Language Development
PSYCH 320

Lecture 18
11/20/18

Announcements

- Assignment 2 due today!

More biology and language

- How is language development affected by different genetic/ biological profiles?
- And what can this tell us about how language development is related to other aspects of cognitive development?

Behavior genetic approach

- Look at variation in rate of language development
- How much is due to environment vs. genetics?
- Twin studies

Twin studies

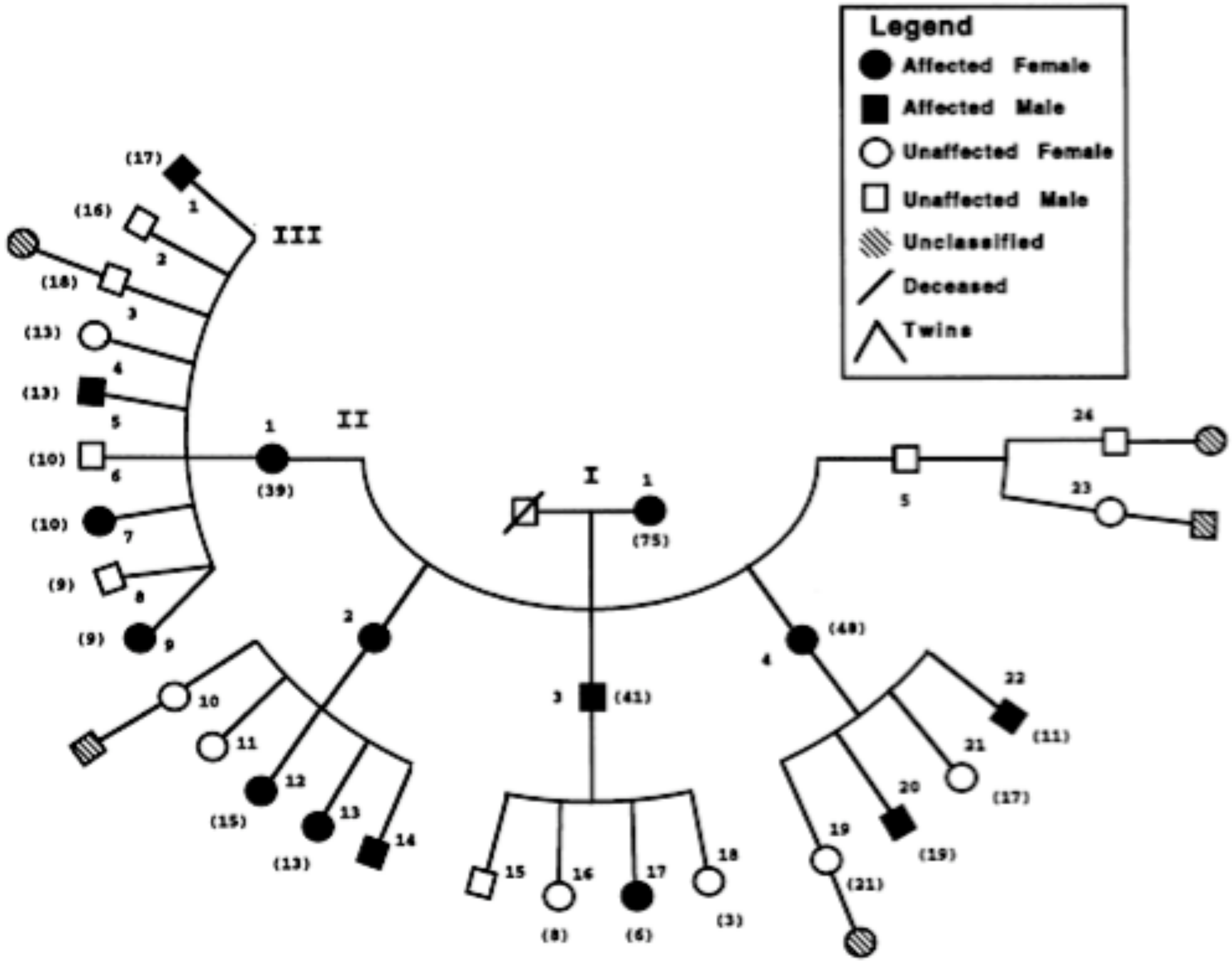
- 25-60% of variance attributable to genetics

- Variation in grammatical abilities more related to genetics than vocabulary

- Environmental studies show more influence of environment on vocabulary than grammar

Language impairment

- KE family
- Claim: Members have abstract grammatical deficit specifically affecting ability to construct syntactic rules for tense, number, gender


Legend
Affected Female
Affected Male
Unaffected Female
Unaffected Male
Unclassified
Deceased
Twins
I
II
III

Genetic basis

- FOXP2 gene identified as being involved
- But what is FOXP2? Codes for proteins
  - Has the potential to affect the expression of an unknown number of other genes
  - Involved in the development of brain and lungs (in many species)
  - Affects song learning in songbirds
- Not a “speech gene”
- Involvement of multiple genes in language impairment

Trying to isolate language difficulties

- Developmental Language Disorder (DLD): language impairment in absence of other impairments
  - intelligence not below normal (IQ cutoff around 80, some with high IQ)
  - absence of obvious neurological, non-verbal cognitive, or social-emotional deficits
- behind peers in both production and comprehension
- 1-5% of population

DLD

- Late onset of talking
- Delay, deficit in use of grammatical morphology
- Asynchronies not seen in normal development between components of language
  - delay of grammatical morphology with respect to syntax
  - "Then he went home and tell mother—his mother—tell what he doing that day."
  - "Then about noontime those guy went in and eat and warm up"

Causes?

