Stability and change in developmental language disorder

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Stockholm, August 2018

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2018-2019
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Surrey County Council

Virginia & Jennifer!
Cheryl, Katherine & Barbara

Teachers, SENCOs and all school staff for their enthusiastic support (and cups of tea)

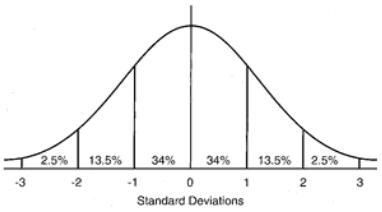
The many, many children and their families, who have taken part and taught me so much

wellcome

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

BRITISH ACADEMY for the humanities and social sciences

Speech and language therapy



- specialist clinical input
- goal of many services is to move children into the 'normal range'
- requires 'greater than expected progress'
- feasible? (if so, how so?)
- contingent on other developmental factors?
- best metric of success?

Plan of talk

- Update on Developmental Language Disorder
- SCALES
  - Prevalence and profile
  - Stability and change
- Is ***rate*** of language change malleable?
  - Implications for treatment

Developmental Language Disorder – DSM5 (APA 2013)

- child's language abilities are below chronological age expectations
- language deficits are not explained by other developmental concerns such as sensory impairment, autism, extreme deprivation, head injury, global developmental delay
  - although language disorder is frequently associated with other developmental concerns
- language deficits interfere with everyday life at home or at school

CATALISE: A Multinational and Multidisciplinary Delphi Consensus Study. Identifying Language Impairments in Children

D. V. M. Bishop[1]*, Margaret J. Snowling[1], Paul A. Thompson[1], Trisha Greenhalgh[2], CATALISE consortium[¶]

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Original Article

Phase 2 of CATALISE: a multinational and multidisciplinary Delphi consensus study of problems with language development: Terminology

Dorothy V.M. Bishop, Margaret J. Snowling, Paul A. Thompson, Trisha Greenhalgh, and the CATALISE-2 consortium

First published: 30 March 2017 Full publication history

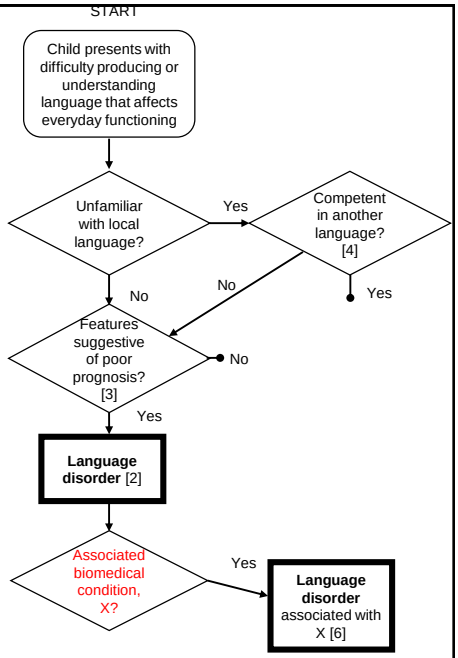
DOI: 10.1111/jcpp.12721 View/save citation

- Included international, multidisciplinary input from English speaking countries
  - SLTs, psychologists, charities, parents, teachers, etc
- Agreed core diagnostic criteria and consistent terminology
- Replace 'specific language impairment' with 'Developmental Language Disorder'
- Non-verbal cognitive ability should not be used:
  - as part of diagnostic criteria
  - to limit access to clinical / educational service

Dorothy Bishop

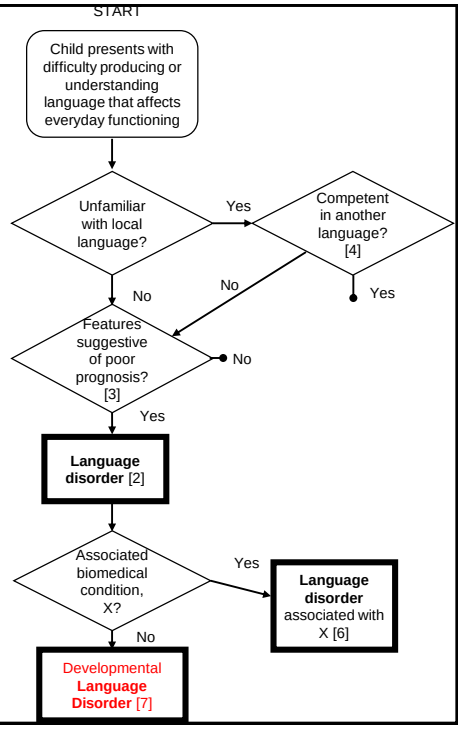
Associated biomedical conditions (examples)

- brain injury,
- acquired epileptic aphasia in childhood,
- certain neurodegenerative conditions,
- genetic conditions such as Down syndrome,
- cerebral palsy
- sensori-neural hearing loss.
- autism spectrum disorder (ASD)
- intellectual disability



