Language Assessment: Dyslexia and Bilingualism

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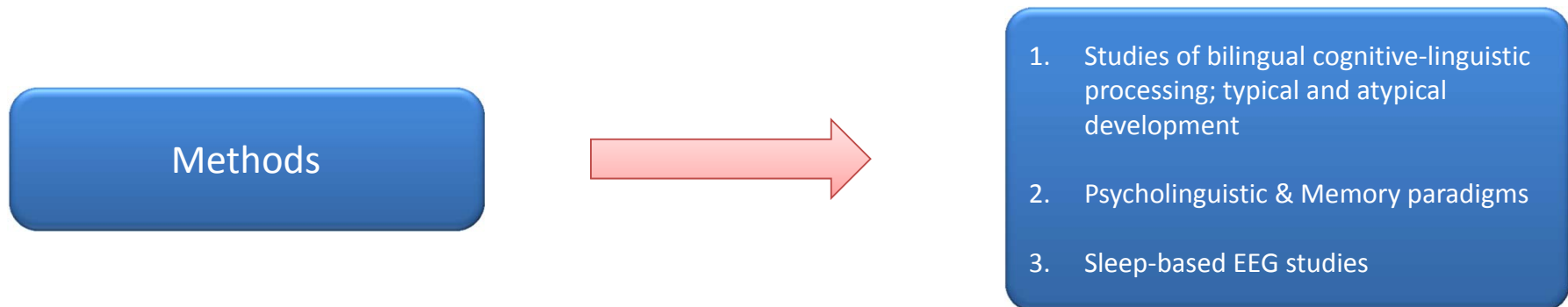Department of Psychology
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Collaborators…

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- Graham Hitch (York)
- Maggie Snowling (Oxford)
- Sue Stothard (Durham)
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My Research: Theory to Application

o The relations between executive skills & language/literacy development
Warmington, Hitch, & Gathercole, 2012; Warmington & Hitch, 2013

o Cognitive & neurological mechanisms underlying literacy/language learning in typical and atypical development
Warmington & Hulme, 2012

How best can we promote literacy and language development?

Methods →

1. Studies of bilingual cognitive-linguistic processing; typical and atypical development
2. Psycholinguistic & Memory paradigms
3. Sleep-based EEG studies

The Leverhulme Trust & Waterloo Foundation

For Today…

1. Dyslexia Assessment – York Adult Assessment Battery – Revised (YAA-R)

2. Issues in second language assessment – Hindi/Urdu-English bilingual children

Characteristics of Dyslexia...

Word-decoding	Spelling
X	X

IQ, SES & Classroom Instruction	Reading Fluency & RAN
✓	X
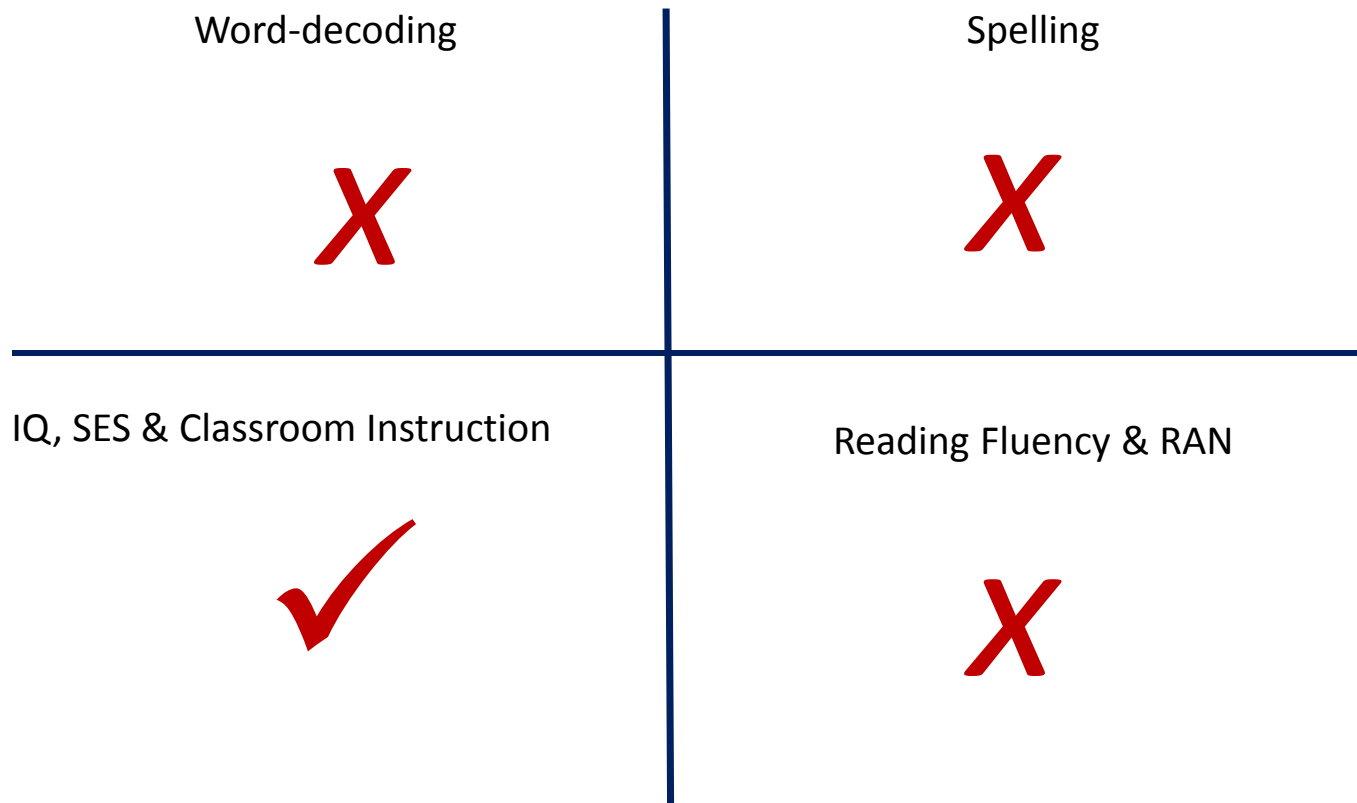
Profile of Dyslexic Students

Table 1. Mean standard scores on tests of reading, spelling and general ability for the dyslexic and control students

		Age (years)	Reading (WRAT-R)	Spelling (WRAT-R)	Vocabulary (WAIS-R)	Block design (WAIS-R)
Dyslexic (n = 14)	Mean	25.50	84.5	73.5	10.5	14.5
	sd	3.9	10.6	14.6	1.7	2.3
	range	20–33	87–104	63–103	8–12	7–16
Control (n = 19)	Mean	22.68	111.16	107.89	12.74	13.53
	sd	2.7	7.0	11.2	2.5	1.7
	range	20–26	96–121	72–123	8–17	11–17

Snowling, Nation, Moxham, Gallagher, & Frith, 1997

Profile of Dyslexic Students

Table 2. Performance of dyslexic students (n = 14) and controls (n = 19) on phonological processing tasks.

