What is Autism?

https://www.nimh.nih.gov/health/topics/autism-spectrum-disorders-asd/index.shtml
https://www.autismspeaks.org/what-autism

- Developmental disorder
- Impairs communication and social interaction
- Difficulty with communication and interaction with other people
- Restricted interests and repetitive behaviors
- Symptoms that hurt the person's ability to function properly in school, work, and other areas of life
- Spectrum disorder - wide variation in type and severity of symptoms

- Signs appear ~ 2-3yrs old
- Can be diagnosed in 18 months
    - Early intervention?
- In 2013, the American Psychiatric Association (APA) merged 4 autism diagnoses into 1 (ASD)
    - Autistic disorder
        - Significant language delays, social and communication challengers, and unusual behaviors and interests, many (40-60%) also have an intellectual disability
    - Childhood disintegrative disorder
    - Asperger's syndrome
        - Milder symptoms of autistic disorder, many with social challenges and unusual behaviors and interests, without problems with language or intellectual disability
    - Pervasive developmental disorder - not otherwise specified (general?) (PDD-NOS)
        - Meet some of the criteria for Autistic disorder or Asperger syndrome, but not all
        - Usually have fewer and milder symptoms, and may have social and/or communication challenges
- ...consolidated of three previous categories of autism symptoms
    - Social impairment
    - Language/communication impairment
    - Repetitive restricted behaviors
- ...into two categories of symptoms
    - Persistent deficits in social communication/interaction
    - Restricted, repetitive patterns of behavior
- ...added sensory issues as a symptom under restricted/repetitive behavior category
    - Hyper- or hypo-reactivity to stimuli (lights, sounds, tastes, touch, etc)

- Unusual interests in stimuli (staring at lights, spinning objects, etc)

First-person views into Autism
https://www.reddit.com/r/AskReddit/comments/5q9ppf/autistic_people_of_reddit_what_is_autism_really/

Autism Spectrum Disorder - Diagnostic Criteria

from Diagnostic and Statistical Manual of Mental Disorders v5 (DSM-5) from APA

https://www.autismspeaks.org/dsm-5-criteria
https://images.pearsonclinical.com/images/assets/basc-3/basc3resources/DSM5_DiagnosticCriteria_AutismSpectrumDisorder.pdf

Persistent deficits in social communication and interaction across mult contexts, current/past	
Deficits in social-emotional reciprocity	Ex: - abnormal social approach, - failure of normal back-and forth conversation - Reduced sharing of interests, emotions, affect - Failure to initiate or respond to social interactions
Deficits in nonverbal communicative behaviors used for social interaction	Ex: - poorly integrated verbal and nonverbal communication - abnormalities in eye contact and body language - deficits in understanding and use of gestures - total lack of facial expressions and nonverbal communication
Deficits in developing, maintaining and understanding relationships	Ex: - difficulties adjusting behavior to suit various social contexts - difficulties in sharing imaginative play or in making friends - absence of interest in peers
Restricted repetitive patterns of behavior, interests, or activities, manifested as **at least two** of the following current/past	
Repetitive motor movements, use of objects, or speech	Ex: - simple motor stereotypes - lining up toys or flipping objects - echolalia - idiosyncratic/peculiar phrases
Insistence on sameness, inflexible adherence to routines, or ritualized patterns or verbal nonverbal behavior	Ex: - extreme distress at small changes - difficulties with transitions - rigid thinking patterns - greeting rituals - Need to take same route or eat same food every day
Highly restricted, fixated interests that are abnormal in intensity or focus	Ex: - strong attachment to or preoccupation with unusual objects

	- excessively circumscribed or perseverative interest
Symptoms must be present in the early developmental period (may not fully manifest until social demands exceed limited capacities or masked by learned strategies later in life)	
Symptoms cause clinically significant impairment in social, occupational, or other important areas of current functioning	
These disturbances are not better explained by intellectual disability or global developmental delay. Intellectual disability and autism spectrum disorder (ASD) frequently co-occur; to make comorbid diagnoses of ASD and intellectual disability, social communication should be below that expected for general developmental level	