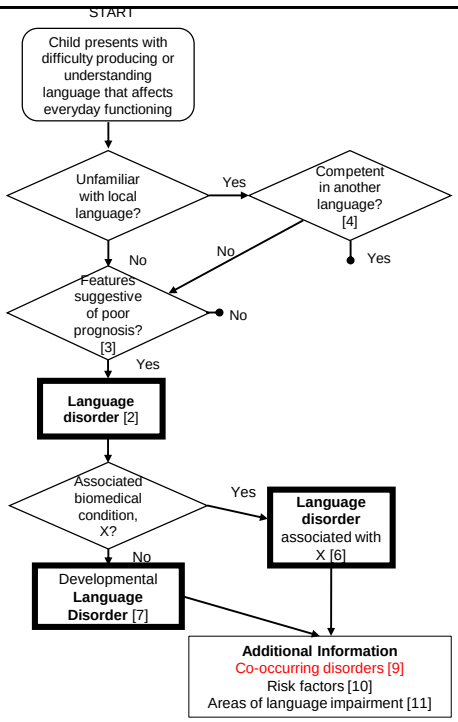
Developmental Language Disorder

- No known associated biomedical conditions
- **Persistent** (diagnosis under age 3 less reliable in many cases)
- Large discrepancy between verbal and non-verbal ability not required
- Children with low non-verbal IQ (who do not meet criteria for intellectual disability) can be included as cases of DLD



Co-occurring disorders

- Attention (e.g., ADHD)
- Motor (e.g., dyspraxia, dysarthria)
- Literacy
- Speech
- Adaptive behaviour
- Behaviour/emotional problems
- Auditory processing (e.g., APD)



Why DLD?

- Developmental – condition that arises from atypical development (i.e. not acquired)
  - Could drop the 'developmental' for adults
- Language – most 'domains' of language (phonology, semantics, syntax, discourse) load on a common 'factor' and language highly predictive of other developmental skills
- Disorder – serious! And on par with other developmental conditions (autism spectrum disorder; attention deficit hyperactivity disorder)

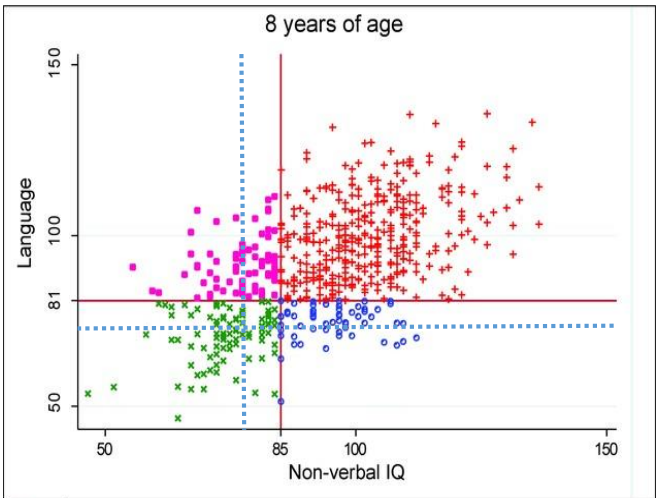
Bishop (2017). *IJLCD*

Concerns raised about these criteria…

- non-verbal IQ criteria – we won't be able to help children with lower non-verbal abilities…?
- Language **delay** versus language **disorder**?

non-verbal ability and DLD

- Non-verbal ability single most common reason children with language disorders refused access to specialist speech-language therapy or placement in language units in the UK (Dockrell et al. 2006)
- Non-verbal ability key risk factor for persistent & severe language disorder (Bishop & Edmundson, 1987; Conti-Ramsden et al. 2012)

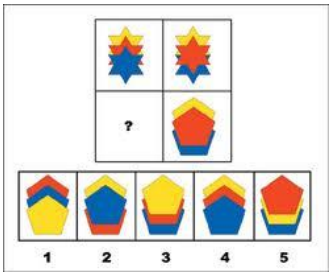


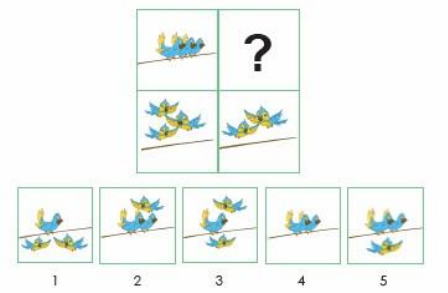
+	Typical language
•	SLI - language impaired (> 1.25 SDs below the population mean on language score) & non-verbal IQ in the normal range (score of >=85)
×	Non-Specific LI - language impaired (> 1.25 SDs below the population mean on language score) & non-verbal IQ low (score of <85)
■	Low non-verbal IQ – Language within normal range and low non-verbal IQ (score of <85)

- need to consider functional impact
- could improving language drive other kinds of learning?

Reilly et al. (2014) IJLCD

what is the causal relationship of language and non-verbal ability?





language is a fantastic problem solving tool!!

