Autism

“He wandered about smiling, making stereotyped movements with his fingers, crossing them about in the air. He shook his head from side to side, whispering or humming the same three-note tune. He spun with great pleasure anything he could seize upon to spin... When taken into a room, he completely disregarded the people and instantly went for objects, preferably those that could be spun... He angrily shoved away the hand that was in his way or the foot that stepped on one of his blocks...”

- This description of Donald, aged 5, was given by Leo Kanner (1943) who also coined the term “autism”
- The disorder was independently noted by Hans Asperger (1944), whose name now denotes a variant of autism

Characteristics of Autism

- Defined as:
  - Markedly abnormal development/impairment in social interaction and communication
  - Markedly restricted repertoire of interests and activities
- Developmental condition noted before 3 years and persisting throughout life
- Severity and characteristics can change over time – now regarded as a spectrum

Characteristics of Autism (cont.)

- Asperger’s syndrome – formally defined as no initial delay in language acquisition or cognitive difficulties (although recent studies suggest early profile isn’t indicative of later functioning)
- Asperger’s also sometimes denotes "high functioning" autism (i.e. normal IQ)
- 40% of autistic people have IQs in the mental retardation range (<70)
- Only 10% have savant skills (e.g. drawing from memory, calculation)

Do Autistic Children Have a Theory of Mind?

Broadly two alternatives to "mindblindness" theory of autism

1. Failure on theory-of-mind tests reflects some other cognitive processes
   - E.g. executive function failure to inhibit reality response
2. Deficit in theory of mind is just one symptom of a wider change in processing style
   - Weak central coherence (i.e. global vs. local processing)
   - Systemizing versus empathizing (male brain hypothesis)

Antisocial Behavior

- Sociopathy
  - Irresponsible and unreliable behavior that is not personally advantageous
  - Inability to form lasting commitments or relationships
  - Egocentric thinking and a marked degree of impulsivity
  - 3–4% of “normal” male population (1% female)
  - Also acquired sociopathy following certain brain lesions
- Psychopathy
  - Aggression that is self-initiated and goal directed
Acquired Sociopathy: The Case of Phineas Gage

- Tamping iron through skull damaging medial and orbitofrontal cortex
- Good cognitive functioning but became reckless in behavior
- Impatient, devising wild plans for future that were never carried out, unable to maintain friendships or jobs

Explaining Acquired Sociopathy

1. Loss of schemas pertaining to social knowledge?
2. A general impairment of executive functions?
3. An impairment of theory of mind?
4. Impaired use of emotional information to control online behavior?

Explaining Developmental Psychopathy

- Inability to empathize with victims because of failure to register and/or act upon distress cues?
- Psychopaths show reduced SCR to distress in others, but show normal SCR in threatening situations (Blair et al.)
- Leads to a failure to learn the difference between social rules (e.g. "talking in class") versus moral rules concerning rights of others (e.g. "hitting someone")

The Stroop task

- No effect of ink color on word reading
- When the color name conflicts with the word, reaction times are the slowest
- Color naming is slower than word reading

Neural-network model of the Stroop task (Cohen et al., 1990)

- Units have low activity at rest
- When a task unit is active, it sends activity to the units it governs
- This extra activity allows units in the color-naming pathway to become active and generate the response

The Stroop task

- Empirical Data
- Simulation Data

- Color Naming
- Word Reading
Reduced context use in Schizophrenia
(Cohen & Servan-Schreiber, 1992)

- Impaired at using preceding context to disambiguate words
  - Context first:
    You can’t keep chickens without a PEN.
  - Context last:
    Without a PEN, you can’t keep chickens

Neural-network model of the Stroop task
(Cohen et al., 1990)

- Sensitivity of units to inputs influenced by “gain” parameter (related to particular modulatory neurotransmitters: dopamine and norepinephrine)
- Schizophrenics have abnormal levels (or sensitivity) to these neurotransmitters in prefrontal cortex

Hypothesis: Abnormal input “gain”
(Cohen & Servan-Schreiber, 1992)