Multilingualism and Cognition
Challenges and controversies

"Multilingualism and Multiliteracy in primary school children in India":
Hyderabad perspective

Suvarna Alladi
National Institute of Mental Health and Neurosciences
Bangalore, India

Abhigna Reddy and team
Hyderabad

The languages of education in multilingual India: exploring effects in reading and mathematics

Shangri-La Hotel, New Delhi

12th and 13th July 2018

Greetings from Hyderabad
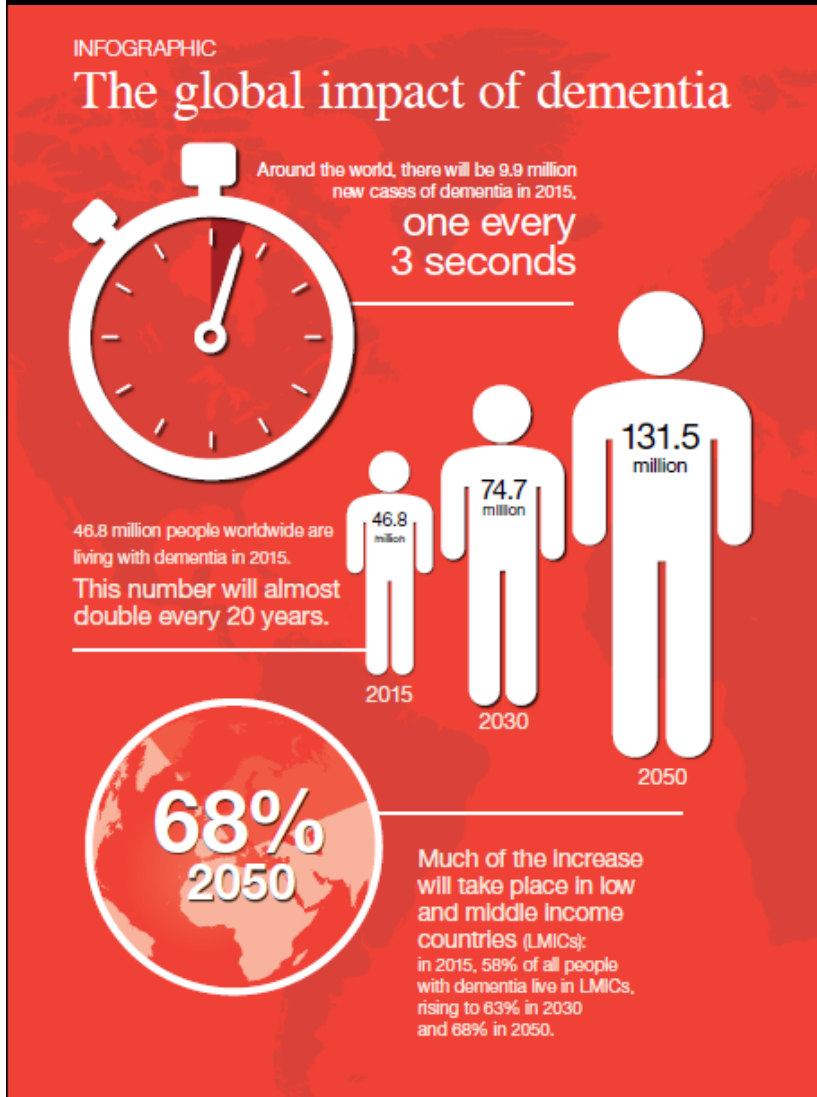

Hello
నమస్కారం
नमस्ते
آدابرز

These are the cognitive processes that break down in Hyderabadis with dementia

Rising burden of dementia

INFOGRAPHIC
The global impact of dementia

Around the world, there will be 9.9 million new cases of dementia in 2015, **one every 3 seconds**

46.8 million people worldwide are living with dementia in 2015. **This number will almost double every 20 years.**

46.8 million — 2015
74.7 million — 2030
131.5 million — 2050

68% 2050

Much of the increase will take place in low and middle income countries (LMICs): in 2015, 58% of all people with dementia live in LMICs, rising to 63% in 2030 and 68% in 2050.
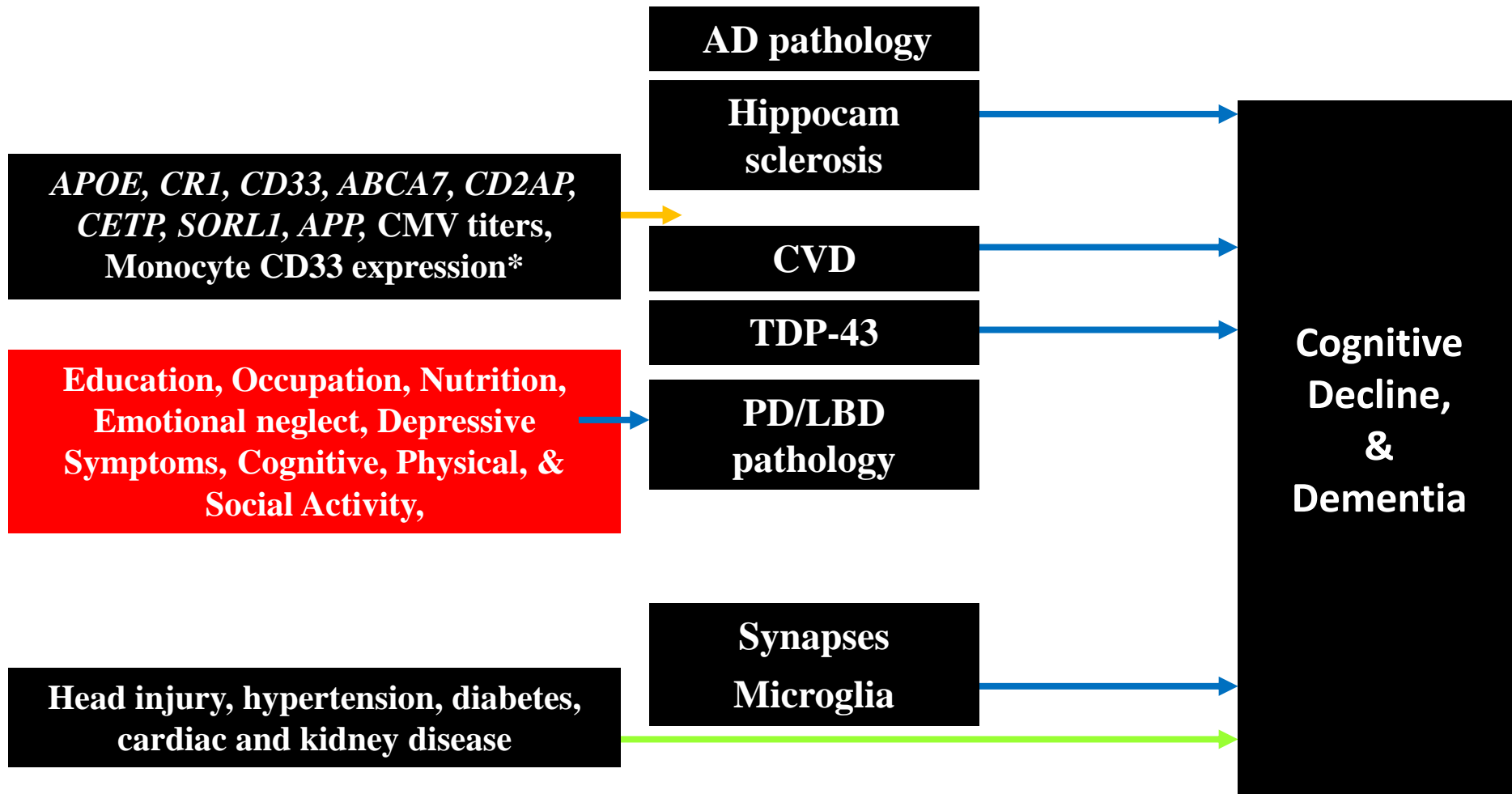
4.8 million

" Much of the increase will take place in low and middle income countries. In 2015, **58% of all people with dementia live in LMICs rising to 68% in 2050** "

Demographic transition

'Dementia is a complex disorder'

AD pathology

Hippocam sclerosis

APOE, CR1, CD33, ABCA7, CD2AP, CETP, SORL1, APP, CMV titers, Monocyte CD33 expression*

CVD

TDP-43

Education, Occupation, Nutrition, Emotional neglect, Depressive Symptoms, Cognitive, Physical, & Social Activity,

PD/LBD pathology

Cognitive Decline, & Dementia

Synapses Microglia

Head injury, hypertension, diabetes, cardiac and kidney disease

Negash, Selamawit, et al. "Cognition and neuropathology in aging: multidimensional perspectives from the Rush Religious Orders Study and Rush Memory and Aging Project." Current Alzheimer Research 8.4 (2011): 336.