There are genetic influences on language development and disorders

- **Family aggregation**: rates of language/learning difficulties **higher in relatives** of children with language disorder, compared to children without language disorder
- **Twin studies**

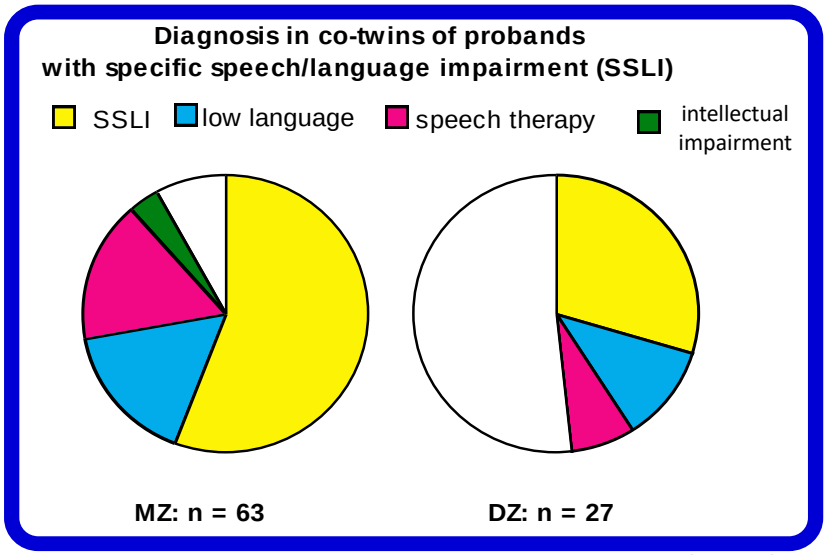
MZ

DZ

MZ twins more similar in language traits

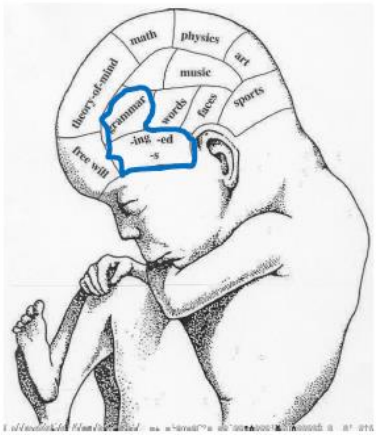
Bishop, DVM, Laws, G., Norbury, CF. and Adams, C. (2006). *Behavior Genetics*, 36, 173 - 184.
Bishop, DVM, Adams, C. and Norbury, CF. (2006). *Genes, Brain and Behavior*, 5, 158-169.

Genetic influences similar regardless of NVIQ status



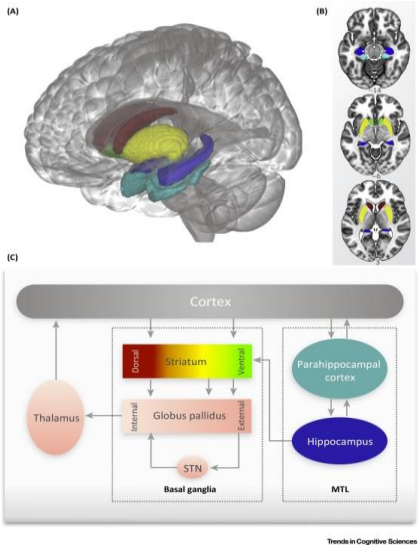
Bishop et al. 1989

Language in the brain



- 'modules' are emergent feature of learning
- Early in development, unlikely to have 'selective' impairments
- Deficits in language are associated with other developmental challenges: motor skills, attention control (behaviour), social interaction

Disorder of language or learning?

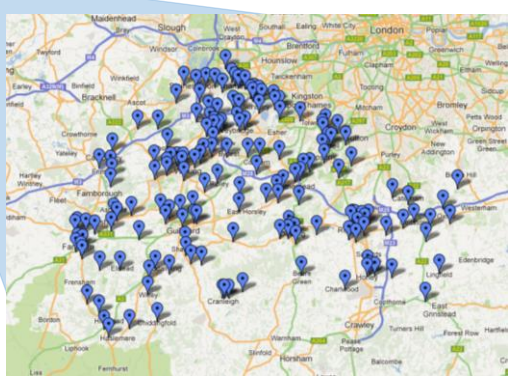


- Early language learning involves multiple cortical/sub-cortical systems
  - Modularity long-term outcome of learning process
- Propose children with DLD have deficient cortistriatal loops involving the dorsal striatum
- These circuits implicated in complex rule-governed LEARNING

Krishnan, Watkins & Bishop (2016) *Trends in Cognitive Sciences*

SCALES

Surrey Communication and Language in Education Study



wellcome

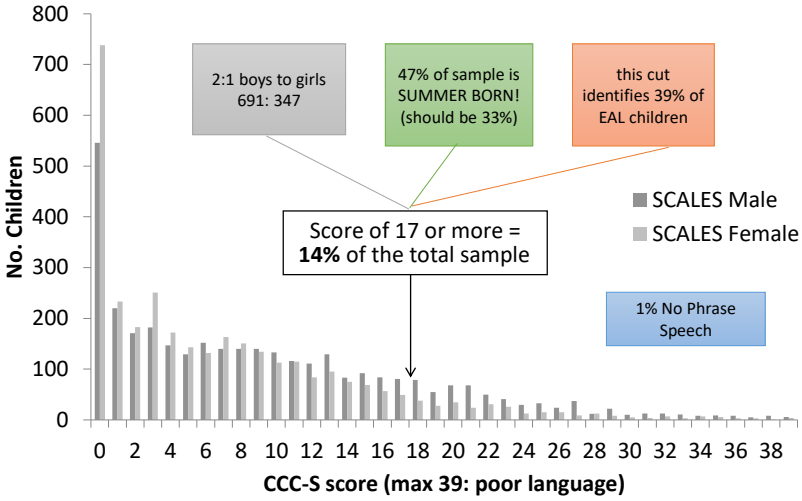
Key research questions

- If child has language disorder at school entry, what other developmental challenges are present from the start?
- How do co-occurring challenges affect language change over time?
- What is the impact of language disorder and co-occurring challenges over time?