- Difficulty or delay in underlying grammar (e.g., Rice & Wexler; Gopnik)
  - Learning rules for marking tense and plural
- Deficit in processing brief or rapidly changing auditory stimuli (e.g., Tallal)
  - difficult to report order of two rapid sounds
  - function words are brief and deemphasized, and speech involves rapidly changing signals
- Poor phonological memory (e.g., Gathercole)
  - nonsense word repetition

Genetic?

- Unknown cause
- DLD runs in families, higher incidence among identical twins
  - Especially grammatical subtype
  - But some people with DLD do not have family incidence

What about the reverse?

- Cases of cognitive impairment, but not language difficulties
  - double dissociation

- Williams Syndrome

Williams Syndrome

Williams Syndrome

- missing genetic material on chromosome 7
- IQ: 40 to 70
- outgoing and talkative
- cannot solve standard cognitive problems (e.g., conservation)
- particular problem with visuospatial abilities (e.g., easily disoriented, cannot copy pictures, cannot draw pictures well …)

picture copying

Williams syndrome

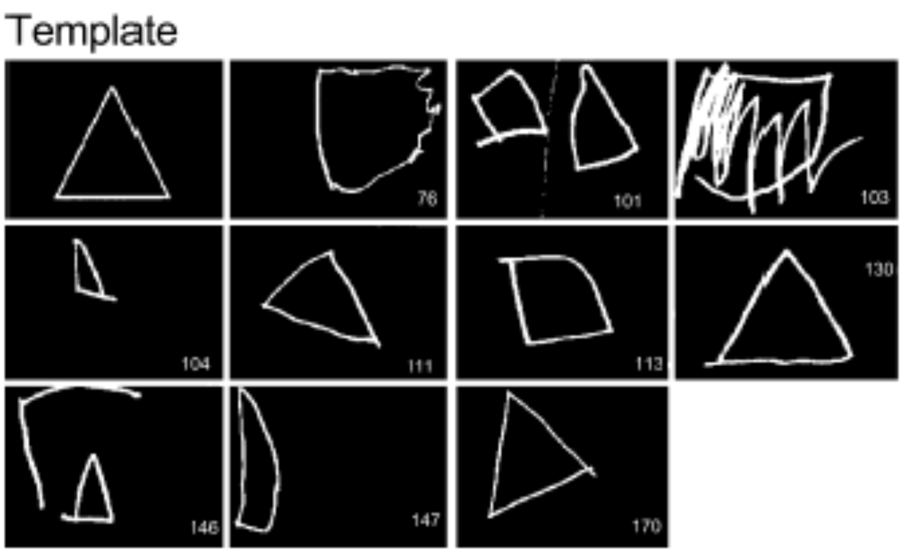


Fig. 6 Copies of the triangle by ten WS subjects. *Numbers* are biological age in months

≈10 years old

controls

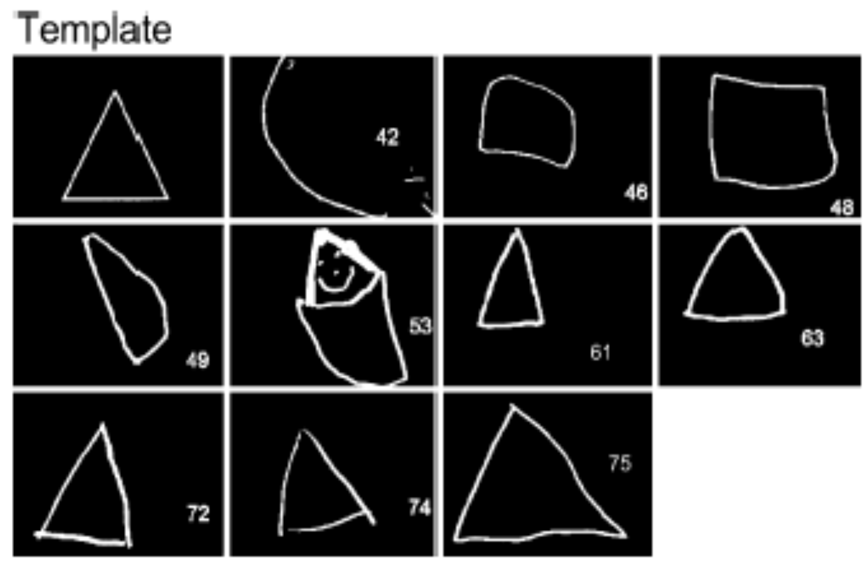


Fig. 3 Copies of the triangle by ten control subjects. *Numbers* are biological age in months