Resilience against cognitive decline

- Education
- Occupational complexity
- Complex leisure activities
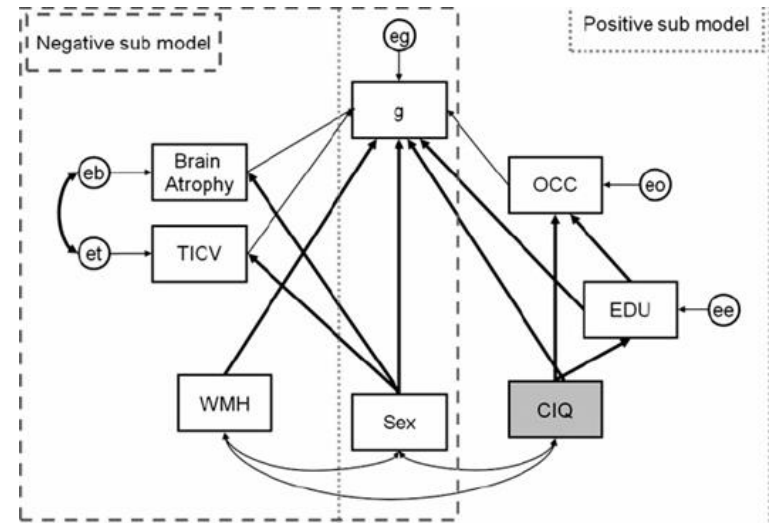- Physical activity

Cognitive reserve

The balance between cognitive reserve and brain imaging biomarkers of cerebrovascular and Alzheimer's diseases

Alison D. Murray,[1] Roger T. Staff,[1,2] Christopher J. McNeil,[1] Sima Salarirad,[1] Trevor S. Ahearn,[1] Nazahah Mustafa[1] and Lawrence J. Whalley[1]

.....and does multilingualism matter

Delaying onset of AD, Bilingualism as a form of Cognitive Reserve

Bialystok E et al , Neurology 2010

Language group	No.	Age at onset, y[a]	Age at first appointment, y[b]
Monolingual	109	72.6 (10.0)	76.5 (10.0)
Men	49	73.3 (9.4)	77.3 (8.9)
Women	60	72.1 (10.4)	75.9 (10.8)
Bilingual	102	77.7 (7.9)	80.8 (7.7)
Men	42	77.6 (7.8)	80.4 (7.8)
Women	60	77.8 (8.1)	81.1 (7.6)

But it's not all that simple

Confounding variables – Immigration, education and number of languages

Discussion forum

The healthy migrant effect may confound the link between bilingualism and delayed onset of Alzheimer's disease

*Esme Fuller-Thomson [a,*] and Diana Kuh [b]*

ORIGINAL ARTICLE

Multilingualism (But Not Always Bilingualism) Delays the Onset of Alzheimer Disease: Evidence From a Bilingual Community

Howard Chertkow, MD, FRCP (C),†‡§‖ Victor Whitehead, MA,* Natalie Phillips, PhD,*¶ Christina Wolfson, PhD,†‖# Julie Atherton, PhD,# and Howard Bergman, MD*†*

Neuropsychologia
Volume 49, Issue 14, December 2011, Pages 3826–3830
ELSEVIER
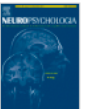
Degree of bilingualism predicts age of diagnosis of Alzheimer's disease in low-education but not in highly educated Hispanics

Tamar H. Gollan, David P. Salmon, Rosa I. Montoya, Douglas R. Galasko
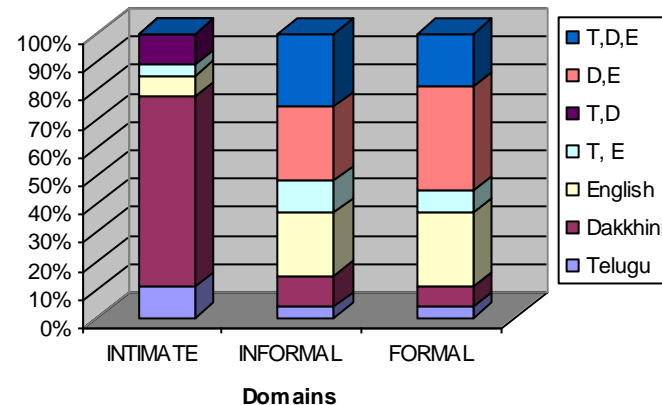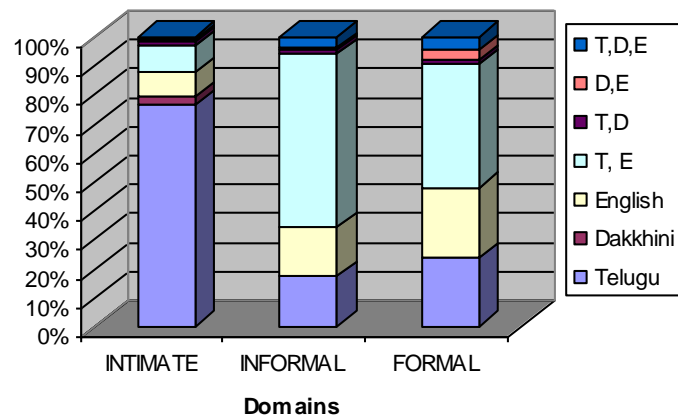
Hyderabad and Multilingualism

Telugu, Dakkhini, English are the languages spoken 78 other mother tongues

Language use questionnaire

Religion		Reported mother tongue		Self-rating of proficiency for all the four lang. Skills*			
				T,D,E	T,E	D,E	T,D
Hindu	78.0%	Telugu	82%	45%	15%	2%	35%
Muslim	16.0 %	Dakkhini	8%				
Others	6.0 %	Hindi	4%				

Vasanta D, LSCAC Proceedings, Thailand, Jan 2010, 57-67

Hyderabad Memory Clinic

Subtypes of Dementia: A Study from a Memory Clinic in India

Suvarna Alladi   Shailaja Mekala   Santhoshi Kumari Chadalawada   Sireesha Jala
Rukmini Mridula   Subhash Kaul

Nizam's Institute of Medical Sciences, Hyderabad, India

648 patients

One Language

Telugu	235
Dakkhini	8
Hindi	7
English	1
Others	6

Two Languages

Telugu and English	75
Telugu and Hindi	42
Telugu and Dakkhini	4
Hindi and English	9
Hindi and Dakkhini	13
Hindi and others	10
Telugu and others	9
English and others	8
Dakkhini and Malayalam	1

Three Languages

Telugu ,Hindi, English	116
Hindi, English and others	42
Hindi, Dakkhini and English	15
Telugu, Hindi and Dakkhini	9
Telugu, Hindi and others	7
Telugu, English and others	5
Telugu, English and Dakkhini	2
Telugu, Dakkhini and Malayalam	1
Hindi, Dakkhini and Punjabi	1

Four or more Languages

|	
Telugu, English, Hindi and others	18
Telugu, English, Hindi and Dakkhini	14
Telugu, English, Hindi Dakkhini and others	8

Bilingualism delays age at onset of dementia, independent of education and immigration status

Suvarna Alladi, DM
Thomas H. Bak, MD
Vasanta Duggirala, PhD
Bapiraju Surampudi, PhD
Mekala Shailaja, MA

ABSTRACT

Objectives: The purpose of the study was to determine the association between bilingualism and age at onset of dementia and its subtypes, taking into account potential confounding factors.