	Dyslexic Mean	s.d.	Control Mean	s.d.	p	effect size
Nonword Reading (max = 15)	8.50	3.6	13.95	1.5	<.001	3.64
Nonword Spelling (max = 15)	12.50	1.5	13.79	1.6	ns	0.81
Rhyme production (no. produced)	27.5	8.2	31.8	9.8	ns	0.43
Rhyming rate (No. produced /30 secs)	6.88	2.1	7.89	2.5	ns	0.51
Phoneme deletion (Max = 12)	9.00	2.4	11.32	1.2	<.01	1.90
Spoonerism correct (Max = 12)	9.50	3.7	11.37	1.1	<.05	1.70
Spoonerism speed (Time/trial secs)	6.59	4.7	2.28	1.1	<.01	3.91
Semantic fluency (No. produced /30 secs)	14.27	2.9	18.5	2.7	<.05	1.56
Phonemic fluency (No. produced /30 secs)	7.33	1.6	10.47	1.6	<.001	1.96
Digit naming speed (Time/trial secs)	23.05	8.0	15.69	5.5	.058	1.34
Word repetition (Max = 12)	11.54	1.1	12	0.0	ns	–
Nonword repetition (Max = 12)	9.92	2.5	11.26	0.9	ns	–
WAIS-R digit span (Scaled score)	9.0	2.5	12.26	2.5	.089	1.30

Self-report higher levels of difficulties with memory, attention and organisation

Snowling, Nation, Moxham, Gallagher, & Frith, 1997

Underlying Causes of Dyslexia

o Consequence of deficits in phonological processing

  o Impaired ability to analyse and abstract the relationship between spelling patterns and sounds
  (*Vellutino et al., 2004; Shawywitz, 1998; Snowling, 2001, 2008*)

o Lack of unified consensus (*Ramus et al., 2003*)

  o Opposing hypotheses (e.g., deficits in visual processing *Stein et al., 1999* and attention Facoetti et al., 2003)

o Procedural Learning Difficulties Framework (*Fawcett et al., 1996; Nicolson & Fawcett, 1990; Nicolson et al., 1999, 2010*)

  o Impaired ability to automatize new cognitive procedures
  o Phonological deficits co-occur with other cognitive deficits
    o Speed of information processing and motor coordination

Prevalence of Dyslexia in Higher Education

3.4% - 2009/10

= 10,000

= 5,000

Higher Education Statistics Agency
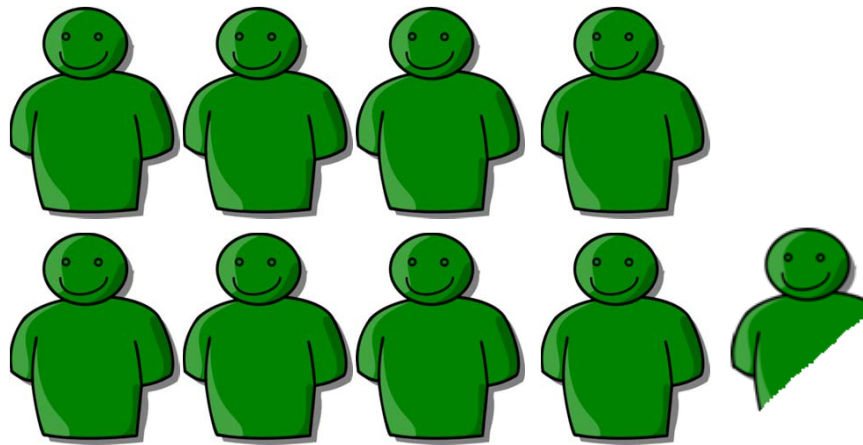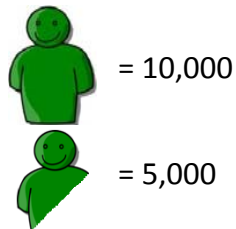
Majority (40-43%) remain undiagnosed until they have actually started university (National Working Party on Dyslexia in Higher Education, 1999; Singleton, 2004)
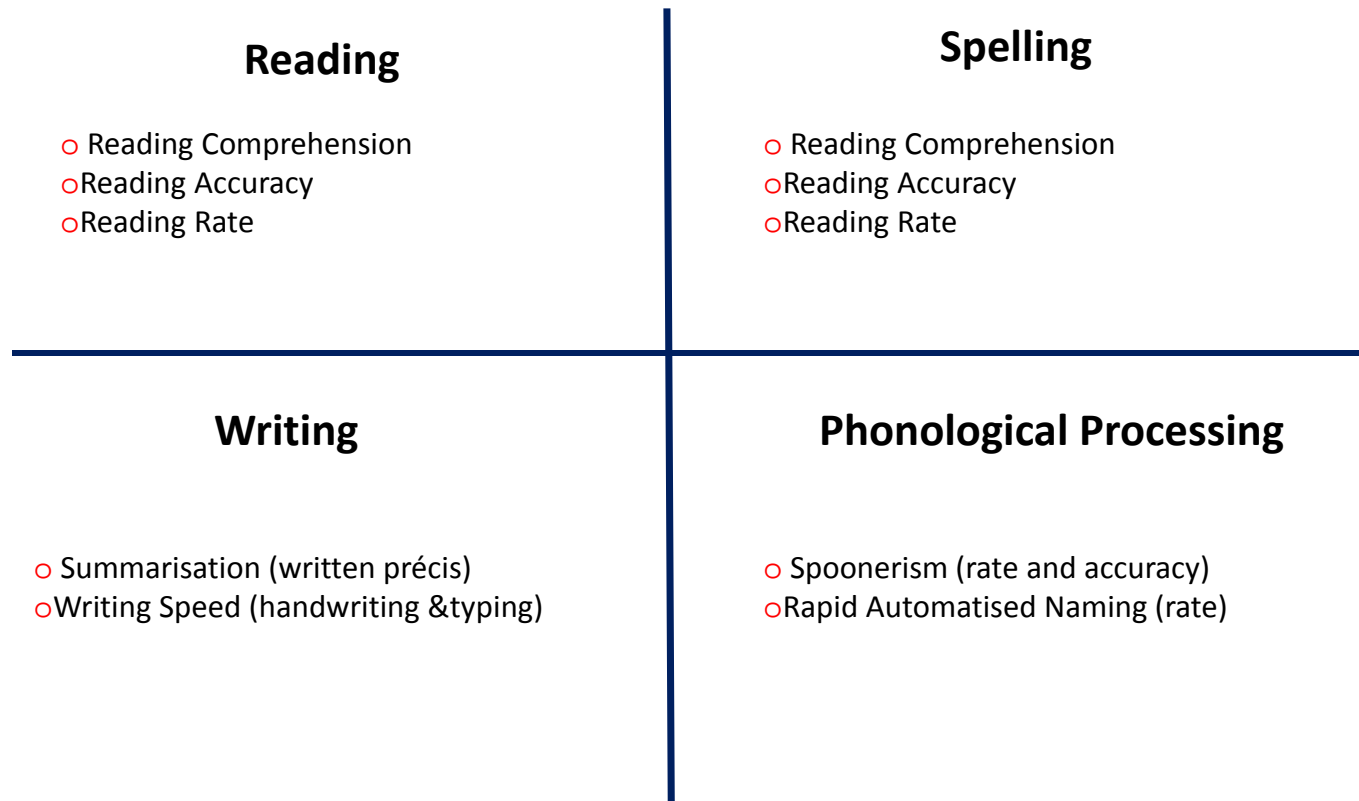
Develop sensitive procedures for the assessment of higher-level literacy skills

