Autism

Autism is the most severe form of the Autism Spectrum Disorders, or Pervasive Developmental Disorders.

- A "spectrum disorder" is a set of seemingly closely related disorders (see also proposed "obsessive-compulsive spectrum disorder", as well as disorders that are "subsyndromal" relative to others, such as dysthymia and schizotypal personality disorder).

- The disorders all share many features, and some may be milder forms of others in the spectrum.
The major Autism Spectrum Disorders include:

- Autism
- Asperger's Syndrome
- Pervasive Developmental Disorder Not Otherwise Specified (PDD-NOS)

The DSM-IV does not use the term ASD, but "Pervasive Developmental Disorder", and adds under this category:

- Rett's Disorder (an inherited neurological condition in girls)
- Childhood Disintegrative Disorder (an apparently neurological condition)

(Some researchers feel these neurological conditions are sufficiently different not to include them as part of ASD.)

In general, the Autism Spectrum Disorders involve:

- widespread abnormalities of or delays in:
  - communication/language skills
  - social interactions
- highly stereotyped behavior
- severely restricted interests

Generally appears to be developmental (some symptoms show at a very young age)
Autism

Diagnostic criteria:

At least six of the following criteria from the three categories, with minimum number of symptoms per category indicated:

**Impaired social interaction (at least 2):**

- Markedly deficient regulation of social interaction by using multiple non-verbal behaviors such as eye contact, facial expression, body posture and gestures.
- Lack of peer relationships that are appropriate to the developmental level.
- Doesn’t seek to share achievements, interests or pleasure with others.
- Lacks social or emotional reciprocity.

**Impaired communication (at least 1):**

- Delayed or absent development of spoken language for which the patient doesn’t try to compensate with gestures.
- In person’s who can speak, inadequate attempts to begin or sustain a conversation.
- Language that is repetitive, stereotyped or idiosyncratic.
- Appropriate to developmental stage, absence of social imitative play or spontaneous, make-believe play.
Activities, behavior and interests that are repetitive, restricted and stereotyped (at least 1 of):

- Preoccupation with abnormal (in focus or intensity) interests that are restricted and stereotyped (such as spinning things).
- Rigidly sticks to routines or rituals that don't appear to have a function.
- Has stereotyped, repetitive motor mannerisms, such as hand flapping.
- Persistently preoccupied with parts of objects.

Before age three, the person shows delayed or abnormal functioning in 1 or more of:

- Social interaction.
- Language used in social communication.
- Imaginative or symbolic play.

These symptoms are not better explained by Childhood Disintegrative Disorder or Rett's Disorder.
In addition, non-diagnostic symptoms often associated with autism often include:

- learning problems/mental retardation (~75% of individuals)
- dysarthria or involuntary movement
- hypoactivity
- psychosis
- Odd or Eccentric or Suspicious Personality
- Anxious or Fearful or Dependent Personality
- "Splinter skills" and savants (e.g., "Rain Man" - very rare)

Asperger’s Syndrome

- Relatively recently recognized (DSM-IV, ICD-10 in 1994)
- Characterized by difficulties in social interaction and by restricted, stereotyped interests and activities.
- Distinguished from the other ASDs in having no general delay in language or cognitive development
- May diagnostically overlap with "High-Functioning Autism"
- Generally more able to live independently than individuals with autism
- Some informal claims that this disorder is over-represented in some social domains (e.g., technology-related fields, narrow academic fields, "geeks")
Prevalence

Estimates of prevalence for autism and ASD are extremely controversial and widely vary.

Current best estimates are:

- autism: 1-2 per 1000 children
- ASD total: 6 per 1000 (most cases are PDD-NOS).

Asperger's rate estimates vary widely, but 0.3 per 1000 is likely a good estimate.

Number of diagnosed cases in US has climbed dramatically over the past decade (~1/1000 in 1996 to 6/1000 currently).

Increase is generally taken not to indicate increase in actual number of new cases, but instead:

- increased awareness of disorder and thus increased application of diagnostic criteria to previously undetected cases
- a shift in patterns of diagnosis to those disorders that receive more treatment funding ("case substitution")
  - autism care relatively more funded in US than other related disorders, such as developmental delay (mental retardation)
  - diagnosis of autism may result in better care for child
Etiology of autism

The underlying cause(s) of autism are little understood.