Methods: Case records of 648 patients with dementia (391 of them bilingual) diagnosed in a specialist clinic were reviewed. The age at onset of first symptoms was compared between monolin-
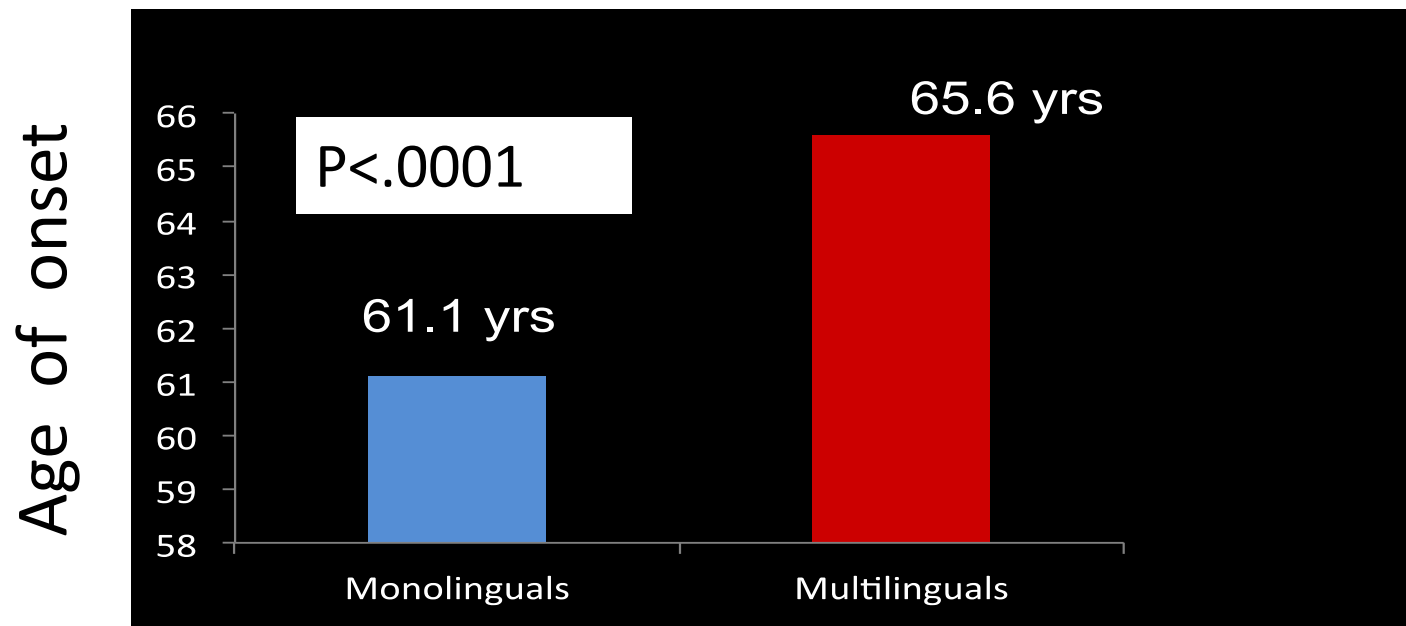
Speaking More Than One Language Could Delay The Onset Of Dementia, Study Says

Charles Catania - 06 November 2013 21:10

THE HINDU

腾讯科技

掌握第二种语言可以保护大脑远离痴呆

腾讯科学 2013年11月08日 07:52
分享

[导读]用印度语如何说"让我远离痴呆"？这或许是值得学习的，因为一项最新研究表明，掌握两种语言能够防止认知减退和痴呆。

elEconomista.es
Jueves, 7 de Noviembre de 2013 Actualizado a las 11:52

Hablar un segundo idioma puede retrasar la aparición del Alzheimer y otras demencias

Europa Press | 7/11/2013 - 11:52

LIVE World's Newsroom

BBC World News Karin Giannone in the World's Newsroom

IMPACT
DELAYING DEMENTIA
Study the largest to date, involving 648 people from India

BBC WORLD NEWS orld AND @bbcbreaking   HEADLINES   IRAN'S SUPREME L

BBC WORLD NEWS

Bandhishola Ro
கிராண்டப் ச
Granduff
Pleasant Road
Road
பெட்டோம்
Beddom
விஸ்டேல் சாலை
avisdale Road

Prof Mortimer's response

Published December 4, 2013

Bilingualism delays age at onset of dementia, independent of education and immigration status

James A. Mortimer, Professor

Department of Epidemiology and Biostatistics, University of South Florida

From their study of 648 patients with dementia in a clinic in India, Alladi et al. concluded that bilingualism leads to a delay in onset age of dementia compared with monolingualism. [1]

The data are not sufficient to draw this conclusion.

Age of onset studies conducted in a single disease group (case-only studies) are unable to show associations with risk factors for a simple reason: the age of onset depends on the age distributions of the groups from which the participants are selected in the source population. If monolingual persons die at a younger age on average than their higher educated bilingual counterparts, then the mean age of monolingual people in the source population will be lower than that of bilingual people.

Our reply

WHY RURAL DWELLING DOES NOT MATTER, BUT THE TYPE OF DEMENTIA DOES - A RESPONSE TO MORTIMER

Suvarna Alladi, Additional Professor; Thomas H Bak, Edinburgh, UK; Tom C Russ, Edinburgh, UK; Mekala Shailaja, Hyderabad, India; Vasanta Duggirala,

Hyderabad, India. Nizam's Institute of Medical Sciences

Dr. Mortimer raises the important issue of confounding variables, which are relevant to all observational studies. Our study controlled for them [1] to a higher degree than others have. We succeeded in eliminating the immigration confound. We also examined illiterate mono- and bilinguals separately and found an even larger difference than among literates.

Only illiterates (59 vs 65 years p<0.01)

Only rural (56.2 vs 60.9 years p<0.01)

Mon...   Biling
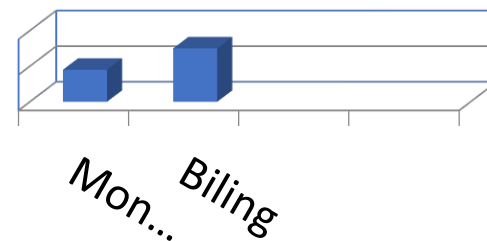
Controversies……

- Mixed results from dementia studies
- Variable definitions of multilingualism
- Confounding variables and reverse causality
- Differential cognitive effects of bilingualism

Multilingualism does not always protect: US studies

Bilingualism Does Not Alter Cognitive Decline or Dementia Risk among Spanish-Speaking Immigrants

Laura B. Zahodne,

Degree of bilingualism predicts age of diagnosis of Alzheimer's disease in low-education but not in highly educated Hispanics

Tamar H. Gollan, David P. Salmon, Rosa I. Montoya, Douglas R. Galasko

Multilingualism protective in European studies

4.6 year delay in age at onset and 4.8 years delay in diagnosis of AD in Dutch-French bilinguals in Ghent, Belgium

Woumans 2015

A low prevalence of dementia in Luxembourg elders with high cognitive reserve due to multilingualism