York Adult Assessment Battery - Revised

Warmington, Stothard, & Snowling, 2013

Revision of the *York Adult Assessment: An Assessment Battery for Dyslexia Screening in Higher Education* (*YAA*; Hatcher & Snowling, 2002)

Reading

- o Reading Comprehension
- oReading Accuracy
- oReading Rate

Spelling

- o Reading Comprehension
- oReading Accuracy
- oReading Rate

Writing

- o Summarisation (written précis)
- oWriting Speed (handwriting &typing)

Phonological Processing

- o Spoonerism (rate and accuracy)
- oRapid Automatised Naming (rate)

Abilities and competencies that are required by students who wish to pursue a course in further or higher education and thereby to assist in the identification of additional needs

Sample

Normative sample – 21 years 10 months	Adults without Dyslexia (N = 106)	Adults with Dyslexia (N = 20) Validation sample – 22 years 5 months
Ethnicity		
White	92	20
Asian	11	-
Black	3	-
Academic Institution		
University of York	71	7
University of Leeds	13	2
Queen Margaret University	12	1
University of Napier	5	-
Other Universities	5	3
Sixth Form Colleges	-	7
Subject Area		
Natural Sciences	19	3
Social Sciences	46	4
Health Sciences	7	9
Arts	28	4
Creative Arts	6	-

Reading

- Reading Comprehension test - *The History of Chocolate*
  - Reading accuracy
  - Reading time
  - Reading rate (words per minute)
  - Reading comprehension

- Non-fictional piece written for the purpose of the study, suitable for university students

- 492 words

- 15 comprehension questions
  - knowledge = 7 items
  - vocabulary = 4 items
  - inference-making = 4 items

- Both reading time and reading accuracy (along with errors) were recorded

- Comprehension questions were scored as correct or incorrect (i.e., maximum reading comprehension score of 15)

Summarisation & Spelling

o Measures of summarisation skills and writing under time pressure. Participants were not allowed to refer back to the text.

o *Written Précis* test - maximum of 10 minutes to write a summary of *The History of Chocolate* once they had completed the comprehension questions.

o Scored as the number of content points (i.e., knowledge based points directly referred to in the text and not inference points) included within the correct context (maximum score of 20)

o The content points
- o Compiled a list of 30 points prior to scoring
- o Randomly selected 15% of the *Written Précis* from the normative sample and compared these responses with the list of 30 content points
- o The final 20 content points reflected a range of difficulty (i.e., 38-87% difficulty; mean accuracy = 12.62, SD = 3.24)

o Points were scored as correct regardless of spelling errors

o Writing rate was expressed as words per minute

o Spelling rate score - the number of errors divided by the number of written words expressed as a percentage

Phonological Processing

o Phoneme awareness – *Spoonerisms*
  o Name of a famous person and had to swap the beginning sounds of the first and last name to make two novel words (e.g., *Wayne Rooney* becomes *Rayne Wooney*)
  o 12 items and total accuracy was scored out of 24 (i.e., 2 words per target item)
  o Spoonerism rate was calculated for correct items only (i.e., score of 2), expressed as seconds per item

o Phonological retrieval and processing (*RAN digits* and *objects*)
  o Name an array of 50 objects and digits from left to right arranged in 10 rows, as quickly and accurately as possible
  o Each task began with a practice trial
  o Both naming time (along with rate expressed as words per second) and errors were recorded.

Writing Speed

o Handwriting
  o Copied the following sentence *Erosion is a gravity driven process that moves solids in the environment* as many times as possible in 2 minutes

o Typing speed
  o Type the following sentence *Transportation is movement of people and goods from one location to another* as many times as possible in 2 minutes.

o In both tests speed was emphasised. Handwriting rate and typing rate were expressed as words per minute.
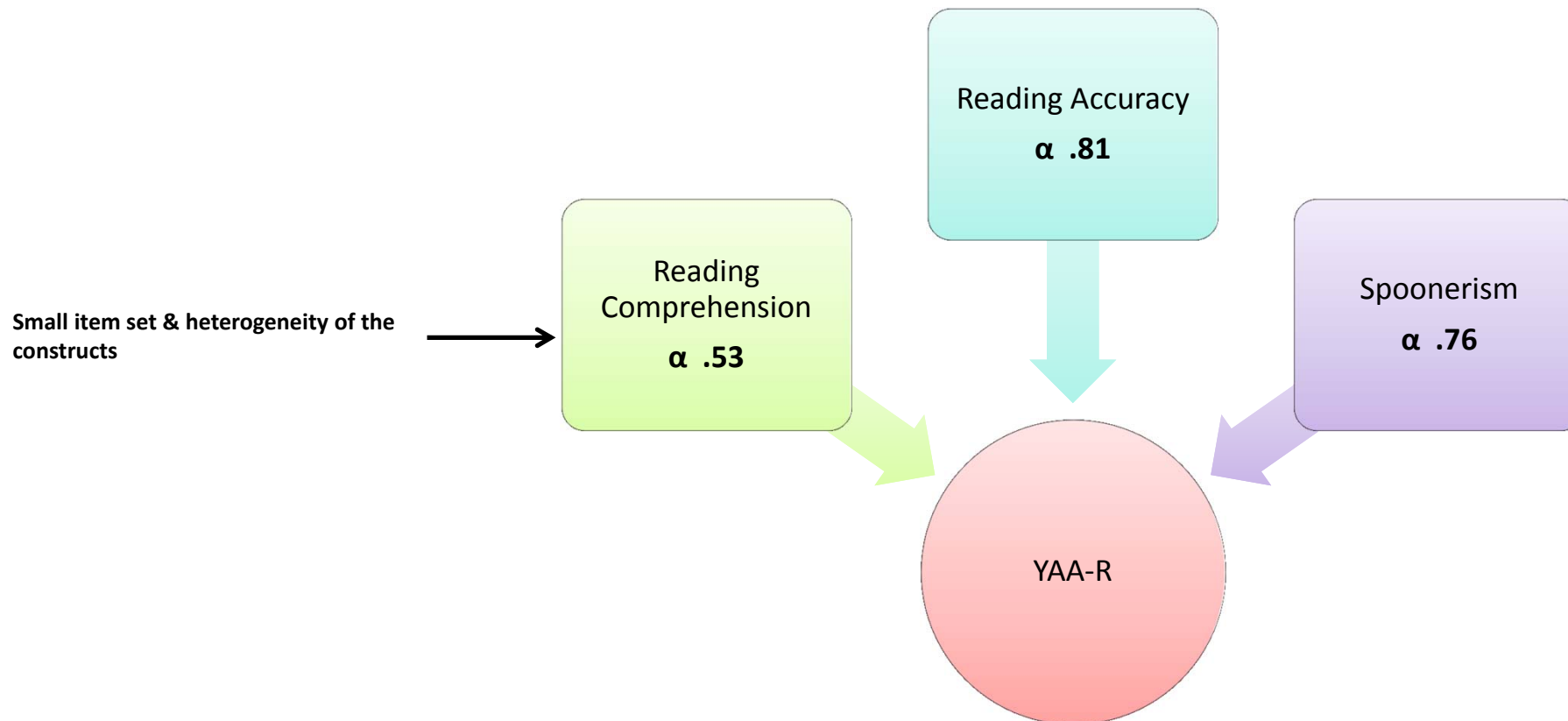
Standardised Tests

o Vocabulary and Block Designs tests from *Wechsler Abbreviated Scale of Intelligence* (Wechsler, 1999)

o Literacy - Reading and Spelling tests from *Wide Range Achievement Test – Third Edition* (Wilkinson, 1993)

o Attention - *The Brown Attention Deficit Disorder Scales* (Brown, 1996)