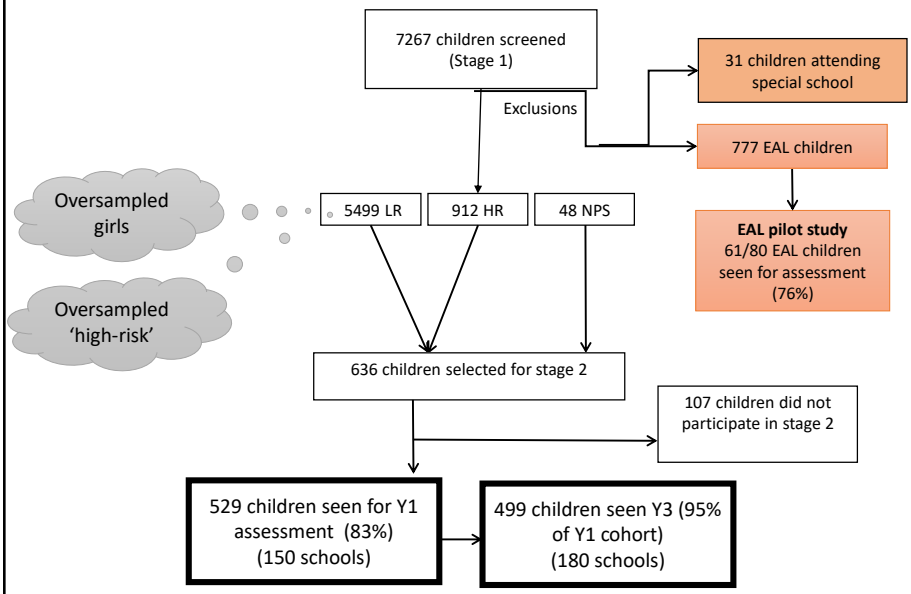
Stage 1: population characteristics (n = 7267)

- *Age*: all children aged between 4;9 and 5;10
- *Gender*: 51% boys and 49% girls
- *Ethnicity*: 5959 children (82%) of white British ethnic origin (83% England; 83% Surrey)
- *English as additional language*: 797 (11%) were rated as having English as an additional language (17% UK total; 10% Surrey)
- *Socio-economic status:* Income Deprivation Affecting Children Index (IDACI)
  - 1 = most deprived; 32482 = least deprived
  - Mean = 21592.16 (Mean for UK 2010 = 16241.50)
  - <10000 = low SES for this study

distribution of scores on the *Children's Communication Checklist - Short*



Stage 2: in-depth assessment



SCALES: diagnostic framework

(after Tomblin et al. 1997)

-1.5SD on 2/5 composite scores

(bottom 7th centile)

NVIQ >70

(above 3rd centile)

ROWPVT Receptive vocabulary	EOWPVT Expressive vocabulary	Vocabulary composite
TROG receptive grammar	SASIT-E32 sentence recall	Grammar composite
ACE Narrative comprehension	ACE Narrative Recall (info units)	Narrative composite
Comprehension composite	Expression composite	

Non-verbal ability assessed using WPSSI block design and matrix reasoning

JOURNAL of CHILD PSYCHOLOGY and PSYCHIATRY
Journal of Child Psychology and Psychiatry 57:11 (2016), pp 1247–1257 doi:10.1111/jcpp.12573

The impact of nonverbal ability on prevalence and clinical presentation of language disorder: evidence from a population study