Perquin 2015

Bilingualism lead to a better cognitive function at age 73, than could be predicted from their performance at age 11- Lothian birth cohort

Bak 2014

Impact of Bilingualism on Cognitive Outcome After Stroke

Suvarna Alladi, DM; Thomas H. Bak, MD; Shailaja Mekala, PhD; Amulya Rajan, MA;
Jaydip Ray Chaudhuri, DM; Eneida Mioshi, PhD; Rajesh Krovvidi, DM;
Bapiraju Surampudi, PhD; Vasanta Duggirala, PhD; Subhash Kaul, DM

	Monolinguals (n=225,41.6%)	Bilinguals (n=316,58.4%)	P
ACE-R	72.3 (19.5)	79.1 (17.5)	<0.0001[b]
Attention & Orientation	14.4 (3.6)	16.0 (3.1)	<0.0001[b]
Memory	19.0 (5.5)	20.4 (5.4)	0.011
Fluency	7.0 (3.4)	7.8 (3.5)	0.006[b]
Language	23.2 (4.3)	23.8 (4.2)	0.182
Visuospatial	12.2 (3.9)	13.4 (3.7)	0.001[b]

Following Bonferroni correction for 6 multiple regression tests, p<0.008 was considered a significant P value

Hello

Namaste

NPG

> India offers a unique opportunity to study bilingualism and its influence on cognition

Nature Reviews Neurology | Published online 16 Dec 2015
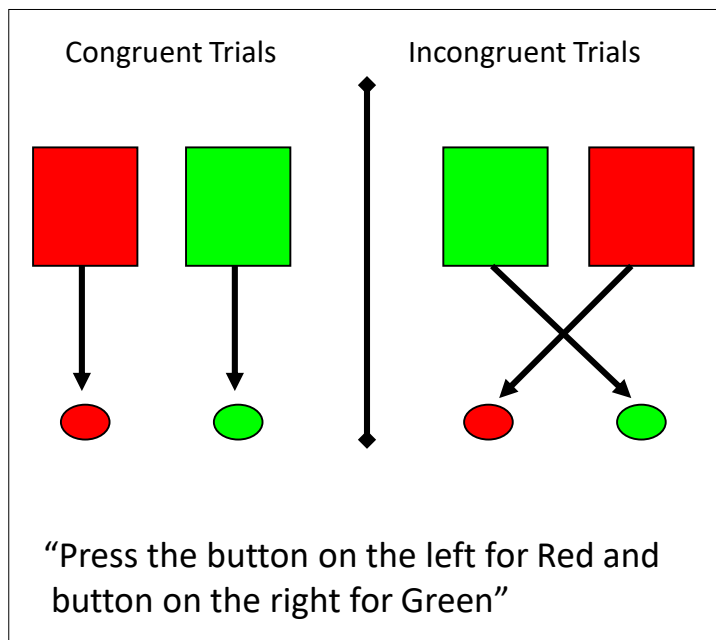
Cognitive effects of Multilingualism

"Skilled bilinguals rarely make the error of speaking the wrong language yet they often code switch with other similar bilinguals in the middle of a sentence, suggesting that they possess an exquisite mechanism of cognitive control."

Grosjean 2004

A life of resolving cross-language competition appears to confer a range of positive consequences for cognition and changes to the brain networks that reflect the way in which control mechanisms are engaged

The Simon Task

Kroll and Bialystok 2013

Congruent Trials   Incongruent Trials

"Press the button on the left for Red and button on the right for Green"

Bialystok et al. (2005)
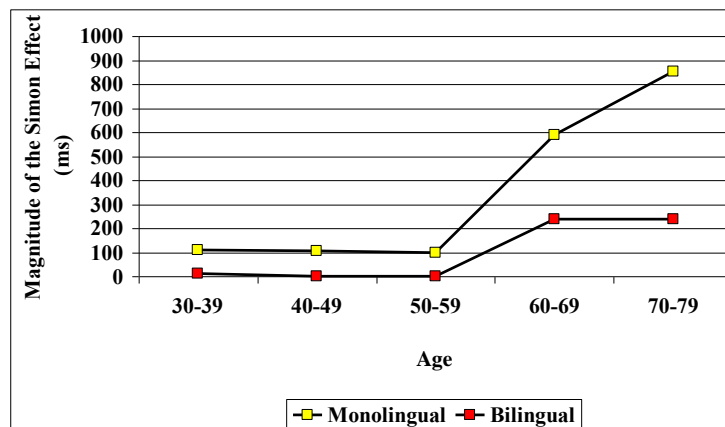
- Bilingual 4 year olds outperformed monolinguals on both congruent and incongruent trials.

- These results suggest that bilingualism enhances inhibitory control
- Protects bilingual older adults from the decline of these processes with ageing

Bilingualism and executive functions

Bilinguals performed better on TMT (A & B) and global-local tasks than monolinguals.

Trail Making Test – A and B
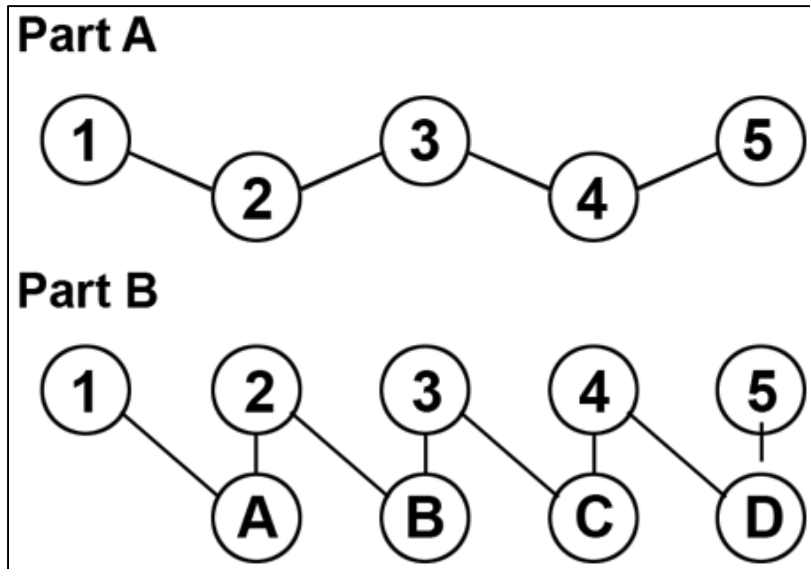
Global-Local Tasks
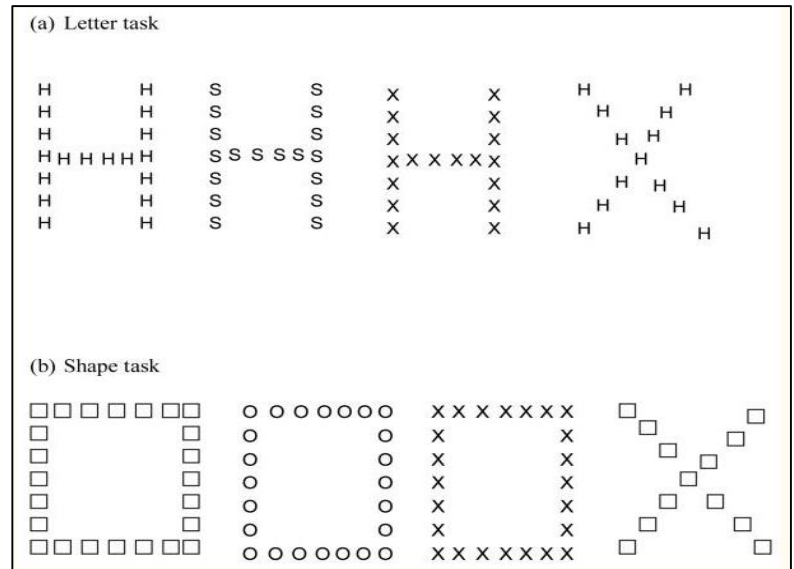
Global: Respond to bigger letters and shapes
Local: Respond to smaller letters and shapes