Standardised Tests

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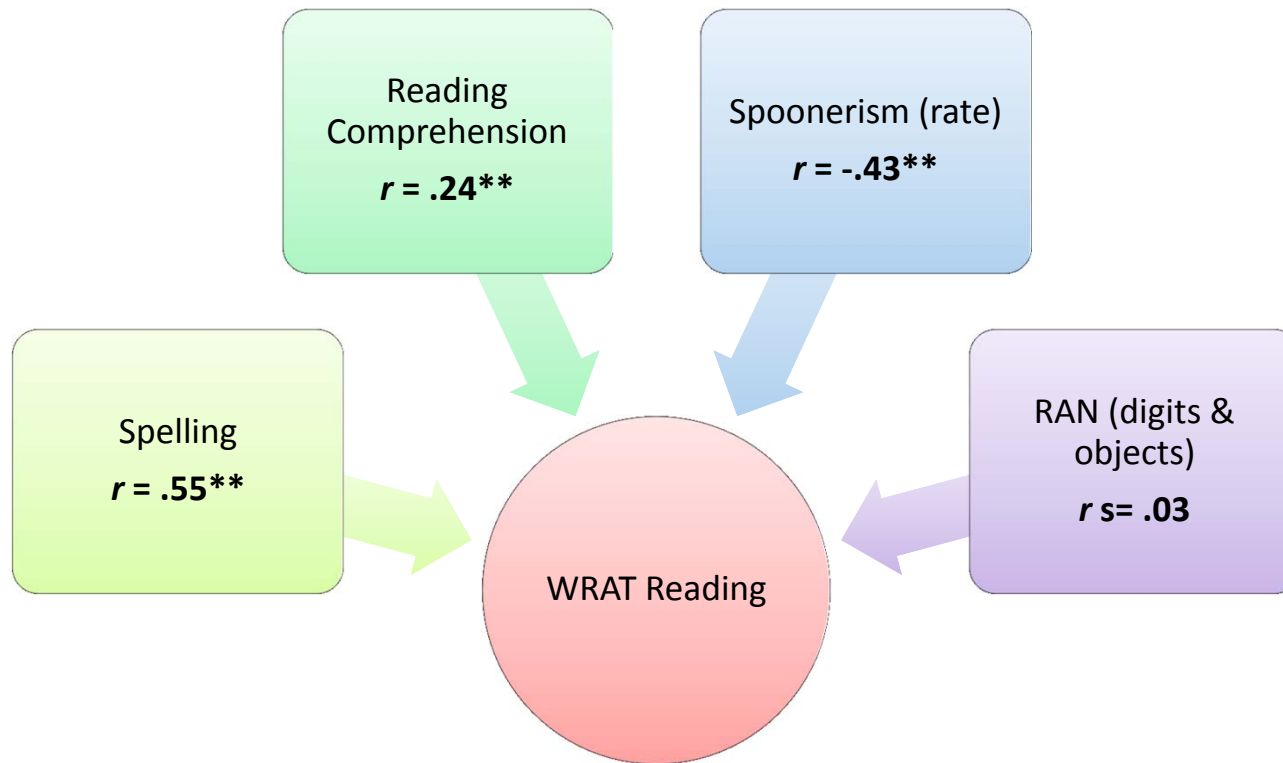o Attention - *The Brown Attention Deficit Disorder Scales* (Brown, 1996)

Reliability

Reading Accuracy

α .81

Reading Comprehension

α .53

Spoonerism

α .76

Small item set & heterogeneity of the constructs

YAA-R

Validity

Reading Comprehension

$r = .24^{**}$

Spoonerism (rate)

$r = -.43^{**}$

Spelling

$r = .55^{**}$

WRAT Reading

RAN (digits & objects)

$r s = .03$

Correlations between *YAA-R* measures ranged from .01-.98

Validation

	Adults without Dyslexia (N = 20)	Adults with Dyslexia (N = 20)	Effect Size (Cohen's *d*)
WRAT-3 Reading (SS)	108.80 (7.07)	93.65 (10.32)	1.76
WRAT-3 Spelling (SS)	109.70 (6.31)	92.35 (11.37)	1.94
WASI			
Vocabulary (T-score)	54.30 (6.17)	49.60 (10.50)	.56
Block Design (T-score)	59.55 (8.23)	59.60 (6.71)	.01
YAA-R Reading Comprehension			
Comprehension (max = 15)	11.05 (2.14)	9.40 (2.64)	.70
Reading Accuracy (max = 492)	486.30 (5.08)	476.15 (10.91)	1.22
Reading Time (sec)	182.28 (22.41)	235.94 (42.94)	1.61
Reading Rate (words/min)	162.27 (19.99)	128.98 (22.85)	1.59
YAA-R Written Précis			
Content (max = 20)	15.45 (3.47)	11.80 (2.96)	1.16
Précis Time (sec)	413.73 (132.05)	450.61 (129.62)	.29
Précis Rate (words/min)	23.74 (4.51)	19.49 (4.62)	.96
Spelling Error Rate (%)	1.51 (2.14)	6.49 (4.28)	1.51

Validation

	Adults without Dyslexia (N = 20)	Adults with Dyslexia (N = 20)	Effect Size (Cohen's *d*)
YAA-R Spoonerisms			
Accuracy (max = 24)	21.95 (3.10)	18.30 (5.77)	.81
Total Time (sec)	34.33 (15.74)	56.01 (35.05)	.82
Rate (sec/item)	4.37 (13.45)	5.29 (9.59)	.08
YAA-R RAN Rate (words/sec)			
Digits	3.24 (.91)	2.51 (.60)	.96
Objects	2.52 (2.84)	1.58 (.26)	.48
YAA-R Writing Speed – Rate (words/sec)			
Handwriting	31.42 (4.20)	27.02 (4.34)	1.06
Typing	43.52 (15.15)	33.45 (11.05)	.78

Discriminant Analyses

	Observed	Predicted		
		Group		
		Non-dyslexic	Dyslexic	% Correct
All *YAA-R* variables	Non-dyslexic	103	3	97.2
	Dyslexic	4	16	80
	Overall %			94.4
YAA-R Literacy variables	Non-dyslexic	104	2	98.1
	Dyslexic	7	13	65.1
	Overall %			92.9
YAA-R Literacy & Phonological Awareness variables	Non-dyslexic	105	1	99.1
	Dyslexic	5	15	75
	Overall %			95.2

Summary Points

o *YAA-R* has good discriminatory power - 80% sensitivity; 97% specificity

o Students with dyslexia in HE continue to experience difficulties with reading, spelling, phonological processing and writing
   o Struggle with tasks which place constraints on their phonological processing skills
   o Text reading rate, spelling rate and reading comprehension skills are impaired in comparison to the non-dyslexic adults
   o Written précis - Typical adults = 71% vs. adults with dyslexia = 60%

o Fundamental generic skills - degree programme

o More likely to withdraw from university studies and attain poorer degree classes

Language Assessment in Bilingual Children

Why is it Important to Study Bilingualism?

