PSY2014

Atypical Language Development

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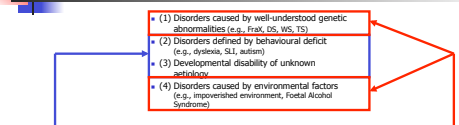
materials from this lecture kindly provided
by Dr D. Annaz (Institute of Education, London)

Types of developmental disorder

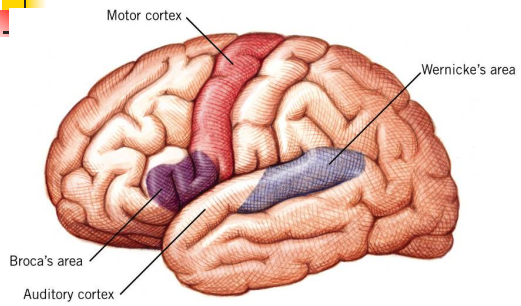
- (1) Disorders caused by well-understood genetic abnormalities
  - (e.g., Down syndrome, Williams syndrome, KE family)
- (2) Disorders defined by behavioural deficit
  - (e.g., dyslexia, SLI, autism)
- (3) Developmental disability of unknown aetiology (i.e. cause, origin)
- (4) Disorders caused by environmental factors
  - (e.g., impoverished environment, Foetal Alcohol syndrome)

Types of developmental disorder



- (1) and (4) distinguish locus of initial causality, nature/ nurture distinction
- (2) and (3) relate to level of current understanding
  - e.g. dyslexia and autism have genetic component (heritability) but genes not yet identified

Language and the Brain



Focal brain lesions: Aphasia

- Aphasia is an impairment of language. An acquired communication disorder that impairs a person's ability to process language, but does not affect intelligence.
- Impairs ability to speak and understand others and most people with aphasia experience difficulty reading and writing

Developmental disorders of language and the brain: same for children?

- Importance of plasticity illustrated by fact that children who experience same brain damage comparable to the kind associated with aphasia in adults end up with no symptoms of aphasia (Bates & Roe, 2001)
- Acquired (trauma) *vs* Developmental (congenital)
- Whatever is wrong in the developmentally disordered brain, plasticity cannot overcome it
- Doesn't imply plasticity isn't trying . . . plasticity itself may be atypical

Bates & Roe (2001) – brain focal lesions, no childhood aphasia

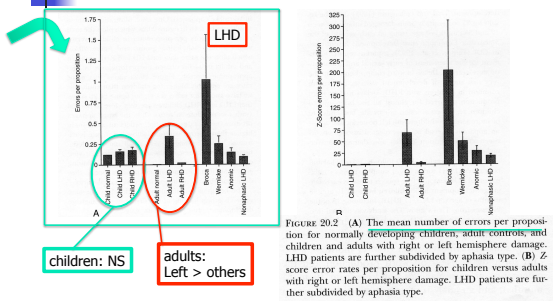


FIGURE 20.2 (A) The mean number of errors per proposition for normally developing children, adult controls, and children and adults with right or left hemisphere damage. LHD patients are further subdivided by aphasia type. (B) Z score error rates per proposition for children versus adults with right or left hemisphere damage. LHD patients are further subdivided by aphasia type.

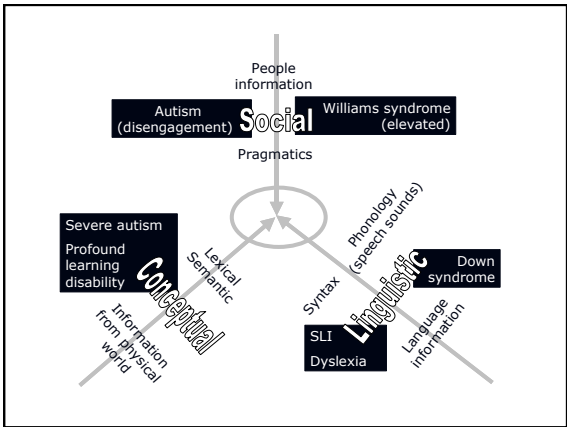
Disorders of language in children

- Landau-Kleffner syndrome
  - Acquired Epileptic Aphasia
- SLI [Specific Language Impairment]
  - Semantic disorders
  - Grammatical disorders
  - Pragmatic disorders
- Autism
- Williams syndrome
- Down's syndrome
- Developmental dyslexia (reading)

Developmental disorders of language: anomalous brain activity

Landau-Kleffner syndrome (**Acquired Epileptic Aphasia**)