Bilingual children scored lower on verbal fluency and vocabulary tests

Peabody Picture Vocabulary Test - PPVT

Is there a neural basis of the bilingual effect

Neuropsychologia

Bilingualism provides a neural reserve for aging populations

Jubin Abutalebi [a,b,*], Lucia Guidi [b,c], Virginia Borsa [b], Matteo Canini [b,d], Pasquale A. Della Rosa [d], Ben A. Parris [e], Brendan S. Weekes [a]
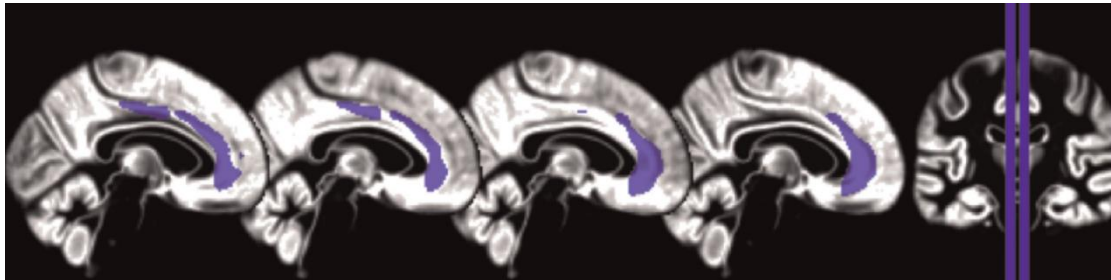
Research report

Bilingualism as a contributor to cognitive reserve: Evidence from brain atrophy in Alzheimer's disease

Tom A. Schweizer [a,b,c,*], Jenna Ware [b], Corinne E. Fischer [a,d], Fergus I.M. Craik [e,f] and Ellen Bialystok [e,g]

Bilingualism and Cognitive Decline: A Story of Pride and Prejudice

- "Public health policy should remove recommendations regarding bilingualism as a strategy to delay dementia"

- "If the entire relevant literature is considered, it becomes clear that there is considerable empirical support for a bilingual effect on dementia, of a size to which no pharmacologic intervention can yet aspire"

Woumans et al, Journal of Alzheimer's disease Aug 2017

World dementia

One approach does not fit all

Suvarna Alladi, DM, and Vladimir Hachinski, MD, DSc

World Brain Alliance: United Nations' resolution 2015

- There is no health without brain health.
- Brain health begins with the mother and the child and their education.
- Our brains are our future.

Alladi and Hachinski et al 2018

"Multilingualism and Multiliteracy in primary school children in India":
Preliminary data analysis from Hyderabad

TEAM HYDERABAD
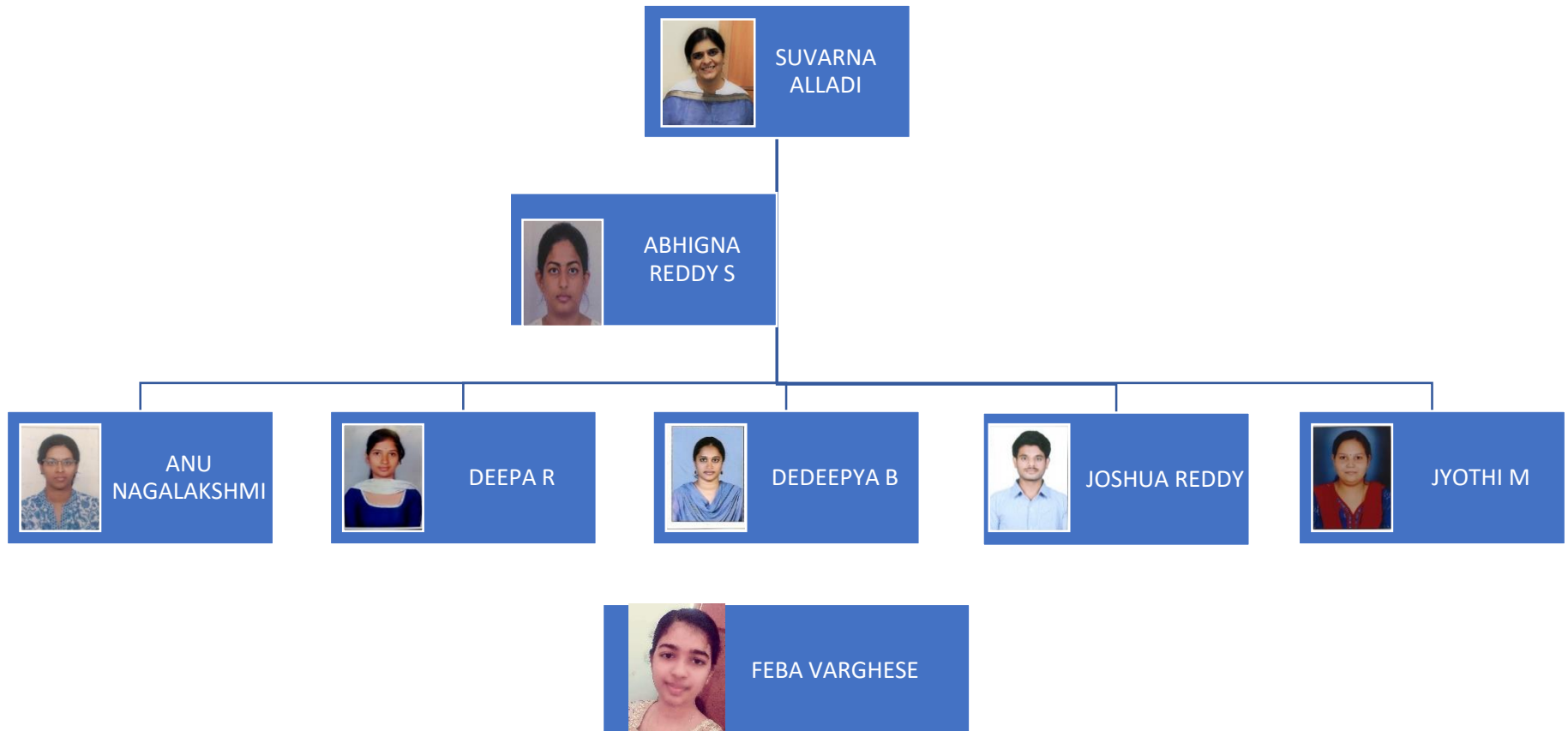
At the beginning

"The project started off initially by meeting educational commissioner Mr. G Kishan who was very supportive and encouraged us to work by giving permission and list of all primary schools in Hyderabad and Ranga Reddy Districts. From the list I sorted out English and Telugu medium schools, later with the permission letter from the commissioner contacted various school principals and teachers to start our data collection who were very supportive and interested to know about the project. They gave us lot of insight on the academic schedule of schools, children's background facilitating data collection strategy.

I had two workshops one at Delhi and other in Hyderabad, trained remaining 5 RA's. Once I got the permissions from schools distributed the schools among other RA's from the team for data collection. Each day was a new experience with kids in the schools, they were super-talented and very enthusiastic in doing the tasks. Teachers were very supportive in allowing us for classroom observations.