European Union

Monolingual 44%

Bilingual, 56%

Luxembourg 99%

The Netherlands 91%

Germany 67%

Sweden 97%

Denmark 88%

Poland 57%
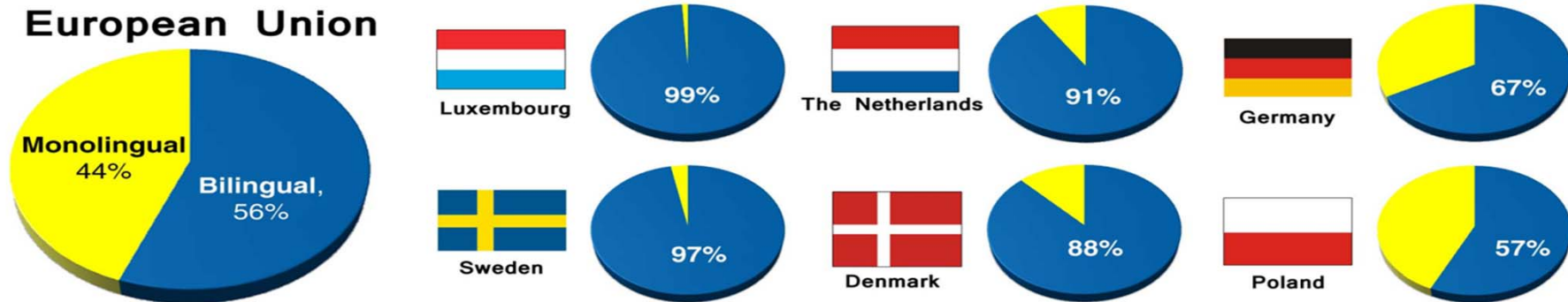
Source: European Commission, "Europeans and their Languages," 2006

Percentage of US Population who spoke a language other than English at home by year

1980	1990	2000	2007
10.97	13.82	17.89	19.73
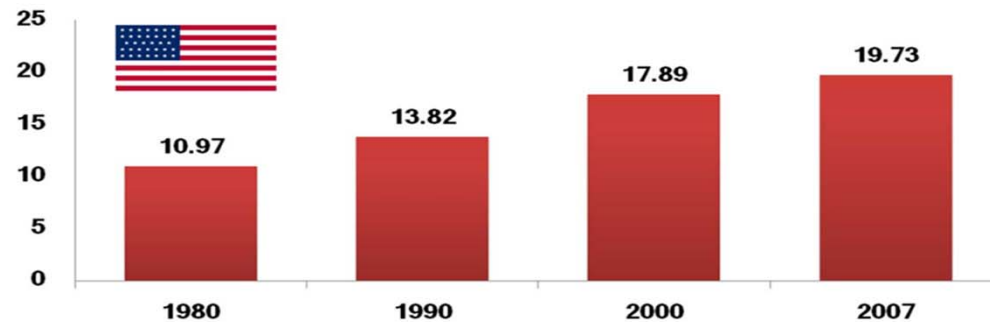
Source: U.S. Census Bureau, 2007 American Community Survey

More than half of the world's population is bilingual

Why is it important to study Bilingualism?

= 100,000

= 50,000
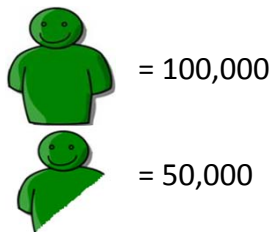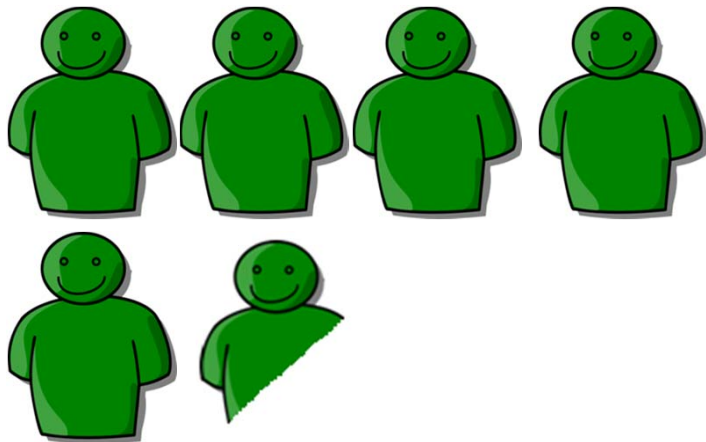
o Over 300 languages are spoken in the homes of children in England

o Bilingual children represent 17.5% of primary pupils in England - increasing by approximately 1% per annum

o Increasing linguistic diversity - substantial and growing challenge to educators and educational practice

o Reports reveal that the performance gap between monolingual and bilingual children in the UK is widening

Why is it Important to Study Bilingualism ?

Bilingualism modifies cognitive development

o Beneficial effect of bilingualism on cognitive (executive control) development

o Executive skills develops earlier in bilingual children than in comparable monolinguals – persists into adulthood

o Development, efficiency and decline of crucial executive abilities are different for bilinguals than for monolinguals

Lifelong experience managing multiple languages increases both frontal white matter integrity and connectivity

Why is it Important to Study Bilingualism?

Impact on Language & Literacy

o Comparable performance between bilingual and monolingual children in word-level skills - decoding, word recognition, spelling

o Bilingual disadvantage in text level skills – reading comprehension and writing

o Oral language proficiency, vocabulary knowledge and narrative ability – areas of vulnerability for bilingual children

SES, Parental Education & Home Language

What is Bilingualism?

"...and I'm proficient in two languages — English and text messaging."

- o The ability to use more than one language (Mackey, 1962)

- o The practice of alternately using two languages (Weinreich, 1968)

- o The point where a speaker can first produce complete meaningful utterances in the other language (Haugen, 1953)

Native-like control of two or more languages (Bloomfield, 1933)

What is Bilingualism?

"...and I'm proficient in two languages — English and text messaging."

o Refer to a single dimension of bilingualism, specifically, levels of proficiency , thus ignoring non-linguistic dimensions (Harmers & Blank, 2004)

o Bilingualism should be defined on a multidimensional continuum (Paradis , 1986)

Suggests that bilinguals function as two monolinguals

What is Bilingualism?

"...and I'm proficient in two languages — English and text messaging."