Severity level for ASD

Severity level	Social communication	Restricted, repetitive behaviors
Level 3 Requiring very substantial support	**Severe** deficits in verbal and nonverbal social communication skills cause **severe** impairments in functioning, **very limited** initiation of social interactions, and **minimal response** to social overtures from others. For example, a person with few words of intelligible speech who rarely initiates interaction and, when he or she does, makes unusual approaches to **meet needs only** and responds to **only very direct** social approaches.	Inflexibility of behavior, **extreme** difficulty coping with change, or other restricted/repetitive behaviors markedly interfere with functioning **in all spheres**. **Great** distress/difficulty changing focus or action.
Level 2 Requiring substantial support	Marked deficits in verbal and nonverbal social communication skills; social impairments apparent even with supports in place; limited initiation of social interactions; and reduced or abnormal responses to social overtures from others. For example, a person who speaks simply sentences, whose interaction is limited to narrow special interests, and who has markedly odd nonverbal communication.	Inflexibility of behavior, difficulty coping with change, or other restricted/repetitive behaviors appear frequently enough to be obvious to the casual observer and interfere with functioning in a **variety of contexts**. Distress/difficulty changing focus or action.
Level 1 Requiring support	Without supports in place, deficits in social communication cause **noticeable** impairments. Difficulty initiating social interactions, and clear examples of **atypical or unsuccessful** responses to	Inflexibility of behavior causes significant interference with functioning in one or more contexts. Difficulty switching between

	social overtures of others. May appear to have **decreased interest** in social interactions. For example, a person who is able to speak in full sentences and engages in communication but whose to-and-fro conversations with others fails, and whose attempts to make friends are odd and typically unsuccessful.	activities. Problems of organization and planning hamper independence.

Social (Pragmatic) Communication Disorder - Diagnostic Criteria

1. Persistent difficulties in the social use of verbal and nonverbal communication as manifested by
    a. Deficits in using communication for social purposes,
        i. such as greeting and sharing information, appropriate for social context
    b. Impairment of the ability to change communication to match context or the needs of the listener,
        i. such as speaking differently in a classroom than on the playground,
        ii. talking differently to a child than to an adult,
        iii. and avoiding use of overly formal language
    c. Difficulties following rules for conversation and storytelling
        i. Such as taking turns in conversation
        ii. Rephrasing when misunderstood
        iii. Knowing how to use verbal and nonverbal signals to regulate interaction
    d. Difficulties understanding what is not explicitly stated
        i. Making inferences
        ii. Nonliteral or ambiguous meanings of language
        iii. Idioms, humor, metaphors, multiple meanings that depend on the context for interpretation
2. Deficits result in functional limitations in effective communication, social participation, social relationships, academic achievement, or occupational performance, individually, or in combination
3. The onset of the symptoms is in the early developmental period (but deficits may not become fully manifest until social communication demands exceed limited capacities
4. The symptoms are not attributable to another medical or neurological condition or to low abilities in the domains or word structure and grammar and are not better explained by ASD, intellectual disability, global developmental delay, or another mental disorder

At home screening / tracking tools

https://www.autismspeaks.org/screen-your-child
https://www.cdc.gov/ncbddd/actearly/milestones-app.html
https://www.cdc.gov/ncbddd/actearly/resources.html[1]
https://vkc.mc.vanderbilt.edu/vkc/triad/stat/
https://www.special-learning.com/checklist
https://www.cdc.gov/ncbddd/actearly/pdf/checklists/Checklists-with-Tips_Reader_508.pdf
https://www.skillsforautism.com/
Autism & Beyond uses facial recognition for autism screening, assessing social-emotional response to a video: https://autismandbeyond.researchkit.duke.edu/ch

Worksheets

https://www.thewatsoninstitute.org/resources/?pageId=069020009178108739569235 2
https://www.autismclassroomresources.com/behavior-data-sheets/
http://4.bp.blogspot.com/-8pv7yoikLpw/Uj8LggKMc4I/AAAAAAAAB-c/e6xxD2PG4_0/s1600/autism+data+sheet+5.png
https://www.earlywood.org/Page/556

Frequent Associated Medical Conditions

- Epilepsy
- Gastrointestinal problems
- Feeding
- Sleep disturbances
- Attention-deficit/hyperactivity disorder
- Anxiety
- Depression
- Obsessive-compulsive disorder

Behavioral Treatments

http://www.interventionsunlimited.com/editoruploads/files/Iowa%20DHS%20Autism%20Interventions%206-10-11.pdf

