies

- ★ Three Good Things Exercise
  - 3 things/events from the day you are grateful for
    - What you noticed.
    - How it made you feel.
    - Why you think the event happened.
- ★ Ask for help from a support system.
- ★ Do small things that you enjoy throughout the day.
- ★ Ask for help from a health provider.



i am  
grateful