- Age of acquisition of the second language

- Continued exposure to the first language

- Relative skill/proficiency in each language

- Linguistic context and environment

- National Identity and social attitudes

Bilingualism is NOT categorical; but rather a continuous dimension that is shaped by cognitive and environmental factors
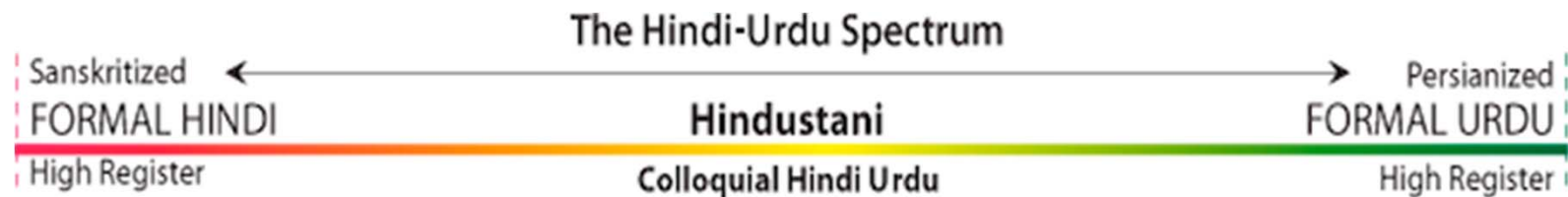
Overview

o Issues in second language assessment

o Why is it important to assess both L1 (Hindi/Urdu) and L2 (English)?

o Guidelines for developing a test in another language

o Comments and Caveats

Before we move on…

o Same spectrum with one major difference – Hindi script is derived from Sanskrit, while Urdu is written in an Arabic script.

The Hindi-Urdu Spectrum

Sanskritized	←	Hindustani	→	Persianized
FORMAL HINDI				FORMAL URDU
High Register		Colloquial Hindi Urdu		High Register

o Sound the same when spoken colloquially as they share similar vocabulary and linguistic features

o Fourth most widely spoken language in the UK

o Highly transparent in contrast to English

o The standard word order in Hindi is Subject-Object-Verb as against Subject-Verb-Object in English

Why assess oral languages in L1 and L2?

o Assessing two languages helps understand organization of language skills in bilinguals

   o Distinguish between normal language differences and genuine language impairment

o Grosjean (1998) outlined important considerations in profiling bilinguals including language history and use as well as language proficiencies

   o Important for participant selection in bilingual studies

Issues in second language assessment

o Studies typically conducted with bilingual (or EAL) children tend to only asses oral language skills in English (L2)

o Limitations to this approach

    o Assumption that both L1 and L2 in these children follow the same developmental trajectory – implications for distinguishing between bilinguals with and without language impairment

    o L1 and L2 impact on each other

Issues in second language assessment

o Though there is a lack of standardised tests in other languages researchers have attempted to address these limitations by:

  o Relying on self reports of language history/proficiency - but mainly normed with adults

  o **Direct translations of standardised tests**

    o Miss critical features - narrative, vocabulary and morphology development
    o Item difficulty - meaning & difficulty of specific items may alter once translated
    o Words/concepts in one language may not have an equivalent in another language
    o Cultural bias that are associated with the original language of the test

About the BPVS

o Normed with children aged 3-16 years

o Matching a spoken word to a visual referent

HARVESTING

o Words and images selected to be familiar in the UK context

o 168 items arranged in 14 sets of 12 items

o Item sets increase in difficulty

o Performance is based on the establishment of basal and ceiling sets

    o Basal and ceiling set – critical range of the individual's range of vocabulary ability

    o Inferences are drawn on the basis of words that are generally relevant to the age and ability of the person

o Scoring is dependent on maintaining the integrity of item sets

Translating the BPVS

o Direct translations are costly and restrictions to application and use (time constrained)

o Translation to Hindi/Urdu
   o Direct translation - loss of 68 items (~40%) = 100 items remaining
   o Back translation – additional loss of 15 items (~15%) = 85 items remaining
   o Total loss of 83 items (~49%)

o Eliminated items based on difficulty – pilot (N = 19)
   o Excluded items with < 50% item difficulty = loss of 42 items

o Final item list = 43 items (loss of 74% of the original test)
   o Impacted on administration and scoring – loss of integrity of items sets
   o Abandon ceiling and basal levels
   o Loss of characteristics of the original test

Translating the BPVS

Impact on diagnostic validity?

SET 1		CORRECT RESPONSE	RESPONSE
1	Ball – gend	3	
2	Duck – batakh	3	
3	Mouth – muh	1	
4	Jumping – koodhna	3	
5	Spoon – chamach	1	
6	Drinking - peena	1	
7	Cat – billi	2	
8	Seb – apple	4	
9	Blue – neela	2	
10	Swimming – tairna	4	
11	Money – paisa	3	

Variability across languages

SET 3		CORRECT RESPONSE	RESPONSE
20	Dancing – naachna	3	
21	Whistle – seeti	1	
22	Nest – ghosla	4	
23	Mountain – pahaad	2	

SET 4		CORRECT RESPONSE	RESPONSE
24	Ring – anghooti	4	
25	Branch – shaaka	4	
26	Elbow – kohni	4	
27	Feather-pankh	1	

SET 5		CORRECT RESPONSE	RESPONSE
28	Map – nakshaa	3	
29	Jewellery – zewar	1	
SET 6		CORRECT RESPONSE	RESPONSE
30	Chef – bawarchi	1	
31	Vehicle – gaadi	4	
32	Brain- dimaag	2	

Translating the BPVS

o Furthermore AoA ratings in Hindi highlighted differences between Hindi and English language acquisition

	Item	Hindi	AoA
1	ball	gend	2
2	duck	batakh	4
3	mouth	muh	1.83

Impact on diagnostic validity?

|			
38	illuminatio	roshni	2.5
39	departing	ravaana	3.16
40	trowel	kanni	7
41	coast	kinaara	3.16
42	capsules	goliyaan	2.83
43	aviation	havaa baazi	4.16

Variability across languages

Which tasks and why?

- Receptive Vocabulary - words that a person can comprehend and respond to, even if the person cannot produce those words.

- Expressive Vocabulary - words that a person can express or produce, for example, by speaking or writing.