[1] CDC resources focus on general health, not just autism

- Applied Behavior Analysis (ABA)
    - Behavioral therapy
        - Qualified behavior analyst
        - Ongoing
    - Evidence-based best practice treatment (has passed scientific tests for usefulness, quality, and effectiveness)
    - Understand behavior and how to apply that understanding to situations
    - Positive reinforcement to drive behavior and attain goals
    - Can be on-on-one or in groups
    - ABC - Antecedent, Behavior, Consequence: understand what happens right before a behavior, the behavior itself (response or lack thereof), and what happens after the behavior
        - Why is a behavior happening,
        - likelihood of happening in the future
        - Replacing with a more appropriate behavior
    - Design by a behavior analyst as unique to individual learners
        - Treatments goals specific to age and ability of person, and can include a variety of skill areas (communication, social, self-care/hygiene, play, motor skills, learning and academic)
    - Other ABA strategies
        - Early intensive interventions
            - Commonly Lovaas-based approaches
        - Social skills training
            - Directly train social skills to increase prosocial behaviors
            - Social narratives/stories are useful tools
            - Specific aspects of social interaction (eye contact, joint attention, verbal greetings) can be learned with focused training
            - Social skills training groups + peer mediation
        - Cognitive behavioral therapy
            -
- Discrete Trial Training (DTT) (Lovaas therapy)
    - Behavioral learning therapy + applied behavior analysis
    - A discriminative stimulus is presented, child reponse, and then child receives a consequence/reward
    - Errorless learning, shaping, modeling, prompting, facing, correction, and reinforcement to encourage skill acquisition
    - Best for skills that can be taught in small, repeated steps
        - Language
        - Motor skills
        - Iitation and play
        - Emotional expression
        - Academis
        - Reduction of self-stimulatory and aggressive behaviors

    - Special training is necessary: DTT trained therapist
    - 25-40 hours a week
    - Expensive
    - All ages and ability levels
- Functional Communication Training (FCT)
    - Behavioral methodology
    - Replaces disruptive or inappropriate behavior with more appropriate and effective communication
    - Behavioral analysis is used to determine communicative functions of disruptive behavior
    - Socially appropriate behaviors are taught as replacements for problem behaviors
    - Weekly training sessions with parents/caregivers
- Early Start Denver Model (ESDM)
    - Behavioral therapy (based on ABA)
    - Play is used to build positive relationships, boost language, social and cognitive skills
        - As young as 18 months
        - One-on-one, in groups, parent training
    - Occurs during natural play and everyday activities
        - Psychologist
        - Behavior specialist
        - Occupational therapist
        - Speech and language pathologist
        - Early intervention specialist
        - developmental pediatrician
        - ...any with specific training in EDSM
    - Improves brain activity associated with social and communication skills
    -
- Floortime
    - Relationship-based therapy
    - Parent gets down on the floor to play and interact with the child at their level
        - 2-5 hours a day - following the child's lead
        - Focus on emotional development
        - Develops "who they are"
        - Open and close child's circles of communication
        - Meet the child at their developmental level and build on strengths
    - Can also be cone in a preschool setting with typically developing peers
    - Key milestones
        - Self-regulation and interest in the world
        - Intimacy, or engagement in relationships
        - Two-way communication
        - Complex communication
        - Emotional ideas

        - Emotional thinking
- Occupational Therapy
    - Works on cognitive, physical, social, and motor skills
    - Improve everyday skills to help individuals become more independent and to participate in a wider range of activities
    - Licensed occupational therapist (OT) - MD, nat. cert, state license
    - Occupational therapy assistant (OTA) - BD, trained and supervised by OT
    - 30 min - 1 hr session with at home / school practice
    - Evaluate how a person
        - Plays
        - Learns
        - Cares for themselves
        - Interacts with their environment
    - Goals that help someone work on key skills
        - Independent dressing
        - Eating
        - Grooming
        - Using the bathroom
        - Fine motor skills like writing, coloring, and cutting with scissors
- Pivotal Response Treatment (PRT)
    - Systematic method of applying scientific principles of ABA
    - Building on child's initiative and interests to develop communication, play, and social behaviors
    - Encourages response to multiple cues, self-management, and self-initiation in a natural setting
    - Implemented by caregivers and teachers
- Antecedent-based interventions
    - In combination with ABA techniques, antecedent conditions should be set up in addition to reinforcement/punishment after a behavior occurs to increase success rate and reduce problem behaviors
    - Choice, behavioral momentum, curing and prompting, modifying task demands, errorless learning, priming, non-contingent reinforcement, and time delay
- Relationship Development Intervention
    - Family-based, behavioral treatment to address core symptoms
    - Focuses on building social and emotional skills
    - Parents are trained as primary therapist - learned through training seminars, books, etc
    - Form personal relationships by strengthening building blocks of social connections (such as form an emotional bond and share experiences with others)
    - Build upon dynamic intelligence /ability to think flexibly
        - Understand different perspectives
        - Cope with change
        - Integrate info from mult sources (sights,sounds)