- profound receptive language impairment (may extend to total disappearance of auditory verbal comprehension)
- Onset 18 months - 13 years (peak incidence 4 years)
- 80% cases also seizure disorder with bilateral EEG abnormality
- disruption of processing of auditory input to Wernicke's area?
- no evidence of deafness - failure of words to be associated with meanings
- knock-on effects in development of syntax
- **the later the onset, the better final language development (established knowledge)**



Developmental disorders of language

- **Developmental dyslexia** (reading/literacy)

5 to 15 % readers in alphabetic languages

- Core deficit: phonological - Problems in forming phonological representations exist prior to literacy (e.g., revealed by phoneme discrimination, onset-rhyme knowledge)
- This inhibits letter-sound awareness necessary to decode unfamiliar words
- Rapid naming deficit (auditory deficit aggravating the above)
- Influence of orthography (transparent vs opaque): Italian 'dyslexics' have less difficulties with reading…
- Deficiency, not delay
- Gene-environment correlation (poor readers read less)

Developmental disorders of spoken language: bahavioural deficits

- Semantic disorders
  - children with word finding difficulties
  - semantic but not phonological errors in naming
  - slow naming times
  - impoverished word definitions

SLI but not only

- Grammatical disorders
  - SLI - esp. errors of morphology (differ across languages)
  - grammatical SLI - restricted to difficulties with representational dependencies within syntactic constructions
  - KE family (motor deficits too - FOXP2 gene)

behavioural ctnd.

- Pragmatic disorders
  - language difficulties overlap with wider social communicative difficulties (autistic spectrum)
- Autism - varying levels of language development, particular pragmatic impairment

Autism

- Prevalence 1/200 to 1/500 (numbers vary!)
- 4x more common in males! (female lower IQ)
- 15:1 in Asperger's syndrome
- No racial or socioeconomic differences
- Usually identified between 18-36 months

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Spectrum Disorder

- Children may posses any level of intellectual ability (savants, Asperger)
- Children vary in the severity of their **language** problems
- Behaviour changes with age

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Qualitative Impairment in Communication

- Expressive/receptive language deficits (intonation, inflection)
- Non-verbal communication deficits (e.g. JA, gestures, facial expression, eye contact)
- Conversational language deficits (interest, staying on topic, asking Qs, initiating)
- Repetitive language (echolalia, video scripting)

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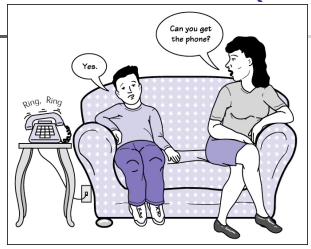
Language in Autism

- Echolalia and repetitions
- Large differences: mute to fluent
- Phonological difficulties: monotonous, no pattern
- Semantic difficulties: even at simple level: "touch your nose"
- Grammar and pragmatic abnormalities

Other Characteristics (cont.)



Children with autism have difficulty with the pragmatic use of language. Based on Autism: Explaining the Enigma, by U. Frith, 1989, p. 121. Basil Blackwell, Ltd.

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ASD profile (strengths & weaknesses) ....

- Recent research showed strengths in music perception and auditory processing
  - **Järvinen-Pasley et al. (2007)***tested "processing biases in children with autism and matched controls. Whereas children with autism exhibited superior perceptual processing of speech relative to controls, and showed no evidence of either a perceptual or semantic processing bias, controls showed a tendency to process speech semantically"*
  - **Heaton et al. (2008)** Superior discrimination of speech pitch

Pam Heaton at Goldsmith's: http://www.gold.ac.uk/psychology/staff/heaton/

Specific Language Impairment

- *"when a child fails to make normal progress in language learning for no obvious reason"*
  Bishop (2004, p.309)
- Between 3 and 7% of population (MacArthur & Bishop, 2004)
- Normal IQ
- No hearing loss
- No learning difficulties
- Twice as many boys
- SLI Consortium: explore genetics
- see RALLI campaign on YouTube

Language sample SLI

RALLI CLIP

What kind of errors can you hear in the children's language?

Video clip

© D. Annaz (approx. 9 min)

SLI is complex

- deficits can occur at every level of language:
  - phonology, morphology, syntax, lexis, pragmatics
- many different profiles of delay and disorder
  - Different sub-groups e.g. Van der Lely's G-SLI group (grammar only)

SLI is complex (Cont.)