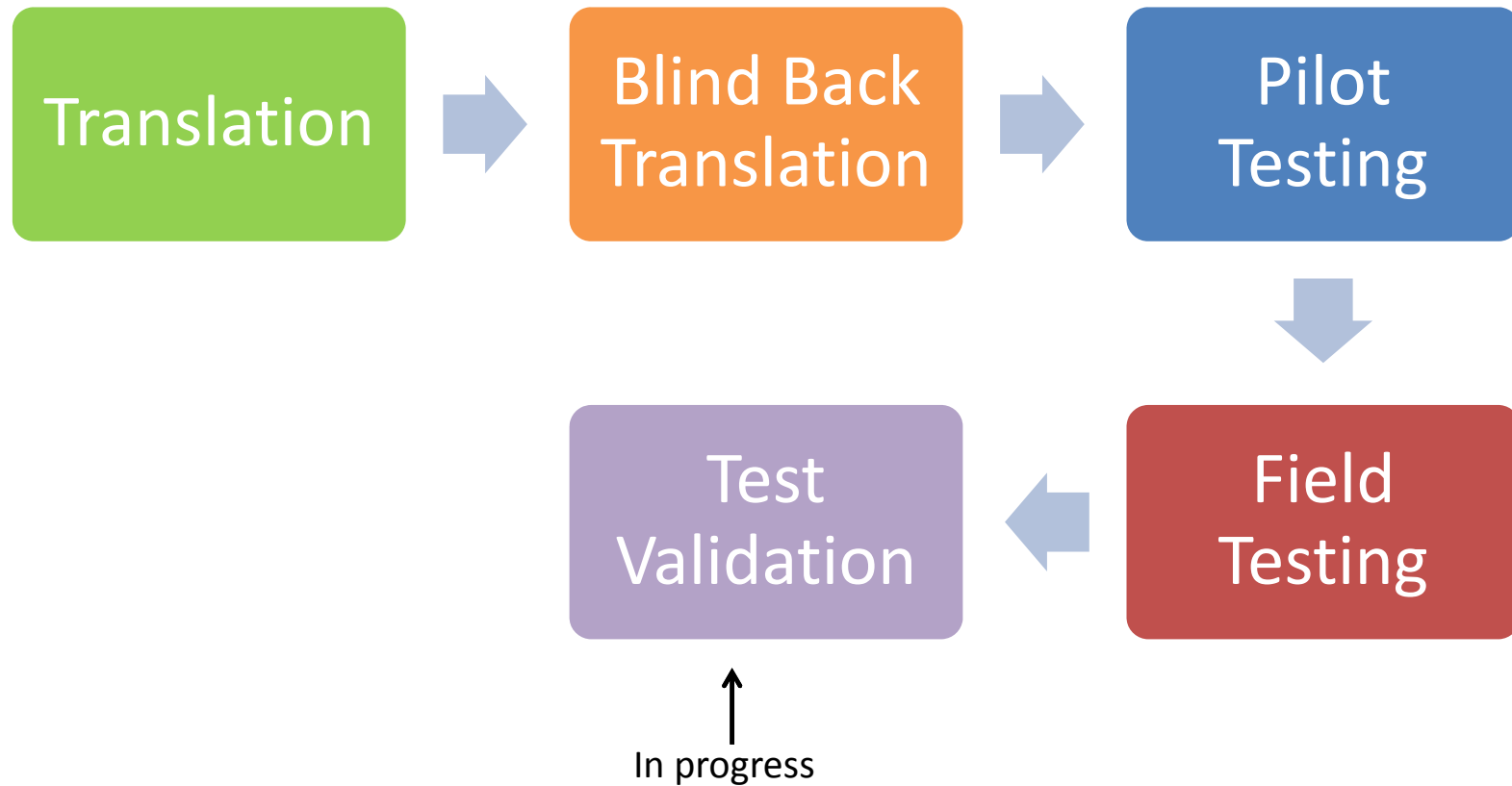- However, child may produce a word with imperfect understanding of its meaning

To understand the role each language plays in relation to cognitive and literacy development
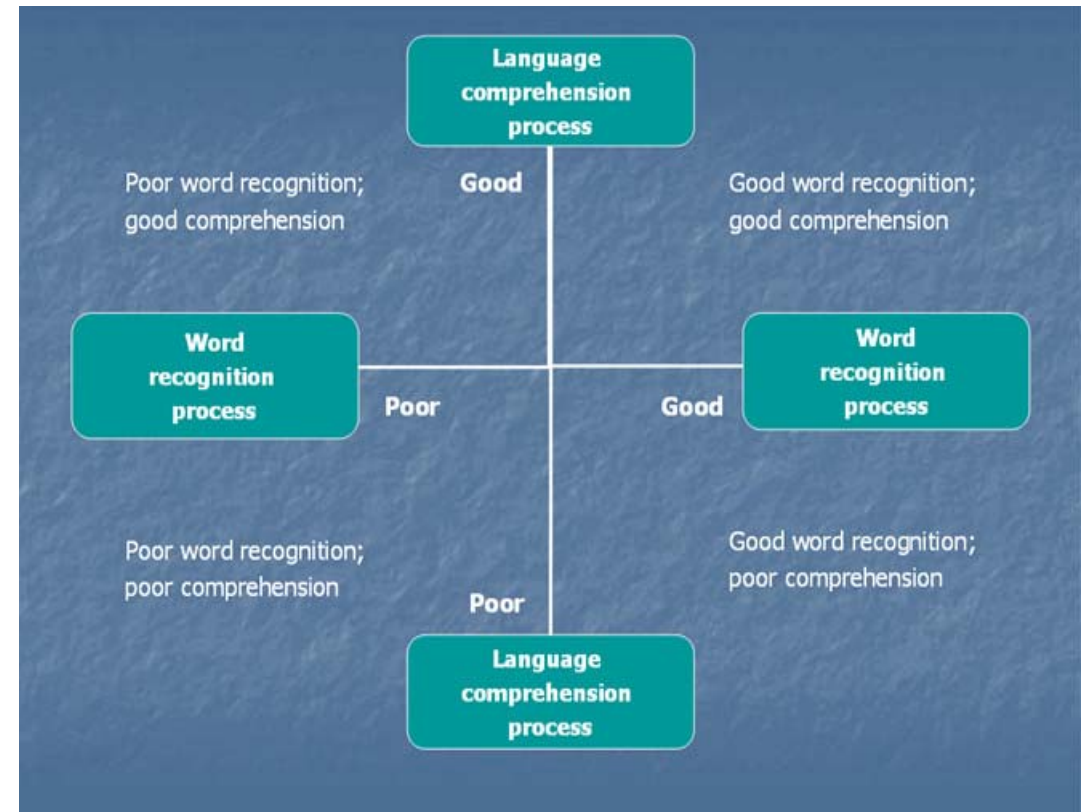
Gough & Tunmer, 1986
Reading Comprehension = Decoding X Oral Language Comprehension

Task Development

Translation → Blind Back Translation → Pilot Testing → Field Testing → Test Validation

In progress

Adapted from Bracken & Barona(1991); Gudmundsson(2009); Sousa & Rojjanasrirat(2010)

Task Development : Step 1

Translation into target language

- A corpus of English words **(1024)** (taken from Gilhooly & Logie, 1980; Masterson & Druks, 1998) were translated from English to Hindi/Urdu
    - Lack of AoA data in Hindi

- Translator was bilingual , bicultural and familiar with measurements of oral language

- Words that did not have a Hindi/Urdu equivalent were excluded.