≈5 years old

picture copying

Williams syndrome

Template

Fig. 7 Copies of another figure which is composed of two elementary shapes. Copies are arranged in the same sequence, with respect to subjects, as in Fig. 6

≈10 years old

controls

Template

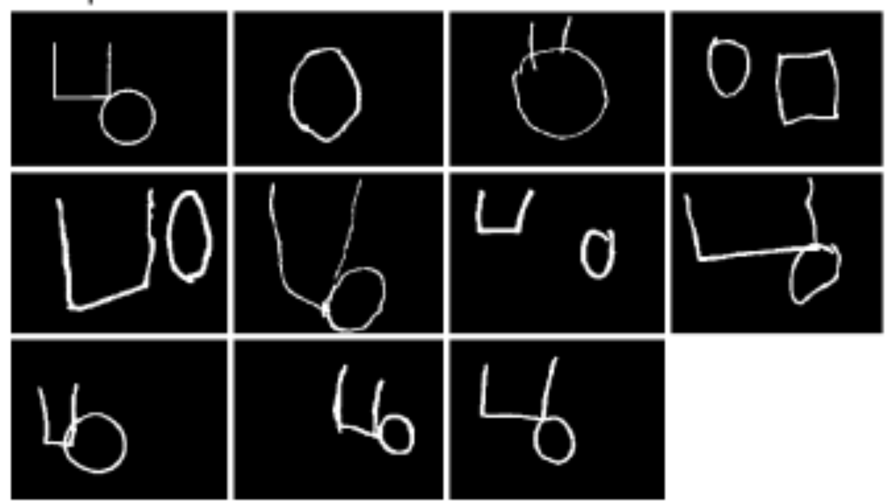


Fig. 4 Copies of another figure which is composed of two elementary shapes. Copies are arranged in the same sequence, with respect to subjects, as in Fig. 3

≈5 years old

picture copying

Williams syndrome

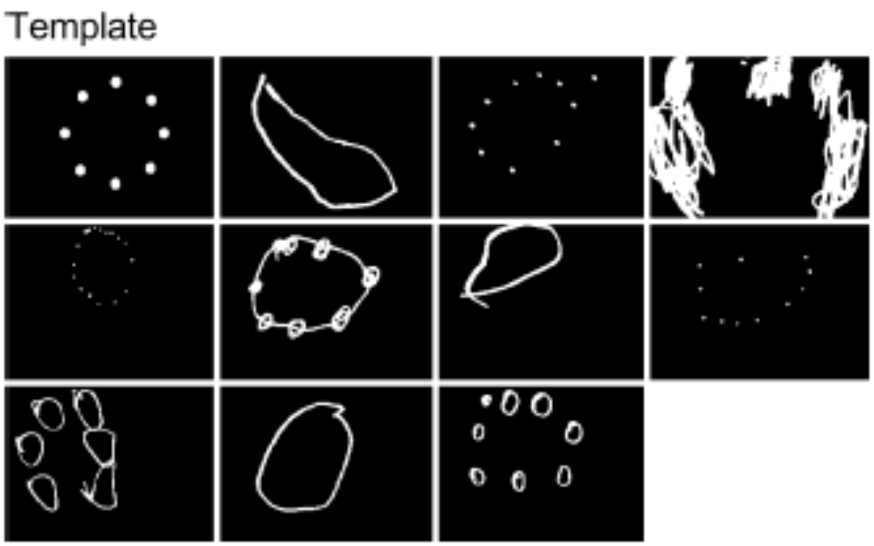


Fig. 8 Copies of the circle composed of *small, filled circles*. Arrangement is the same as in Fig. 6