Courtenay Frazier Norbury,[1,2] Debbie Gooch,[1,2] Charlotte Wray,[2] Gillian Baird,[3] Tony Charman,[4] Emily Simonoff,[5] George Vamvakas,[6] and Andrew Pickles[6]
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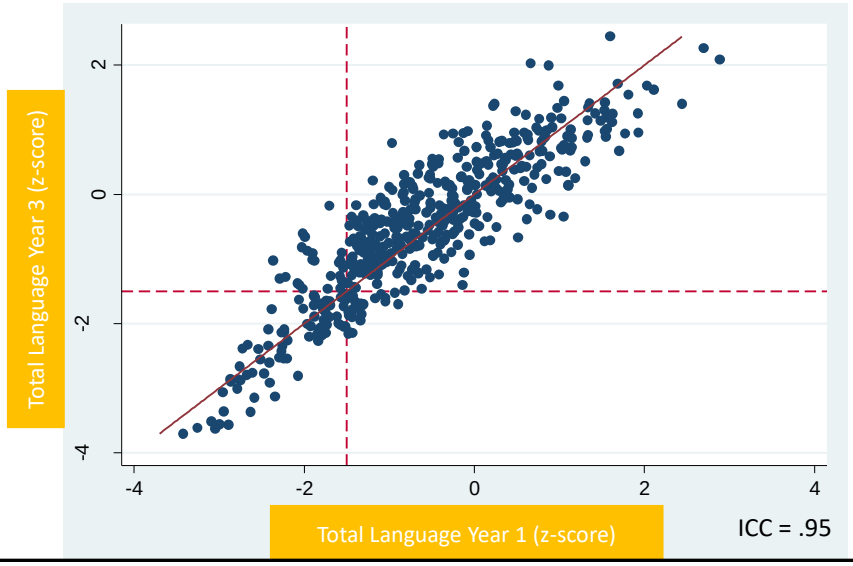
Prevalence Year 1	% of population
Language Disorder (cause unknown)	**7.58%**
higher NVIQ	4.80%
lower NVIQ	2.78%
Language Disorder (other clinical condition and/or intellectual impairment)	**2.34%**
Total Language Disorder	**9.92%**

Fewer than 12% meet early curriculum targets

Clinical profile by diagnosis & non-verbal IQ band

	Low NVIQ (>-2SD & <-1SD)	High NVIQ (>= -1SD)	Lang Disorder+
IDACI rank	17987	17770	18923
Communication checklist	19.61	18.06	25.24
Language composite (z-score)	-1.88	-1.60	-2.16
% Social, emotional, behavioural probs	9.38	9.85	51.36
Academic attainment	27.20	28.32	25.79
% referred to SLT	52.05	31.50	66.00

language is incredibly stable



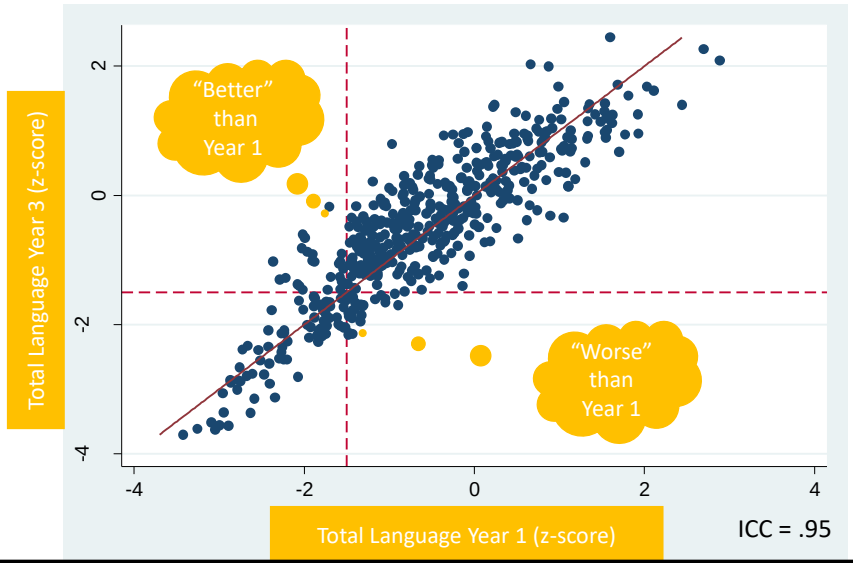
Language is stable

(Marc Bornstein et al.)

- In general population using multi-age, -measure, -domain, -informant (Dev Psych, 2012)
- In children at increased biological/social risk (JCPP, 2016)
- In children with contrasting language skills (Dev Psych, 2016)

- Even when taking account of maternal education, maternal language, home environment, child NVIQ, child social behaviour

language is incredibly stable



diagnostic 'instability' likely reflects measurement error

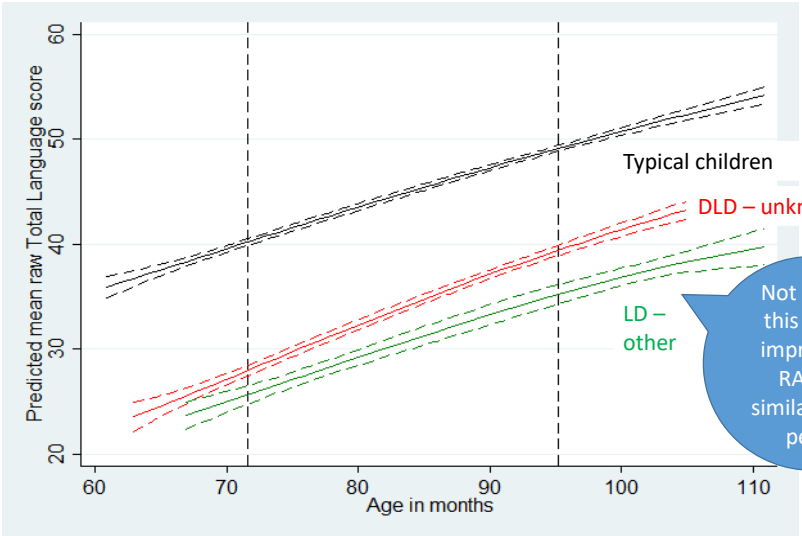
McKean et al. (2017). Subgroups in language trajectories from 4 to 11 years. JCPP