- 146 words – 49 abstract nouns, 72 concrete nouns and 25 verbs

Task Development : Step 2

Blind Back Translation to Primary Language

- Previously translated items were back translated from Hindi/Urdu to English

- Two independent bilingual translators – Translator 1 was a native Hindi speaker with a psychology background and Translator 2 was a fluent Urdu speaker with a linguistic background

- Comparison of the 3 translated versions resulted in further loss of ambiguous and discrepant items (116 words)**(21 % loss)**

Task Development : Step 3

Pilot Testing – 19 Hindi/Urdu and English bilinguals

- Bespoke Hindi/Urdu Receptive (99 items) and Expressive tasks (116 items) were used in the pilot
    - Overlap between words in receptive and expressive tasks

- Age of Acquisition Questionnaire for all the items

- Rated how similar the speaker's pronunciation of each item was to their own for the receptive tasks

- Based on the results, items were selected based on AoA ratings and item difficulty

Example

- Items with a accuracy percentage of less than 50 % were eliminated
-
- Remaining words were arranged according AoA and item difficulty

- Receptive (20 items) and Expressive (19 items)

AoA English – 6.06 ⟶

AoA English – 2.75 ⟶

| Expressive Hindi			
Item	Hindi	AoA	Difficulties%
eye	aankh	2.33	81.25
elephant	haathi	2.66	81.25
potato	aloo	2.73	93.75
brother	bhai	2.8	68.75
nose	naak	2.8	87.5
fruit	phal	3	68.75
rain	barish	3	68.75
book	kitaab	3.06	62.5
hunger	bukh	3.13	87.5
answer	jawab	3.2	81.25
chilli	mirch	3.46	75
family	khaandan	3.53	56.25
athlete	khiladi	3.66	56.25
enemy	dushman	3.66	62.5
paper	kagaz	3.73	75
diamond	heera	3.86	50
soldier	sipahi	4	75
foreigner	pardesi	4.4	75
crime	jurm	4.73	62.5

Task Development : Step 4

Field Testing

- Translated BPVS and bespoke tests of Receptive and Expressive Vocabulary in Hindi Urdu were administered to Hindi/Urdu – English speaking bilingual children in the UK (N=104) and India (N=60)

- In the receptive task, children had to match a word that they heard to one of the 3 pictures shown to them.
    - Accuracy was scored as 1 or 0

- In the expressive task, children were given a word and asked to explain the word as best as they can.
    - All responses were recorded verbatim.
    - Scores could be 2 (accurate answer in Hindi/Urdu), 1 (accurate answer in mixed code) and 0 (inaccurate response)

Oral Language (N = 266)

BPVS: *r* = .72, *p* < .001; WASI: *r* = .55, *p* < .001; Expressive (Hindi): *r* = .25, *p* < .05
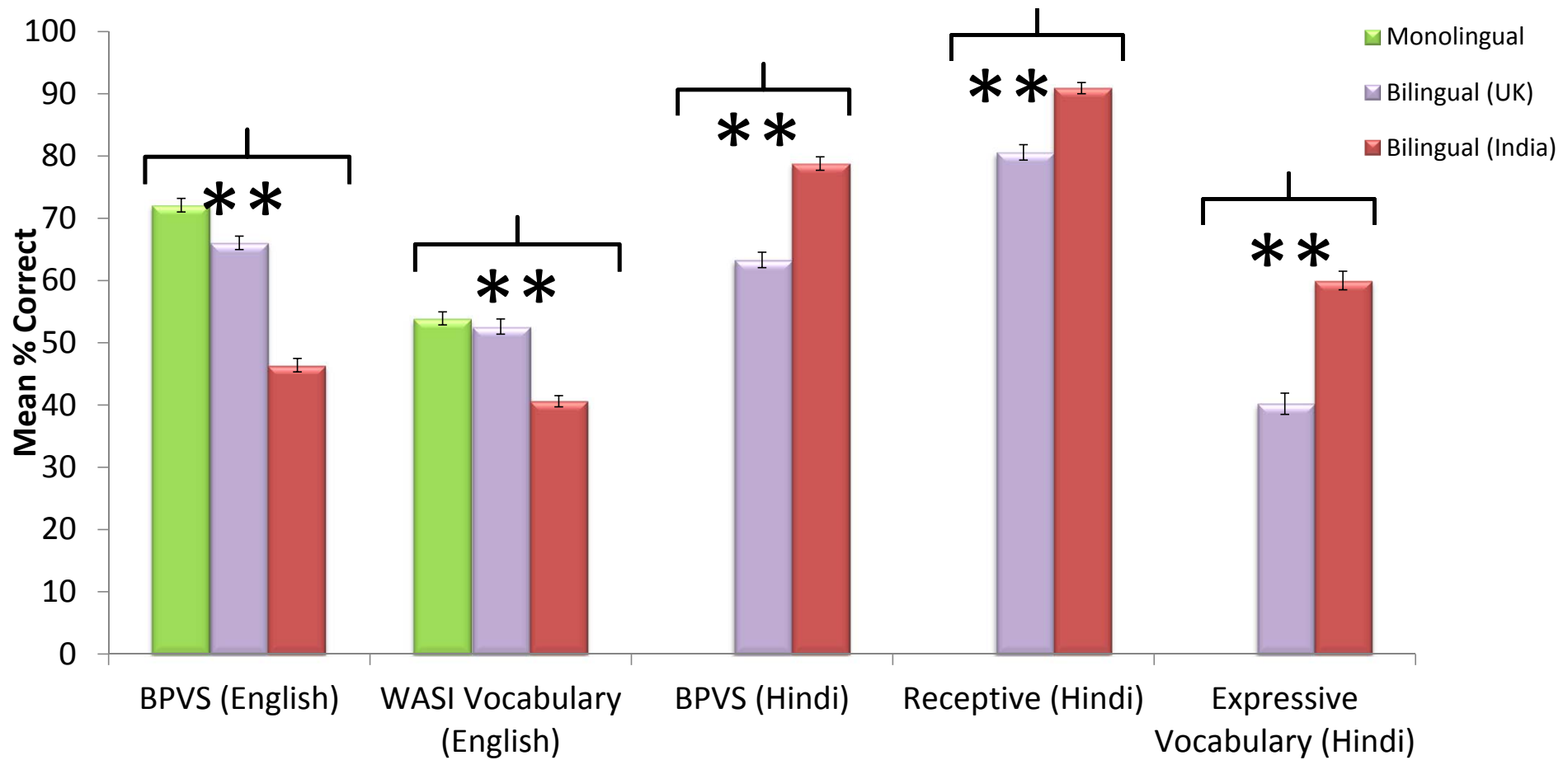
Babayigit, Warmington, Kandru-Pothineni, Clarke, & Hitch, in prep

Comments & Caveats

o Issues with direct translation

o Translation of an instrument into another language is a laborious process that involves adhering to strict guidelines for proper adaptation and validation

    o Even the use of a rigorous methodological approach to translating does not eliminate all bias

    o Often the translated version does not possess all characteristics of the original test

o In our experience, the reasons assumed for translating tests – quicker process, requires fewer resources and provides a comparable measure to the original test, do not hold

o The same amount of time and resources may be better used in empirically developing a new standardised test to measure the same construct

o The translated and bespoke tests of Hindi/Urdu vocabulary developed in this study are ideal to assess oral language skills in Hindi/Urdu speaking bilingual children as well as in selecting the appropriate bilinguals in cognitive and developmental bilingual studies. However, in order to be used in a clinical setting, the tests need to be expanded to include a larger set of items that are validated on a larger sample of bilingual children

o In view of all this, more tests need to developed in other languages and normed on diverse populations around the world to understand the linguistic, cognitive and behavioural implications of these languages and cultures

Thanks for Listening!