≈10 years old

controls

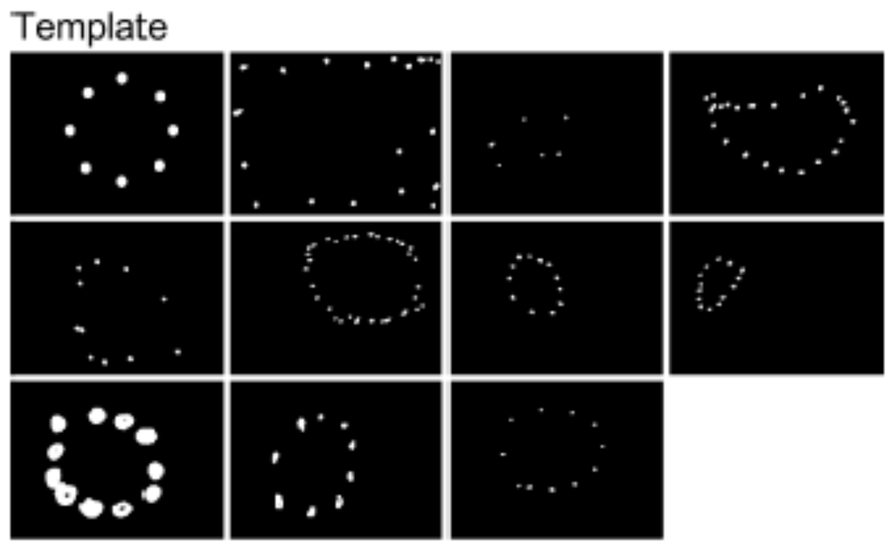