Early theories emphasized upbringing, such as the “refrigerator mother” account (1950s):

- Autism due to poor parenting by mothers who are emotionally distant and frigid.

By mid-1970s, it was clear that there was a very strong genetic component, and parenting accounts were largely abandoned.

Now recognized as primarily arising due to some sort of neuro-developmental dysfunction.

A few researchers, and some laypeople, have argued the increase in diagnosed cases suggests environmental cause:

- most commonly cited culprit: *thermiosol* (mercury-based preservative used in some childhood vaccines)
  - some overlap between anti-thermiosol groups and general anti-vaccination groups

Numerous studies have looked at this suggestion, no reliable research supports this claim.
Is ASD a “disorder”, or just different neural wiring?

In contrast to the environmental approach to ASD, which looks on it as a disorder inflicted on its possessors and something to be avoided, some have argued that ASD is simply a different, but not "abnormal", way for a brain to be wired.

"Neurodiversity" movement

Neurodiversity approach argues that ASD individuals are different from "neurotypicals" (“normal” individuals), but are not "disordered" -- simply see the world in a different way.

Some proponents are high-functioning autistics and (self-labelled) "aspies":

- Temple Grandin (professor of animal science at Colorado State University, animal welfare advocate)

Others are parents of ASD children

- Morton Ann Gernsbacher
While there are many high-functioning autistic individuals and people with Asperger's who have successful careers, most autistic individuals cannot care for themselves without assistance.

(Possibly largely due to co-morbid intellectual impairment, rather than ASD symptoms.)

Cognitive accounts of Autism

Cognitive accounts of autism can be roughly divided into those that argue for *general cognitive difference*, and those that focus on differences in *social cognition*. 
Executive Dysfunction

Some researchers have observed that autistic individuals have problems with tasks typically thought to measure executive function:

Rumsey and Hamberger (1988)

Gave autistic and non-autistic participants Wisconsin Card Sort Task

- standard task used to measure ability to infer a rule from examples, and to identify shifts in rules as they appear.

Autistic individuals had increased perseverations (stuck to inferred rule even when the rule later changed) as compared to normals.

Hughes, Russell, and Robbins (1994)

Autistic individuals require more moves to complete Tower of London task.

Not clear how general executive deficit would account for specific symptoms in autism.
Weak Central Coherence

Proposed by Frith (e.g., Frith, 1989)

Argues for a qualitatively different processing style

- process information in a local style
- being more focused on details
- make less allowance for the context in which the information is put in

Frith:

“The normal 'effort after meaning' which appears to be a manifestation of an autonomous characteristic of human information processing is abnormally weak in autism. This hypothesis relates the efficiency in processing unconnected stimuli to an unusual ease with which autistic individuals can resist the normal 'pull' of strongly coalescing, i.e. meaningful wholes.”
Due to this cognitive processing style, autistic individuals experience difficulties in reciprocal social communication, especially because these situations require the ability to account for the given context.

However, they do well in situations that require focus on details, and ignoring of larger context.

(cf. schizophrenia findings)

Empirical examples:

Hermelin and O'Connor (1971)

Relative superiority in autistic children's ability to learn and recall random strings of words compared to meaningful prose (the opposite of normal children's pattern of performance)
Shah and Frith (1983):

Three groups:

- Autistic children (mean age 13)
- mentally retarded (mean age 13)
- normal controls (mean age 9)

Matched for "mental age" (IQ).

Had all three groups perform Children's Embedded Figure test:

- Given cutout cardboard figure, and drawing of an object that contained figure embedded in it.
- Had to locate figure in the object.
Results:

Of the trials, autistic group got 82% correct, 55% for mentally retarded group, 63% for normal group.

Better performance than normal on task that demands processing of local features.

Shah and Frith (1993)

Tested autistic individuals, mildly retarded individuals, and normal children on Koh's Block Design Test:

Given four identical wooden blocks with different patterns on each face.

Given drawing of shape to construct with four blocks -- had to organize blocks and adjust block faces to create drawing.
Key manipulation: shown drawings either intact or segmented into separate blocks.