94% STABLE

2% low-improving:

most were learning English as an additional language

change in raw total language composite scores



http://onlinelibrary.wiley.com/doi/10.1111/jcpp.12793/full

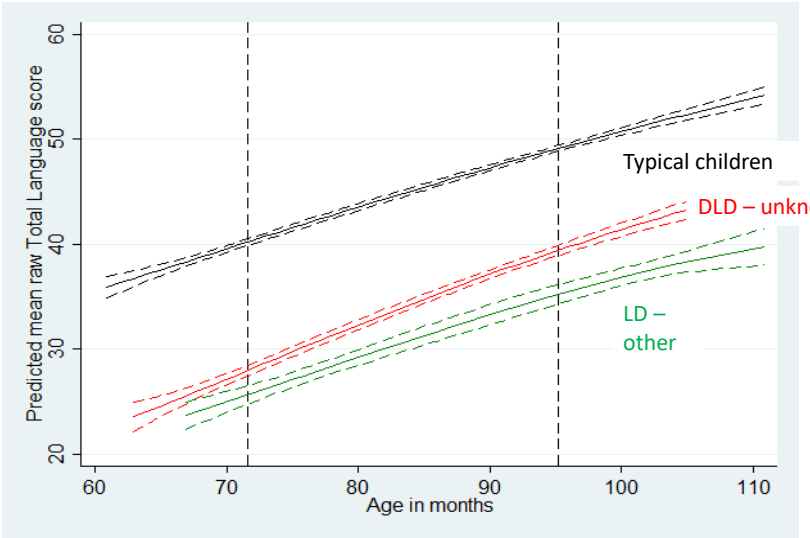
What predicts slope (growth)?

- Socio-economic status
- Non-verbal IQ at intake
- Social, emotional, behavioural problems (SDQ)

- All predict starting point (i.e. associated with poorer language ability at Year 1)
- None associated with growth

Cf.. Bornstein et al. (2014, 2016)

change in raw total language composite scores



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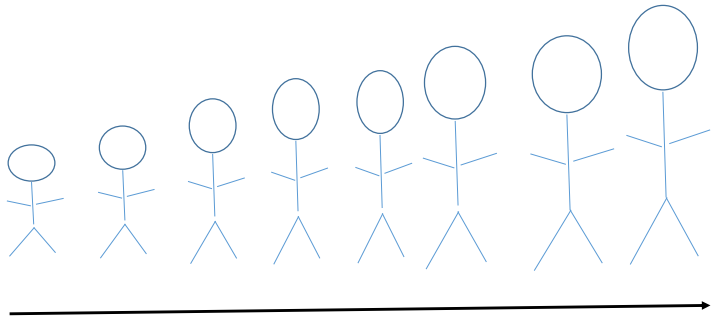
features of child language…

- **growth**: individual change/development on a particular characteristic over time

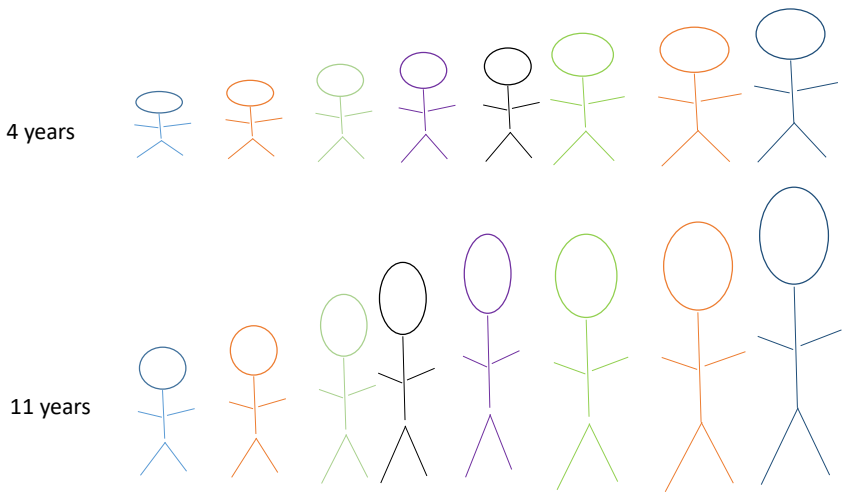


4 years

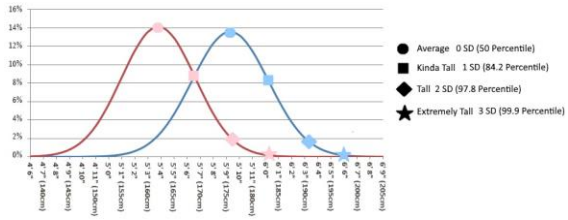
11 years

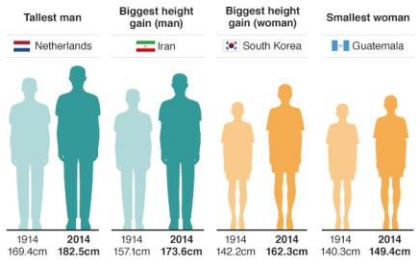
features of child language…

- **stability**: maintain position within a distribution on a particular characteristic over time