-----------------*Abhigna*

RA responsibilities

Pre-data collection phase

1. Establish contact with schools, teachers and children
2. Categorize them according to the independent variables to be included (slum/non-slum; English medium/Regional medium; boys/girls)

Data collection phase

1. Task familiarization with subjects (children, teachers, head teachers)
2. Task administration
3. Data input (hard copy/soft copy) and uploading on the central database (psychopy manual)

Post data collection phase

1. Collating data and summarizing trends (SPSS)

Demographic characteristics of cohort

Number	461 (Target 400)
Boys: Girls	208 :253
Location of school	241 (Slum): 220 (Non slum)
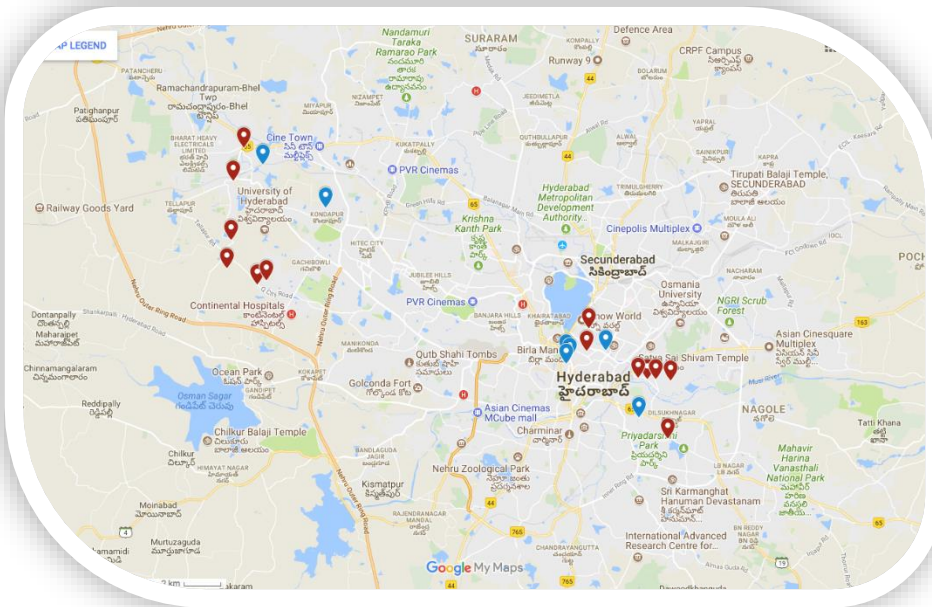
List of schools in Hyderabad

S.No.	SCHOOL ID	SLUM/NON-SLUM	MEDIUM
1	2111	slum	English
2	2222	non-slum	Telugu
3	2223	non-slum	Telugu
4	2214	non-slum	English
5	2125	Slum	Telugu
6	2126	slum	Telugu
7	2227	non-slum	Telugu
8	2128	Slum	Telugu
9	2219	non-slum	English
10	21210	Slum	Telugu
11	22211	non-slum	Telugu
12	21212	slum	Telugu
13	22113	non-slum	English
14	22214	non-slum	Telugu
15	21115	slum	English
16	21216	non-slum	Telugu
17	22117	non-slum	English
18	22218	non-slum	Telugu
19	21119	slum	English
20	22220	slum	Telugu

Medium of Instruction
English vs Telugu

School profile

Student profile

schools english 46%

schools telugu 54%
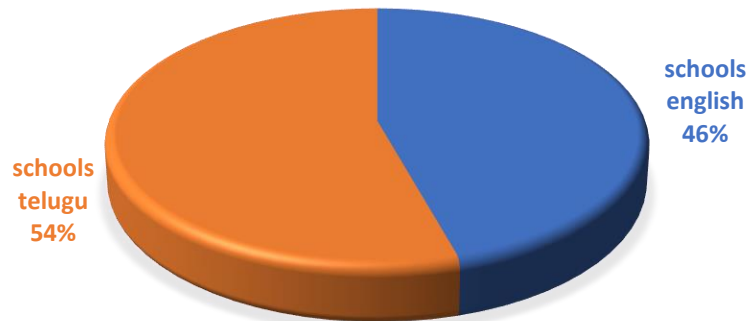
English 38%
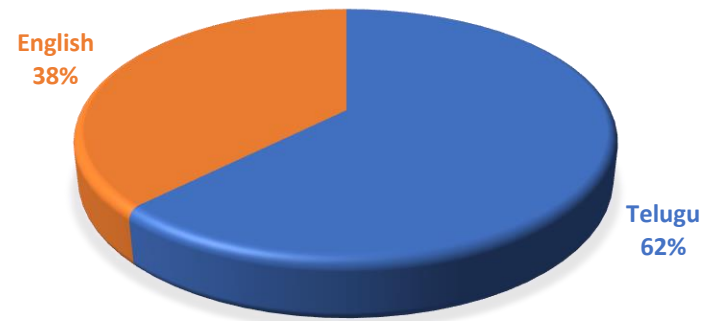
Telugu 62%

Medium of Instruction in Slum and Non Slum areas

Telugu Medium Schools

English Medium Schools

telugu non-slum 45%

telugu slum 55%

english slum 44%

english non-slum 56%
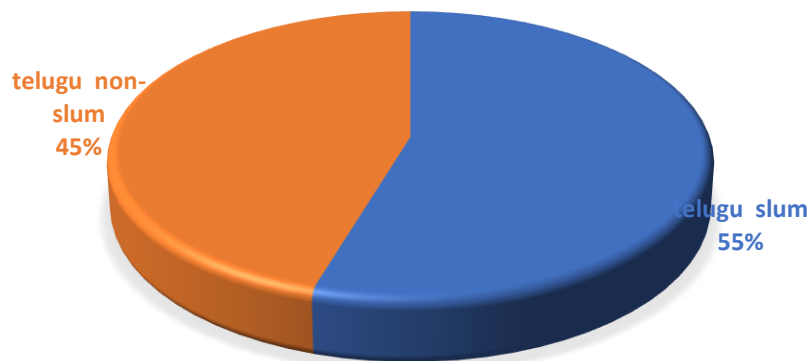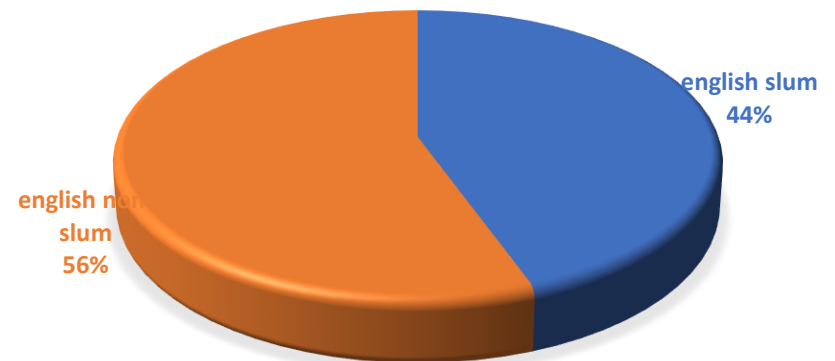
Language distribution among students

1. TELUGU: 310
2. HINDI: 40
3. MARATHI: 15
4. KANNADA: 23
5. URDU: 24
6. LAMBADI: 40
7. NEPALI: 1
8. VODDERA: 1
9. BIHARI: 3
10. ORIYA: 1
11. TAMIL: 1
12. GUJARATHI: 2

Tests

Raven's coloured progressive matrices

General Intelligence

Literacy and Fluency tests

ASER

LANGUAGE READING TEST: Letters

1.1 Name of Research Assistant:	1.4 Date of Test DoT: / /
1.2 Child's ID Number CID:	1.5 Start time STIME: [hr]: [min]
1.3 School ID Number SID:	1.6 End time ETIME: [hr]: [min]

Letter

e d w
s c
g h z
i q

1.9 Total number of correctly read letters by the child: _____
Total number of task letters: 10

LANGUAGE READING TEST: Words

Word

ring   sun
     ball
cold   king
clap   foot
     fan
girl   crow

2.1 Words read by child
1. ring (1=read corr
2. sum (1=read corr
3. ball (1=read corr
4. cold (1=read corr
5. king (1=read corr
6. clap (1=read corr
7. foot (1=read corr
8. fan (1=read corr
9. girl (1=read corr
10. crow (1=read corr

2.2 Total number of words identified by the child: _____
Total number of task words: 10

LANGUAGE READING TEST: Paragraph

Para

In front of my house is a hill.
It has a forest.
We play on the hill.
We hide behind the trees.