        - Social skills, adaptability, and self awareness
    - 6 objectives
        - Emotional referencing - learn from emotional and subjective experiences of others
        - Social coordination - observe and control behavior to participate in social relationships
        - Declarative language - use language and non-verbal comm. to express curiosity, invite others to interact, share perceptions and feelings and coordinate your actions with others
        - Flexible thinking - adapt and alter plans as circumstances change
        - Relational information processing - put things into context and solve problems that lack clear solutions or have no right/wrong solutions
        - Foresight and hindsight - think about past experiences and anticipate future possibilities based on past experiences
    - Step-by-step approach to build motivation and skills, based on current age and ability used in daily life with positive reinforcement
        - Initial goal - build a guided participation relationship between parents and child
            - Example: parents limit how much they use spoken language to improve eye contact and non-verbal communication
        - Advance through a series of developmental goals to improve neural connectivity
        - Child spends time with a peer who shares similar social and emotional skills, and gradually additional children will join to form a group
            - Meet and play with a parent or therapist to practice forming and maintaining relationships in different contexts

Education and learning programs

- TEACCH
    - Clinical, training, and research program based at the university of north carolina - chapel hill and used as a statewide program
    - “Structured TEACCHing”
        - Strengths in visual information processing
        - Difficulties with social communication, attention, and executive function
        - External organizational supports to address challenges with attention and executive function
        - Visual or written information to supplement verbal communication
        - Structured support for social communication
    - Provides strategies and tools for teachers

Other treatments and therapies

- Speech Therapy

    - Focuses on language and communication to improve verbal, nonverbal, and social comm. And communicate in more useful, functional ways
    - One-on-one or social skill groups (for social communication)
    - Skill examples
        - Strengthening the muscles in the mouth, jaw, and neck
        - Making clearer speech sounds
        - Matching emotions with the correct facial expression
        - Understanding body language
        - Responding to questions
        - Matching a picture with its meaning
        - Using a speed app on an iPad to produce the correct word
        - Modulating tone of voice
    - Alternative Augmentative Communication (AAC) - Some people with autism find pictures or technology more effective for communication than speaking
        - Sign language
        - Picture exchange communication system (PECS)
        - iPad
        - Speech output device (Dynavox)
    - Separate child and parent coaching
        - How to communication with friends
        - Communicating in a relationship
        - Appropriate behavior at work
-
- Verbal Behavior
    - Teaches communication and language
    - Based on ABA and behaviorist BF Skinner's theories
    - Students learn that words can help them get desired object or results - learn language by connecting words with their purposes
        - Not words just as labels, but also why we use words and how they are useful
    - Language types / Operants
        - Mand - A request (saying "Cookie" to ask for a cookie) (most basic type of language)
        - Tact - share an experience or draw attention (saying "Airplane" to point out an airplane)
        - Intraverbal - respond or answer a question ("Arlington Elementary" in answer to "Where do you go to school?")
        - Echoic - repeated or echoed word, imation helps the student learn ("Cookie?" "Cookie!")

Medication Options

- https://www.autismspeaks.org/tool-kit/atnair-p-medication-decision-aid
- https://www.autismspeaks.org/tool-kit/atnair-p-autism-and-medication-safe-and-careful-use

- Antipsychotics
- Serotonin reuptake inhibitors
- Stimulants / hyperactivity medicines
- Secretin (for digestion problems)
- Chelation (removes heavy metals from the body - a controversial idea that heavy metals in the body causes autism)
- R-baclofen

Diet

- Megavitamin therapy
- Gluten and casein-free therapy
    - limit gluten by cutting out wheat, barley, oats, rye, and derivatives
    - limit casein by cutting out cow's milk
    - inability to properly metabolize proteins can lead to gastrointestinal or neurological problems
- Need enough fat to absorb vitamins A, E, D, and K
- vegan or vegetarian diets may lack B12
- melatonin to help with sleep issues
- probiotics to help with GI distress
- vitamin D3 shows improvement in signs and symptoms of ASD
- vitamins B6 and magnesium can help ease symptoms, but each dhild may react differently to supplements

Autism Software

- https://github.com/Mindera/autism
- https://github.com/autyzm-pg/friendly-plans
- https://github.com/ckinson/Autism-Project
- http://homepage.divms.uiowa.edu/~hourcade/projects/asd/index.html

Random Readings

- https://www.indiegogo.com/projects/world-s-first-augmented-reality-glasses-for-autism#/
- http://autismglass.stanford.edu
- https://www.autismspeaks.org/expert-opinion/what-it-about-autism-and-food-0
- https://uwreadilab.com/wp-content/uploads/2015/07/TRIAD-Social-Skills-Assessment-English-version.pdf
- https://www.sfari.org/2018/12/20/spark-workshop-discussed-digital-tools-for-phenotyping-cognition-and-behavior-in-autism-spectrum-and-other-brain-disorders/

Research programs

- Brain Net / ATP https://www.sfari.org/resource/autism-brainnet/
- Autism genomic cohort https://www.wuxinextcode.com/simons-simplex-collection/

Data Analysis tools

- https://www.sfari.org/resource/data-analysis-tools/