Language (and height)…

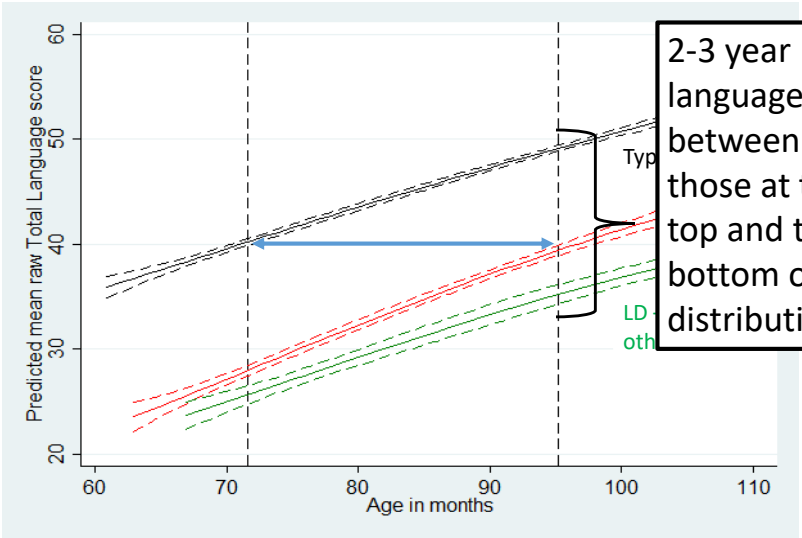




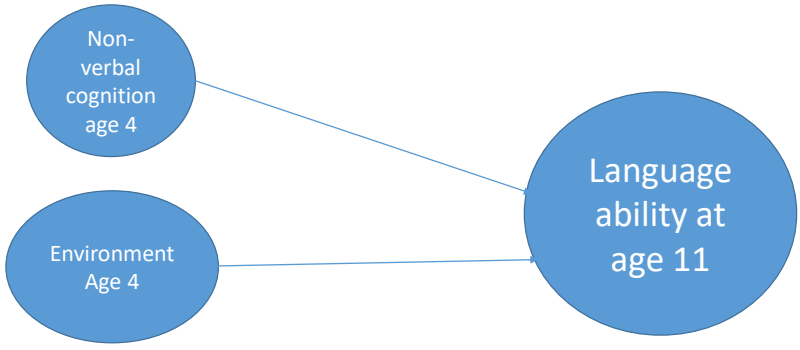
- distributed within the population
- arbitrary cut-offs for ‘extreme’ scores
- highly heritable
- highly stable
- ultimately subject to environmental influences

Some challenges and questions that arise from stability…

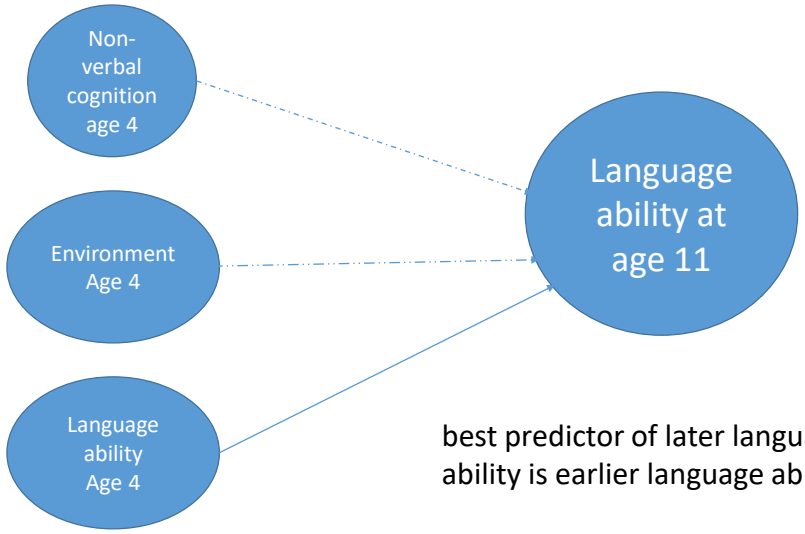
improvement not enough to "narrow the gap" with TD peers



Stability is a challenge for understanding causal relationships



Stability is a challenge for understanding causal relationships



best predictor of later language ability is earlier language ability!!