- Start to speak late (see 'late talkers')
- Problems with phonology
- Problems with acquisition of rules but not all rules
  - 3rd person "s" versus possessive "s"

(Webster & Shevell, 2004)

- Language levels plateau earlier

Different types of theoretical explanations

- Domain specific account:

Language is a specific module unrelated to general cognition: Deficits to rule-based language-specific structures (e.g., van der Lely 2005, or Rice, 2000)

- Domain general account:

Higher level deficits are the developmental outcome of other lower-level developmental processes (e.g., Rapid Aud. Processing deficit (Benasich & Tallal, 2002 - infancy)

- Mixed accounts:

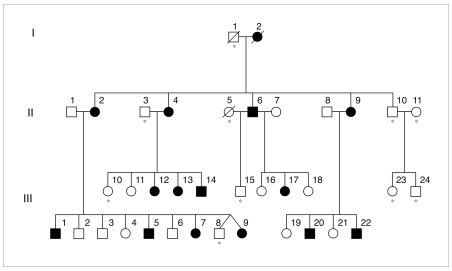
e.g., implicit learning of sequential information (Ullman & Pierpont 2005)

Genes and SLI?

- KE family
- half have a speech and language disorder

(Vargha-Khadem et al. 1995)

Circles are females; squares are males. A shaded box represents an individual with language problems



KE family: results

- Affected and non-affected members and IQ scores: not just low IQ
- Articulation problems but no motor control problems
- Impaired understanding
- Abnormal brain structures

- Skeptics suggested that the gene merely lowers intelligence or makes speech unintelligible, or that the disorder is nothing more than an artifact of a working-class dialect

CS

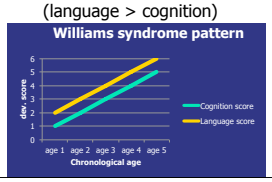
- Unrelated individual
- Similar speech disorder to KE Family
- Translocation on Chromosome 7 region 7q31! → Gene FOXP2 (Lai et al., 2001)
- Changes in FOXP2: changes in brain
  - FOXP2 is expressed in motor-related circuits during brain development.
- 200,000 years ago in Homo Sapiens

FOXP2 and KE family

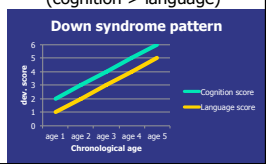
- It is possible that the accompanying linguistic and grammatical impairments in the KE family are secondary consequences of ***basic deficits in motor planning and sequencing***.
- However, it is equally plausible that the ***motor and cognitive*** problems arise ***simultaneously***.
- There is growing appreciation that areas traditionally considered to be purely motor also contribute to cognitive and complex behavior
- For a discussion of FoxP2 and language see Marcus and Fisher (2003), Marcus & Rabagliati (2006)

Developmental disorders of language: genetic

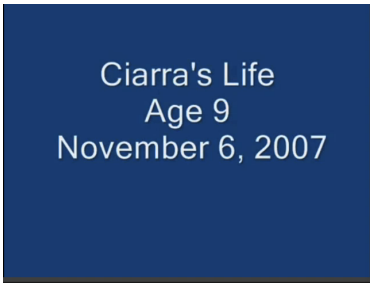
- **Williams syndrome** – prevalence: 1 in 20,000
  language relative strength compared to visuospatial skills
  (language > cognition)



- **Downs syndrome** – prevalence: 1 in 1,000
  language development much delayed (esp. syntax), poor phonological working memory
  (cognition > language)



Example 1: Down's syndrome



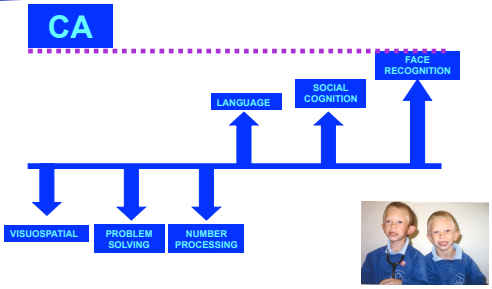
Example 2: Williams syndrome

- Rare genetic disorder (1 in 20,000 live births) caused by a deletion of ~28 genes on the long arm of chromosome 7 at q.11,23
- Clinical features:
  - Heart abnormalities - typically SVAS
  - Facial dysmorphology
  - Small stature
  - Hernias
  - Hoarse voice
  - Premature ageing of skin
  - Constipation
  - Hyperacusis
  - Abnormal gait



- Cognitive features:
  - low IQ (60-80)
  - a specific personality profile ('hypersociability', empathy, anxiety)
  - poor visuospatial constructive skills
  - particular difficulty with number processing
  - relatively good face processing abilities
  - relatively good language abilities

Williams syndrome



Language in WS: early studies

- Pinker (1994): "…. WS are described as **hyperlinguistic** with **selective sparing of syntax**, and grammatical abilities are close to normal in controlled testing. This is one of several kinds of **dissociation** in which language is preserved despite severe cognitive impairments**, suggesting that the language system is autonomous of many other kinds of cognitive processing**."