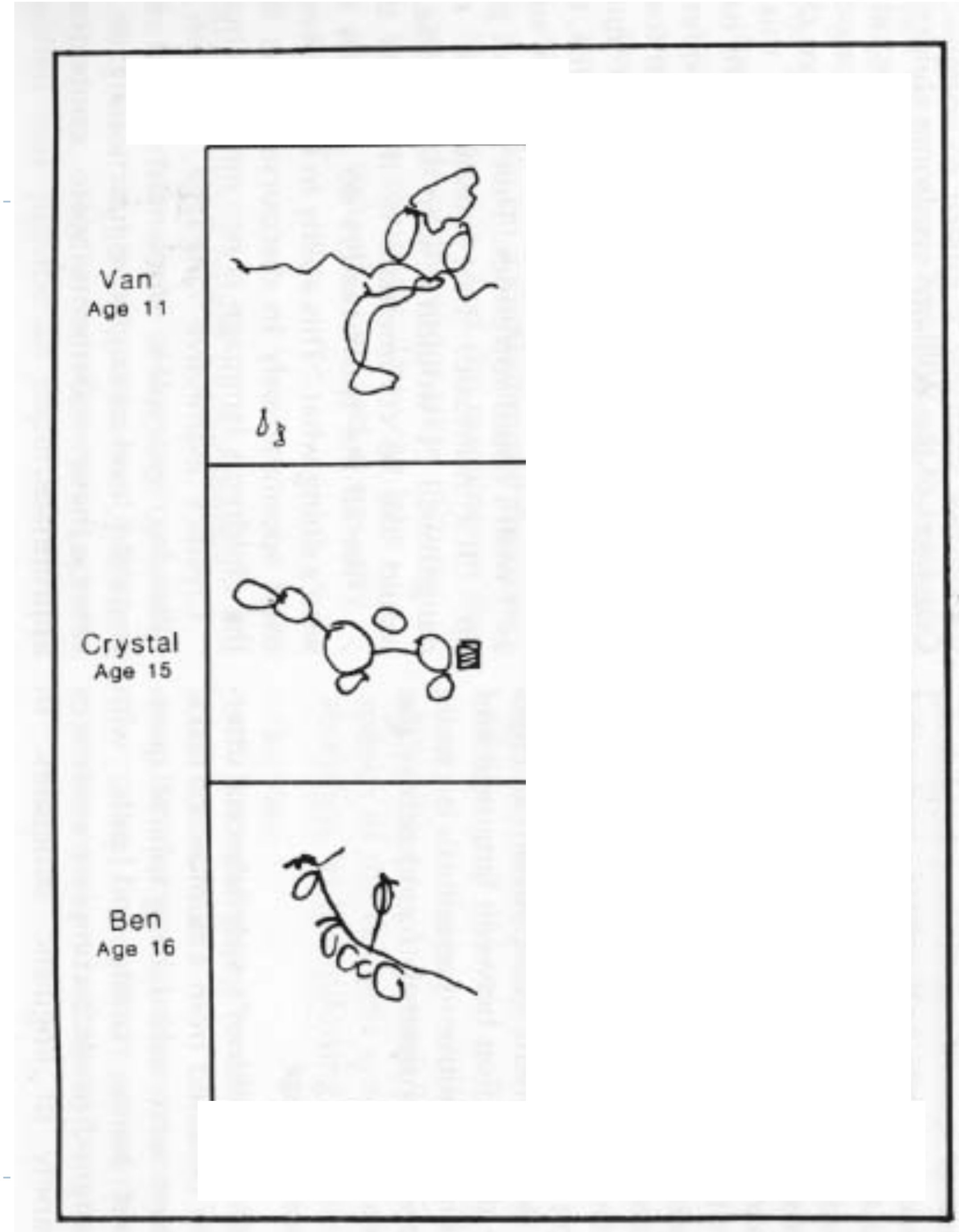
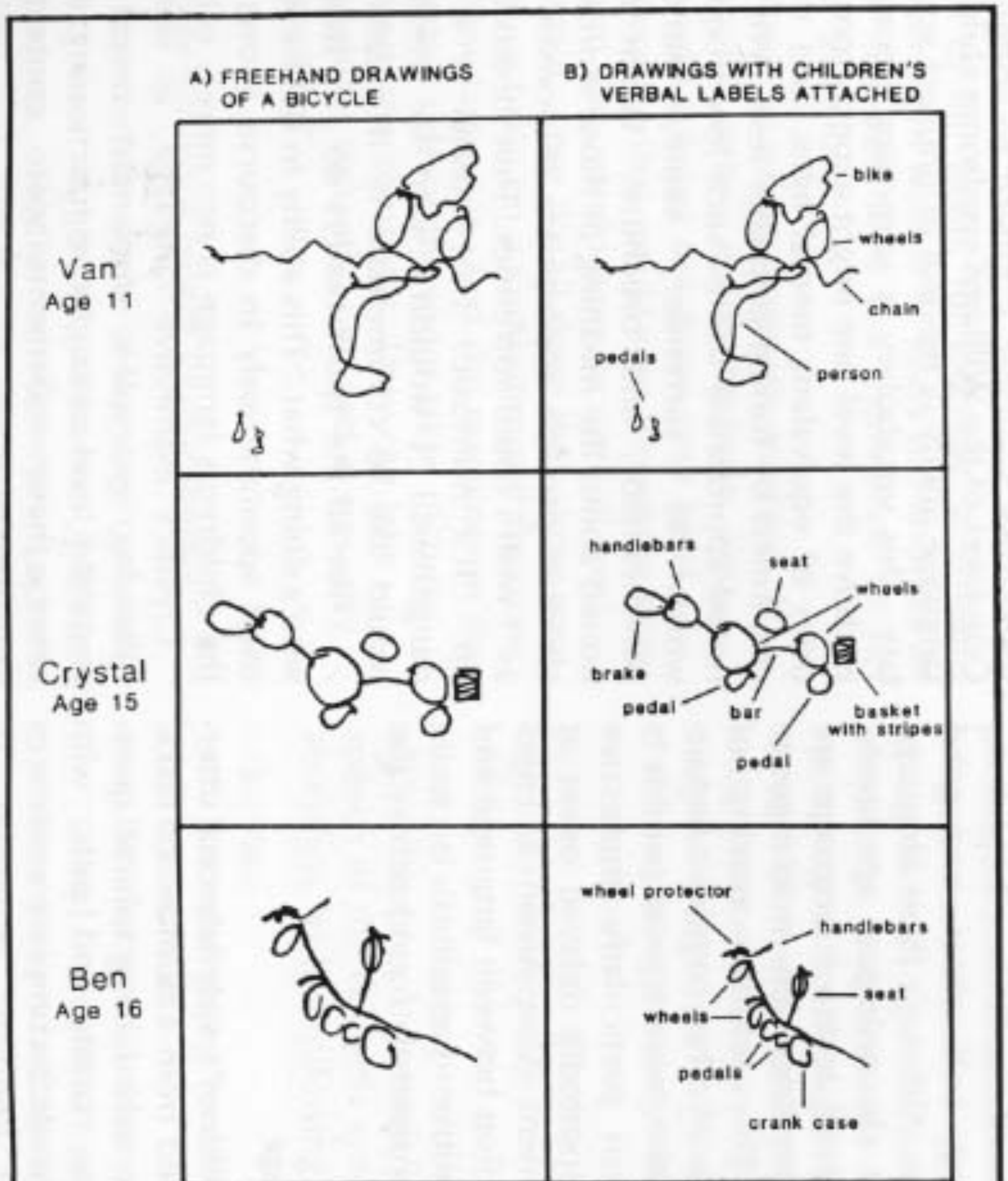