3.1 Total number of errors (or words read incorrectly) made by the child: _____ / 22 words

3.2 No. of sentences read correctly by the child: _____
Total no. of sentences in the task: 4

LANGUAGE READING TEST: Story

Story

A big tree stood in a garden. It was alone and lonely. One day a bird came and sat on it. The bird held a seed in its beak. It dropped the seed near the tree. A small plant grew there. Soon there was another tree. The big tree was happy.
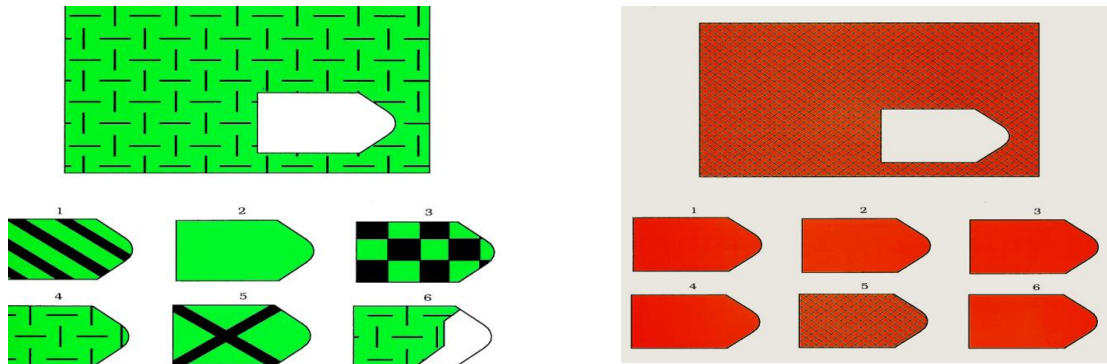
4.1 Comprehension questions:
Q.1 How did the small plant grow near the tree?
Q. 2 Why was the big tree happy?

4.2 No. of sentences read correctly by the child: _____
Total no. of sentences in the task: 8

4.3 Total no. of errors: _____ / Total no. of words: _YL_

SEMANTIC FLUENCY

Semantic Fluency Task

RA ID:	
Child's ID:	
School ID	

Nos.	School language (Day 1) Date:		Home language (Day 2) Date:	
	Living (ANIMAL)	Non-living (FRUITS)	Living (BIRDS)	Non-living (HOUSEHOLD OBJECTS)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Audio Recording done: Yes/NO

Math tests - Numeracy

NUMBER RECOGNITION

SUBTRACTION/DIVISION

Math tests – Reasoning

WORD PROBLEMS

NUMERACY 2: WORD PROBLEMS

1.1 Class, & Section: Std 4 - Section _____	1.2 Date of Task: ____/____/_____

1.3 Name of Student:		1.4 Name of School:	

Task instructions:
Please give one correct answer for every question. Feel free to do your working around the sheet. Once you have completed the test, please hand these sheets back to the Research Assistant.

Image 1
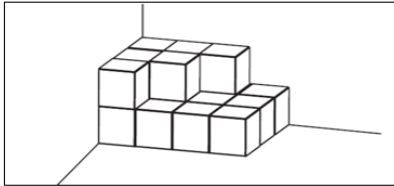
Question 1:
Sita stacks the boxes (image 1) in the corner of the room. All boxes are the same size. How many boxes has she used, in total? [Please tick/circle]

A 25

B 19

C 18

D 13

QUESTION 2
Kerosene comes in 5 litre cans. Ashoka needs 17 litres of kerosene for the household. How many cans must he buy? [Please tick/circle correct answer]

A 5   B 2   C 8   D 4

QUESTION 3
Zarin has these cards (see image 2 below) with numbers on them. What is the smallest three digit number she can show with the cards? She may use each card only once.

Image 2

1   8   6   5   2   Answer: _____

QUESTION 4
If the pattern 3, 6, 9, 12 were to be continued, which of the numbers (given below) could be one of the numbers?
[Please tick/circle correct answer]

A 26   B 27   C 28   D 29

QUESTION 5
Adil went to buy some apples from the bazaar. The shopkeeper put the apples on the weighing scale to calculate the price. How much do the apples weigh in grams, as shown in the scale (image 3) below?

Image 3
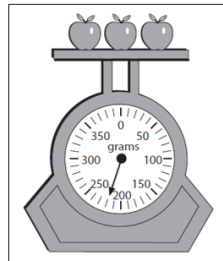
Answer: _____

QUESTION 6
Rahim and Gaurav are playing a game. The object of the game is to get the highest total of points.

The chart below shows how many points they scored.

Player	Rahim	Gaurav
Round 1	125	100
Round 2	125	125
Round 3	150	100
Round 4	50	150

Who won and by how many points? (Please tick your answer)

A) Gaurav won by 25 points
B) Gaurav won by 100 points
C) Rahim won by 25 points
D) Rahim won by 175 points

Math tests – Reasoning

META MATHS

University of Reading

NUMERACY 1: META-MATHS

1.1 Class & Section: Std 4 - Sec_____   1.2 Date of Task: ____/ _____/ _____

1.3 ID of Student:	
1.4 ID of School:	

Note on Task:
The task requires you to look at some problems solved by other children, and decide if their responses are correct or not. Please give your answers in the spaces given below. When you have finished please hand back the sheets to the Research Assistant. Thank you for your time!

Task sheet uploaded by (Signature): _____   Checked by (Signature): _____

QUESTION 1
Here is how Nita solves two addition problems.

```
        49            27
       +33            +9
     ----------    ----------
       712           216
```

1. Nita doesn't know how to add numbers.
2. Nita doesn't know place value and carry forward values.
3. Nita was not attentive.
4. I don't know.
5. Any other.

QUESTION 2
Here is how another child, Iqbal solves two subtraction problems given to him by his teacher.

```
        22            27
       -18            -9
     ----------    ----------
        16            22
```

Do you think that the problems are solved correctly? If not, why is Iqbal wrong in his responses?

1. Iqbal doesn't know how to subtract numbers.
2. Iqbal doesn't know place value and borrowing of values.
3. Iqbal was not attentive.
4. I don't know.
5. Any other.

QUESTION 3
Here is a page from Seema's math notebook.

```
5 x 4 = 9
3 x 2 = 5
4 x 2 = 6
```

Why does Seema make these mistakes?

1. Seema doesn't know how to multiply.
2. Seema mistook multiplication symbol for addition.
3. Seema was not attentive.
4. I don't know.
5. Any other.

2

MATHS ANXIETY

NUMERACY 2: MATHEMATICS ANXIETY SCALE

1.1 Class & Section: Std 4 - Section _____   1.2 Date of Task: ___/ ___/_____

1.3 Name of Student:		1.4 Name of School:	

1.9 Anxiety Scale	Low anxiety	Some anxiety	Moderate anxiety	Quite a bit of anxiety	High anxiety
1. Having to complete a worksheet by yourself.	☺	☺	☺	☺	☹
2. Thinking about a maths test the day before you take it.	☺	☺	☺	☺	☹
3. Watching the teacher work out a maths problem on the board.	☺	☺	☺	☺	☹
4. Taking a maths test.	☺	☺	☺	☺	☹
5. Being given maths homework with lots of difficult questions that you have to hand in the next day.	☺	☺	☺	☺	☹
6. Listening to the teacher talk for a long time in maths.	☺	☺	☺	☺	☹
7. Listening to another child in your class explain a maths problem.	☺	☺	☺	☺	☹
8. Finding out you are going to have a surprise maths quiz when you start your maths lesson.	☺	☺	☺	☺	☹
9. Starting a new topic in maths.	☺	☺	☺	☺	☺

Thank you!