Results:
Autistic individuals perform faster on intact designs than did other groups, but not when designs were segmented.
Jolliffe and Baron-Cohen (1999)

Autistic individuals less likely to use context in verbal tasks:

- poorer at using context to disambiguate pronunciation of homographs
- less likely to select appropriate bridging inference that made a story beginning and ending cohere
- less likely to use context to interpret ambiguous sentences

However, other studies have not found support for local focus.

Ropar and Mitchell (2001)

Presented autistic and control groups with standard size illusions.

Had to adjust part of one figure to match the size of a part in the other figure:
If weak coherence is correct, might expect that autistic individuals less susceptible to the visual size illusions (since these illusions involve misperceiving size of element based on other elements).

Results:

Autistic individuals performed just as normals on illusions (just as inaccurate in size estimations).

Plaisted, Swettenham, and Rees (1999)

Gave autistic and normal participants Navon figures:

```
1

  XXXXXX
  XXXXXX
  XX XX
  XX XX

2

  XXXXXX
  XXXXXX
  XX XX
  XX XX

1

  XXXXXX
  XXXXXX
  XX XX
  XX XX

```

Large letter (global level) made up of smaller letters (local level). Component letters could be same or different from larger letter.
Two conditions:

- **Divided attention:** identify target letter if it appears regardless of level
- **Selective attention:** given a level at which to identify letter

Question: How does context (compatibility of local and global levels) affect reaction time?

Results:

**Divided attention:**

- Normal children made more errors at local level
- Autistic children made more errors at global level

**Selective attention:**

- Both groups responded faster to global target than local target

With appropriate instructions, autistic children seemed able to ignore local features and perform like normal children.
Some researchers (e.g., Happé & Booth, 2008) have recently suggested that it may be useful to look at weak coherence in terms of two possible dimensions:

- reduced tendency to integrate information
- increased tendency to featural processing

and that these two dimensions might have different qualities (e.g., susceptibility to instruction manipulation, developmental trajectory, etc.)

Social Cognition Theories

Theory of Mind deficit

*Theory of Mind* is the term used for the recognition that other people have mental states, the attribution of beliefs, attitudes, feelings to others.

In normal children, theory of mind has its major development around ages 3-4, when children begin to recognize that others do not necessarily have the same beliefs as they do.

Because autistic individual have such difficulty with social/communication aspects, perhaps this is due to faulty Theory of Mind.
Typical test for Theory of Mind is the *Sally-Anne Test*

Children see marble moved from location when the Sally doll is away.

Children are asked where Sally will look for the marble.

Does child recognize that Sally does not have the same state of knowledge that they do (i.e., that Sally doesn’t know the marble has been moved)?

Assesses child’s ability to attribute beliefs other than his/her own to others.
Baron-Cohen, Leslie, and Frith (1985)

Had autistic, Down’s syndrome, and normal children perform Sally-Anne Task.

Results:

- Both control groups performed task well
  - recognized that Sally would not know marble had moved
  - said she would look in original location
- Most autistic children failed task
  - said Sally would look in new location

These (and similar studies) suggest dysfunction of normal Theory of Mind development.

Baron-Cohen (2006) has extended the Theory of Mind approach to an account termed Hyper-systemizing:

There are two major ways to predict changing events:

- If the event is agentive (involves another person or organism), one can adopt the “intentional stance” (or ‘empathize’).
- If the event is non-agentive, one can ‘systemize’ (look for law-like regularities and structures in the events)

Baron-Cohen argues that the degree to which the systemizing strategy is used can vary among individuals, and that autistic individuals are “hyper-systemizers”:

- tend to search for regularities and patterns in events, even those caused by “agents”
- tend not to use cognitive mechanism specifically designed to make sense of social interactions (e.g., Theory of Mind)
Baron-Cohen (2006) argues that hyper-systemizing approach accounts for the same evidence as weak coherence:

- Better performance on sub-pattern matching tasks which are highly lawful.
- Poorer performance on contextual processing tasks, where it is harder to abstract predictable rules.

Also accounts for findings interpreted as executive dysfunction:

- Perseveration on Wisconsin Card Sort and more moves on Tower of London may be indicative of attempt to develop and confirm regularities and rules.