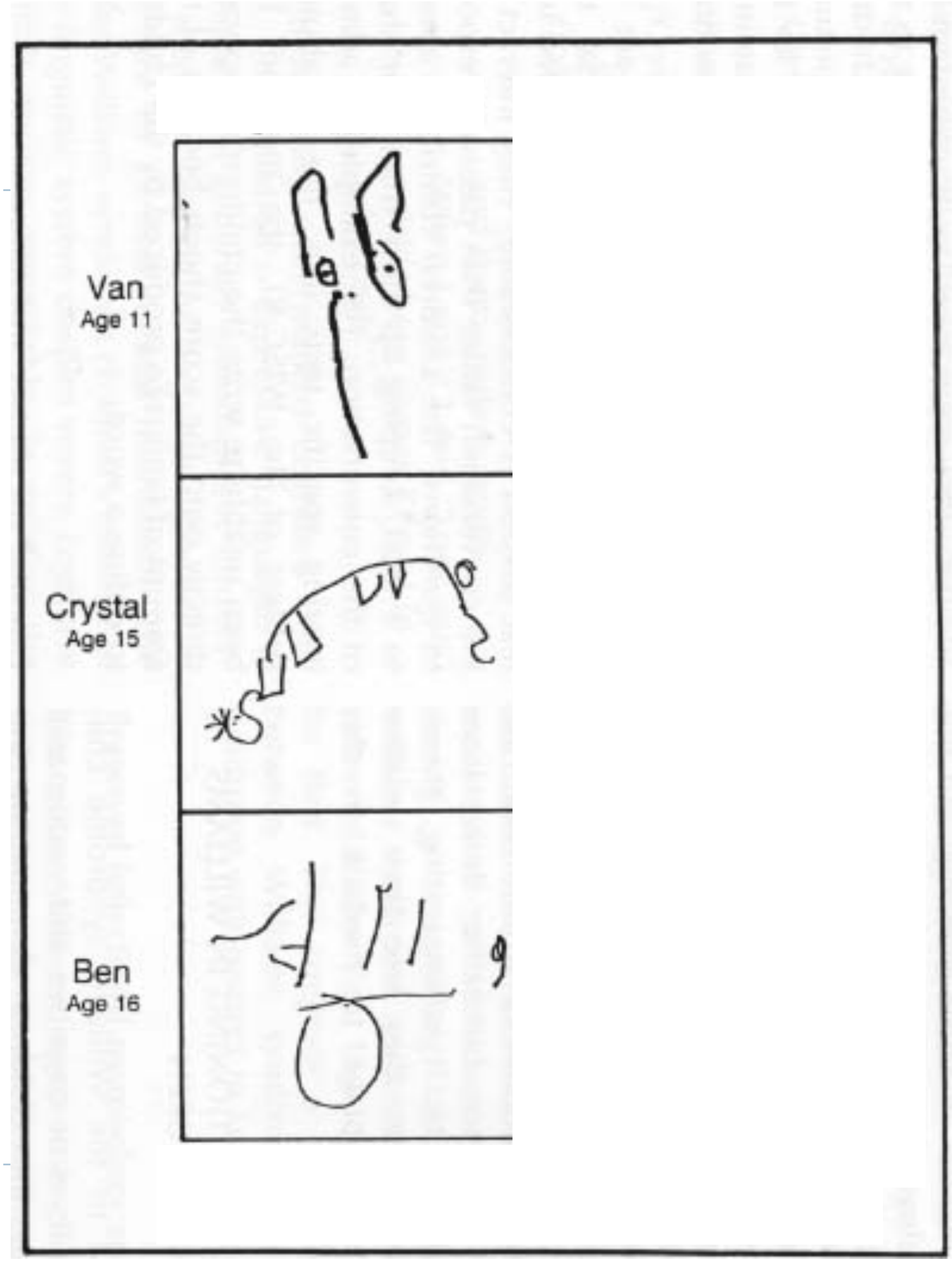
Fig. 5 Copies of a circle composed of *small, filled circles*. Arrangement is the same as in Fig. 3