Developmental changes in stability

School entry
Ages 4-6 years

- Golden period of developmental plasticity (get in early)?
- 'normal' variation
- Measurement error

- (more) Consistency in measurement
- Consistency in environmental experience
- Fewer studies of language change in adolescence

age

Stability estimates range from .15 to ~.50

Stability estimates exceed .85

Language delay…

- Age at onset of spoken language
  - 'late-talkers' (Rescorla et al. 2011): children between the ages of 18 to 20 months who have fewer than 10 words and children between the ages of 21 to 30 months who have fewer than 50 words and/or no two-word combinations
  - Note 1: **huge range of normal variation** in onset of first words/phrases (McGillion et al.: range 355 days – 575 days for four consistent words)
  - Note 2: **~50% of those identified catch up**,
    - Barring any other associated risk factors, most of these children resolve early difficulties and do reasonably well on all outcome measures **WITHOUT ADDITIONAL SUPPORT**

Measurement of language at 2

- Duff et al. (2015): *the stability of vocabulary skills from infancy to later childhood is too low to be sufficiently predictive of language outcomes at an individual level*
  - Vocabulary at age 2 explained only 4% of variation in language outcome at ages 5-9 (and 11% of reading outcome)
- Bornstein et al. (2016): *15 months was too early to form reliable skill groups that predicted later outcomes.*
  - only 44% of variation in language at 5 explained by language at 25 months
  - Prediction doubles at age 5

consider other risk factors…

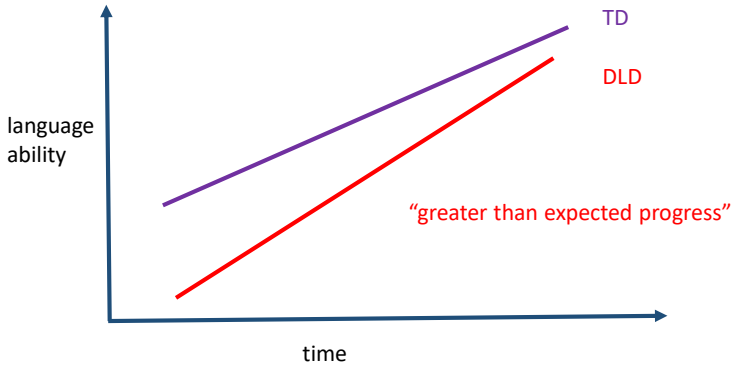
- **Family history**
- **Low SES background**
- Behaviour problems
- Poor language comprehension
- Reported language regression
- Global developmental delay
- Lack of gesture
- Poor social engagement
- Male sex

Language is malleable…

…but ***rate*** of language learning may not be

So what are the clinical/educational implications?

change a developmental trajectory?

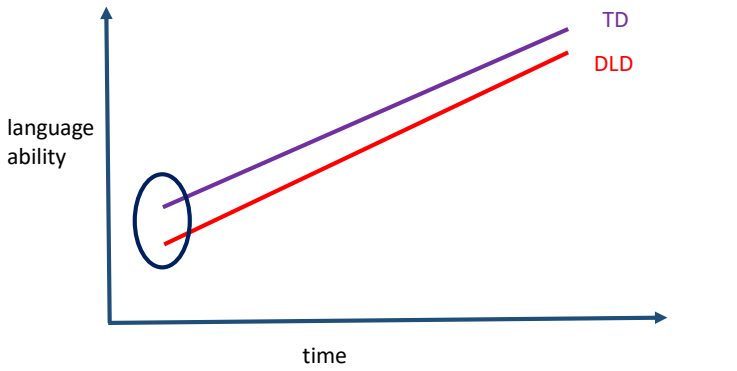


'normalisation' of language / narrow gap

e.g. improve significantly on a standardised test of language

LD groups must learn language **faster** than the TD group…

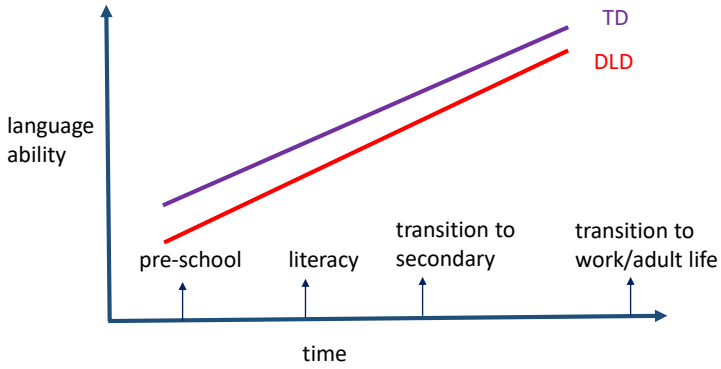
could narrow range of distribution



pre-school intervention (coupled with high quality nursery provision) to increase language capacity prior to school entry

this will take time and considerable effort!

and someone will always be at the bottom of the language distribution…

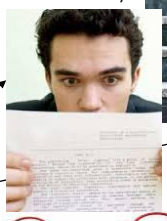


- Ensure 'bottom' is functional level of language/communication/literacy
- EXTRA support at vulnerable transition periods
- Non-language/academic outcome measures

Cascading impacts

children with DLD become adolescents and then adults with DLD…

Poor literacy



unemployment

Problems with peer relationships

Increased risk poor mental health

Key priority: mitigate risk of adverse outcomes in other developmental areas

Need to acknowledge and plan for:

- persistent language disorders: from early years to adulthood
- 'narrowing the gap' is unlikely without targeted, intensive, and persistent support
- on-going support from multi-disciplinary, specialist services is needed to mitigate risks of cascading, negative impacts of language disorder

Find out more about language disorder and the impact of language disorder on children and young people!

https://www.youtube.com/RADLD

http://www.lilac-lab.org

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