New views / evidence?

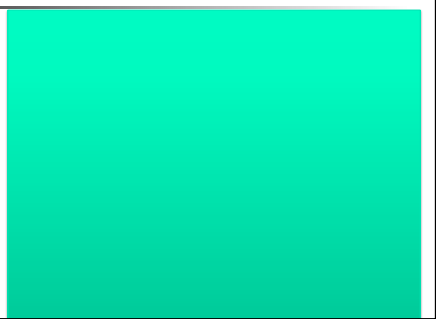
Language in WS: new studies

- Language development is delayed:
  - About 2 years (Mervis et al., 2003, Paterson et al., 2001)
- Language develops atypically:
  - Pointing follows vocabulary acquisition (Laing et al., 2002)
  - Categorization: Visual clues over verbal (Nazzi & Karmiloff-Smith, 2002)
  - Atypical balance of semantics/phonology

Overall picture of language in WS

- Different lexical constraints
- Subtle grammatical impairments
- Language is relatively good but develops atypically
  - Notably good compared to individuals with Down syndrome matched for IQ – but maybe that tells us more about DS?

WS language clip



© D. Annaz 12 min

WS+ and SLI- Evidence for modularity?

- "Brain volume, brain anatomy, brain chemistry, hemispheric asymmetry, and the temporal patterns of brain activity **are all atypical** in people with WS. How could the resulting cognitive system be described in terms of a normal brain with parts intact and parts impaired, as the popular view holds? Rather, the brains of infants with WS develop differently from the outset, which has subtle, widespread repercussions at the cognitive level"

(Karmiloff-Smith, 1998)

Conclusions

- Developmental deficits in language not due to brain damage analogous to adult case (acquired)
- Genetic developmental disorders can show auditory, semantic (meaning/words), grammatical, and pragmatic (use) deficits
- Competing explanations in terms of
  - (1) selective modular damage
  - (2) atypical neurocomputational constraints on developmental processes

Alternative to innate theories?

"A developmental perspective is essential to the analysis of human cognition because understanding the built-in architecture of the human mind, constraints of learning and how knowledge changes progressively over time can provide subtle clues to its final representation format in the adult mind." (Karmiloff-Smith, 1998, 26)

Useful: Comparison of disorders

- Comparison of developmental disorders may be informative about constraints acting on normal language development
  - e.g., importance of various information sources
- Strengths & weaknesses profiles
- Developmental trajectories approach
  - not only nonverbal mental age
  - also chronological age (experience)

What does this tell us about typical development?

- Developmental disorders can show us how complex and dynamic the process of development is (as well as timing issues)
- they cannot be used as evidence for a modular-specific account nor provide evidence for innate claims

Interested in language?

- 3rd year optional module:
- "Psychology of language, communication and literacy"

Reading

Marcus and Rabagliati (2006). What developmental disorders can tell us about the nature and origins of language. *Nature Neuroscience* 9 /10.

Rice, Warren and Betz (2005). Language symptoms of developmental language disorders: An overview of autism, Down syndrome, fragile X, specific language impairment, and Williams syndrome. *Applied Psycholinguistics,* 26/1, 7-27.

Geurts, H. M., & Embrechts, M. (2008). Language profiles in ASD, SLI, and ADHD. *Journal of autism and developmental disorders*, *38*(10), 1931-1943.

Further readings (not all available in the library):

Brock (2007). Language abilities in **Williams syndrome**: A critical review. *Development and Psychopathology*, 19, 97-127.

Kjelgaard and Tager-Flusberg (2001). An investigation of language impairment in **autism**: Implications for genetic subgroups. *Language and Cognitive Processes*, *16*, 2-3.

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Laws and Bishop (2004). Verbal deficits in **Down's** syndrome and **specific language impairment**: a comparison. *International Journal of Language & Communication Disorders*, 39/4, 423-451.

Marcus and Fisher (2003). **FOXP2** in focus: what can genes tell us about speech and language? *Trends in Cognitive Neuroscience*, 7/6, 257-262.

Nicholson, R. (1999). Reading skills and **dyslexia**. In D. Messer & S. Millar (Eds), Exploring developmental psychology (pp 171-194). London: Arnold.

Roberts, Price, Malkin (2007). Language and communication development in **Down** syndrome. *Mental Retardation and Developmental Disabilities Research Reviews*, 13/1, 26–35.

Tager-Flusberg (1999). A psychological approach to understanding the social and language impairments in **autism**. *International Review of Psychiatry*, 11/4, 325-334.