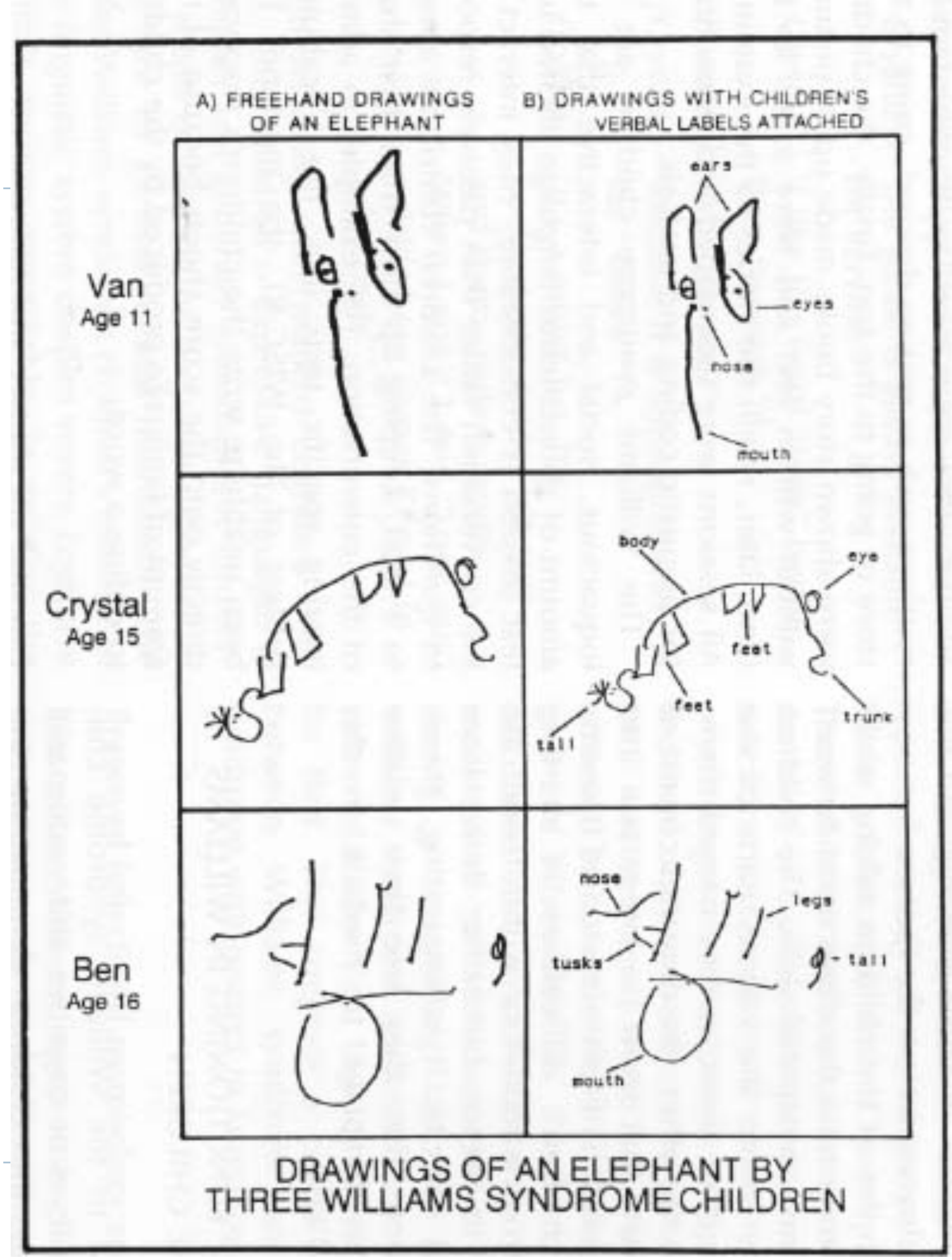
≈5 years old


Van
Age 11
Crystal
Age 15
Ben
Age 16



DRAWINGS OF A BICYCLE
BY THREE WILLIAMS SYNDROME CHILDREN


Van
Age 11
Crystal
Age 15
Ben
Age 16



A) FREEHAND DRAWINGS OF AN ELEPHANT
B) DRAWINGS WITH CHILDREN'S VERBAL LABELS ATTACHED
Van
Age 11
ears
eyes
nose
mouth
Crystal
Age 15
body
eye
feet
feet
trunk
tail
Ben
Age 16
nose
legs
tusks
tail
mouth
DRAWINGS OF AN ELEPHANT BY THREE WILLIAMS SYNDROME CHILDREN

language development in WS

- Somewhat below chronological age, but all language skills are far above *mental* age
- Lexical development
  - often know words that are very advanced for their age (e.g., 11-yr-old (MA: 4) knows "peninsula", "solemn")
  - able to provide good word definitions
  - able to quickly generate words in a given category (e.g., plants, animals)

Examples:

"I wish I could surrender. That means I give up."
"It's nontoxic. That means it is not dangerous."
"I wouldn't want to wrestle. I would like to commentate it. It means that… like all the sportscasters do... they tell who's doing what."

Examiner:	*May I borrow your watch?*
Crystal:	*My watch is always available for your service.*

Naming Task:

Van: sea lion, zebra, hippopotamus, lizard, beaver, kangaroo, chihuahua, crocodile, tiger, owl, turtle, reptile, frog, giraffe

Crystal: koala bear, antelope, moose, anteater, lion, tiger, rat, bear, giraffe, elephant

Ben: buffalo, leopard, sabretooth tiger, condor, vulture, turtle, bear, snake, giraffe, lion, bull, dog, cat, tiger

WS and DLD

- Dissociation of nonverbal cognition and language

- "Overall, the genetic double dissociation is striking…. The genes of one group of children [DLD] impair their grammar while sparing their intelligence; the genes of another group of children [WS] impair their intelligence while sparing their grammar (Pinker, 1999, p. 262)."

DLD vs. Williams

- DLD: language impairment in the absence of obvious cognitive deficits
- Williams: good language skills in the presence of severe cognitive impairments

- Evidence for *some* degree of dissociation between general cognition and language

Autism

- Cause not well understood
- 4 times more likely in males
- delay in cognitive and language skills
- spectrum disorder

Language in Autism

- 50% never develop expressive language
- early mutism and non-recognition of speech
- little interest in communication (evident in infancy)
  - Early lack of preference for IDS
  - Early failure to respond to own name
- echolalia (may signal lack of comprehension)

High Functioning Autism

- Normal to high IQ
  - impaired social awareness, theory of mind
  - excellent memory
  - impaired comprehension (‘common sense’)
  - often exhibit savant abilities

Language in HF Autism

- Language development delayed, but generally normal
  - Except for communicative aspects (e.g., joint attention)

- Problems in perception and production of prosody, pragmatics
  - Difficulties with non-literal language
- Vocabulary missing mental state words (*think*, *believe*)
- Few questions produced

Eye gaze and word learning

- By 18 mos, toddlers use eye gaze to determine intended referent (Baldwin)
- Eye gaze monitoring part of joint attention

- Absence of joint attention at 18 mos predictive of autism

- Autistic children less likely to use eye gaze to determine referent than IQ matched controls (Baron-Cohen, 1997)

Theory of Mind

- Autistic vs. typical and DS children: False belief
  - Sally put a marble in her basket and left.
  - Anne moved the marble to a box.
  - Sally returns.
  - Children asked, "Where will Sally look for her marble?"
- ND and DS: *the basket*
- Autistic group: *the box* (even though IQs higher than the DS group)

Summary

- Cognition vs. language:
  - WS: impaired cognitive abilities; spared language
  - DLD: spared cognitive abilities; impaired language
- Impairments in language use:
  - Autism (high functioning): impaired pragmatics and communicative language, spared grammar

Exploring the role of input

- What about cases of normal cognition, modified input?
- How well does the brain handle different kinds of input?
- Language acquisition in deaf children
- Language acquisition in bilingualism

Deafness

- Prelingual deafness: loss of hearing prior to language acquisition
- Sign language
  - about 10% of deaf children
- Oralist
  - 90% of deaf children
- Total communication
- Primary determinant of language outcome: language environment

Acquisition of sign language

- Sign languages are real languages
  - with phonology, morphology, syntax

- For children exposed to sign from birth:
  - pass through same stages
  - in same order
  - same types of processes

Language Development – Sign Language

Categorical Perception

Acquisition of sign languages

- Stages:
  - manual babbling
  - single-sign productions
  - multisign combinations
  - addition of morphology
  - more complex syntax
- Processes:
  - overregularization errors
  - pronoun reversal errors

  - Video

Language Development- Sign Language

But:

Most infants with hearing loss are born to hearing parents

- Parents aren’t fluent signers
- Parents must make difficult choices about treatment and communication options

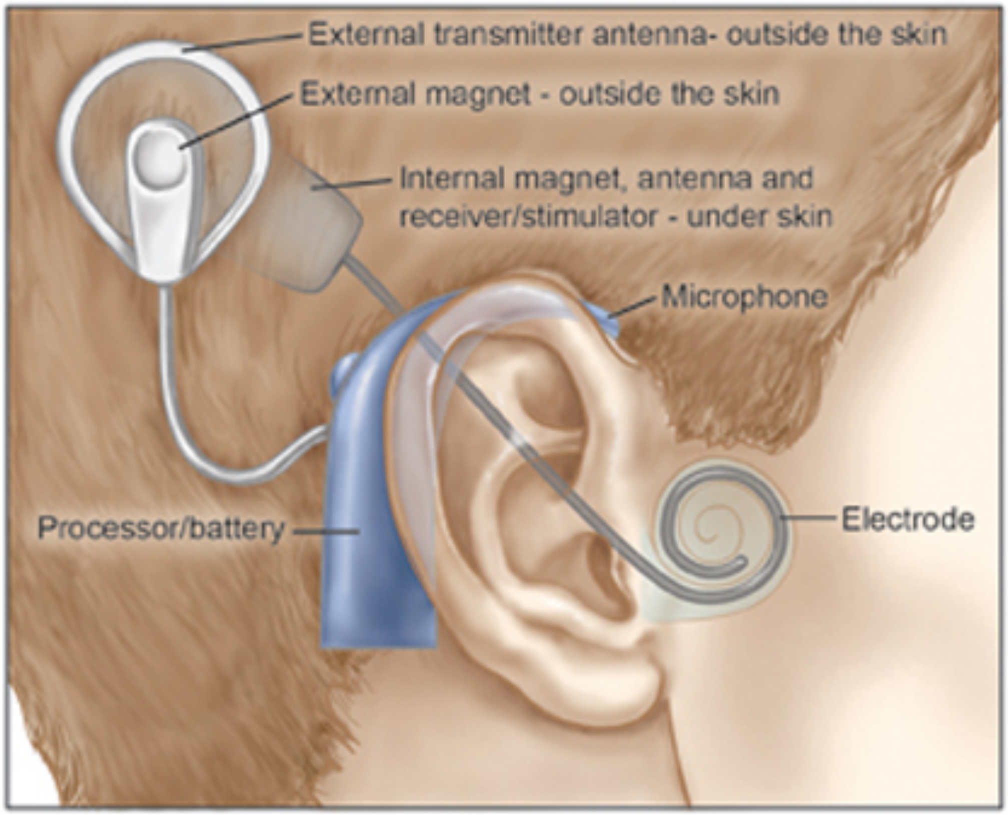
Oral language in deaf

- Lip reading
  - But lip shape is only a partial cue to speech sounds
- Limited success:
  - Phonological development: not normal
  - Lexical development: delayed, slower, more variable outcomes
  - Syntactic development: delayed, plateaus
  - Only 15-50% produce intelligible speech
- Better outcomes if combined with sign language

Cochlear Implants

- Normal hearing:
  - "hair cells" inside the cochlea vibrate in response to in-coming sound waves, activating auditory nerve
- What is a cochlear implant?
  - an electronic device that provides electrical stimulation directly to the auditory nerve

How does a cochlear implant work?



Amplification Techniques – Cochlear implant

Limits of Cochlear Implants

- Ideal goal of cochlear implants: normal hearing
- But important limitations:
  - acoustic input is degraded
  - early auditory deprivation

1

2

3

4

6

8

Age of implantation matters

- Houston et al. (2012):
  - Taught toddlers two new word-object pairings
  - Toddlers tested at least 12 months after implantation
  - Toddlers whose implants on by 14 months learned; those with later implantation did not
  - Correlation with later vocabulary size

- Guimaraes et al (2017):
  - children with implantation before age 3 years vs. age 3-6
  - All with ~66 months use of implant
  - Significantly greater production vocab in early group

Language development in the deaf

Mode of communication matters:

- Early sign exposure leads to normal language development
- Relying on spoken language alone without implant leads to highly variable outcomes
  - Better outcomes if combined with sign language
- Cochlear implants
  - Again, variable outcomes
  - Age of implantation matters
  - May be better outcomes if combined with sign language

Exploring the role of input

- How well does the brain handle different kinds of input?
  - Language acquisition in deaf children
  - **Language acquisition in bilingualism**