OVERALL SCORES

TEST	n	MEAN ± S.D
ASER ENGLISH	461	58.75 ± 27.20
META MATHS	440	59.18 ± 37.08
WORD PROBLEM	461	36.01 ± 19.72
DIVISION/SUBTRACTION	458	27.41 ± 26.21
NUMBER RECOGNITION	461	91.60 ± 25.28
MATHS ANXIETY	461	52.01 ± 18.31
RAVEN'S	461	16.50 ± 5.68

Correlation between Literacy, Numeracy and General Intelligence

- General Intelligence correlated significantly with numeracy, math reasoning, literacy and fluencies

- Literacy correlated significantly with numeracy, math reasoning

SLUM vs NON-SLUM

TEST	SLUM(243)	NON-SLUM(218)	P VALUE
ASER ENGLISH	56.03 ± 27.10	61.79 ± 27.06	0.023
META MATHS	56.25 ± 37.35	62.64 ± 36.55	0.071
WORD PROBLEM	36.21± 20.12	35.78 ± 19.31	0.814
DIVISION/SUBTRACTION	18.94 ± 17.41	36.92 ± 30.81	<0.001
NUMBER RECOGNITION	87.68 ± 30.49	95.975 ± 16.80	<0.001
MATHS ANXIETY	51.88 ± 19.49	52.16 ± 16.54	0.868
RAVEN'S	16.42 ± 5.71	16.59 ± 5.66	0.775
SEMANTIC FLUENCY - RESPONSE IN ENGLISH			
LIVING THINGS	7.32 ± 2.75	7.49 ± 2.61	0.492
NON-LIVING THINGS	7.31 ± 2.60	7.41 ± 2.21	0.659
SEMANTIC FLUENCY - RESPONSE IN TELUGU			
LIVING THINGS	5.47 ± 2.34	5.25 ± 2.38	0.331
NON-LIVING THINGS	8.30 ± 3.15	7.84 ± 2.91	0.12

BOYS vs GIRLS

TEST	GIRLS(257)	BOYS(204)	P VALUE
ASER ENGLISH	59.81 ± 28.15	57.43 ± 25.97	0.351
META MATHS	56.54 ± 37.35	62.50 ± 36.56	0.094
WORD PROBLEM	34.89 ± 19.59	37.42 ± 19.84	0.172
DIVISION SUBTRACTION	26.01 ± 25.28	29.19 ± 27.31	0.198
NUMBER RECOGNITION	91.25 ± 25.50	92.05 ± 25.08	0.738
MATHS ANXIETY	51.60 ± 17.27	52.54 ± 19.20	0.58
RAVEN'S	16.51 ± 5.77	16.48 ± 5.57	0.95
SEMANTIC FLUENCY - RESPONSE IN ENGLISH			
LIVING THINGS	7.35 ± 2.66	7.45 ± 2.71	0.717
NON-LIVING THINGS	7.44 ± 2.52	7.25 ± 2.30	0.387
SEMANTIC FLUENCY - RESPONSE IN TELUGU			
LIVING THINGS	5.26 ± 2.47	5.49 ± 2.21	0.31
NON-LIVING THINGS	8.17 ± 3.15	7.98 ± 3.22	0.522

ENGLISH MEDIUM vs TELUGU MEDIUM

TEST	ENGLISH (175)	TELUGU (286)	P VALUE
ASER ENGLISH	73.53 ± 22.49	49.71 ± 25.88	< 0.001
META MATHS	59.49 ± 34.07	58.99 ± 38.92	0.89
WORD PROBLEM	33.90 ± 19.48	37.30 ± 19.79	0.072
SUBTRACTION	32.76 ± 31.43	35.76 ± 32.86	0.451
DIVISION	35.76 ± 32.86	33.26 ± 19.43	0.336
NUMBER RECOGNITION	85.52 ± 32.88	95.32 ± 18.32	< 0.001
MATHS ANXIETY	49.37 ± 15.93	53.63 ± 19.21	0.01
RAVEN'S	16.70 ± 6.39	16.38 ± 5.21	0.558
SEMANTIC FLUENCY - RESPONSE IN ENGLISH			
LIVING THINGS	8.06 ± 2.48	6.99 ± 2.72	<0.001
NON-LIVING THINGS	7.77 ± 2.36	7.09 ± 2.43	0.002
SEMANTIC FLUENCY - RESPONSE IN TELUGU			
LIVING THINGS	5.42 ± 2.45	5.31 ± 2.28	0.601

Home Language vs Medium of Instruction

HOME LANGUAGE	SCHOOL LANGUAGE	NUMBER
TELUGU	TELUGU	225
TELUGU	ENGLISH	74
NON-TELUGU	TELUGU	61
NON-TELUGU	ENGLISH	101

MOTHER TONGUE NOT SIMILAR TO SCHOOL LANGUAGE…

MOTHER TONGUE SIMILAR TO SCHOOL LANGUAG…
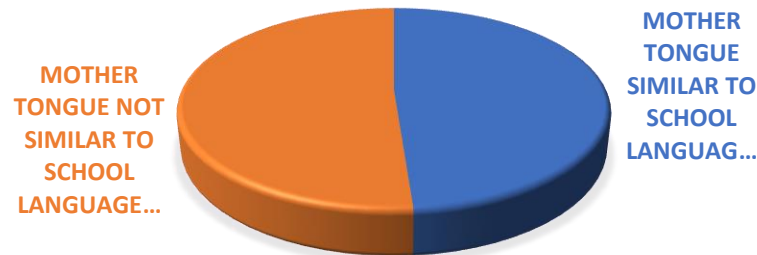
HOME LANGUAGE
SAME vs DIFFERENT FROM MEDIUM OF INSTRUCTION

TEST	HOME LANGUAGE SAME AS MEDIUM (225)	HOME LANGUAGE DIFFERENT FROM MEDIUM(236)	P VALUE
ASER ENGLISH	48.94 ± 26.15	68.11 ± 24.82	< 0.001
META MATH	59.06 ± 38.63	59.30 ± 35.67	0.946
WORD PROBLEM	37.63 ± 20.01	34.46 ± 19.35	0.085
SUBTRACTION	28.37 ± 19.51	30.17 ± 30.52	0.322
DIVISION	22.42 ± 19.51	24.17 ± 30.52	0.226
NUMBER RECOGNITION	96.25 ± 16.26	87.17 ± 30.97	< 0.001
MATH ANXIETY	54.40 ± 19.67	49.74 ± 16.26	0.006
IQ	16.20 ± 5.05	16.79 ± 6.22	0.293
SEMANTIC FLUENCY - RESPONSE IN ENGLISH			
LIVING THINGS	7.02 ± 2.81	7.75 ± 2.50	0.003
NON-LIVING THINGS	7.15 ± 2.55	7.54 ± 2.29	0.087
SEMANTIC FLUENCY - RESPONSE IN TELUGU			
LIVING THINGS	5.56 ± 2.19	5.18 ± 2.50	0.252
NON-LIVING THINGS	7.80 ± 3.31	8.35 ± 3.04	0.244

General Linear Model to study factors affecting performance on tests

TEST	GENDER	MEDIUM OF INSTRUCTION	SLUM vs NON-SLUM	HOME LANGUAGE	HOME LANGUAGE =/≠ MEDIUM OF INSTRUCTION
ASER English		English better than Telugu			Students with medium of instruction different from home language better than students with same medium of instruction
Meta math	Boys better than girls		Non-slum better than slum		
Word problem		Telugu better than English (trend)			
Division/subtraction	Boys better than girls		Non-slum better than slum (trend)		
Number recognition		Telugu better than English (trend)	Non-slum better than slum (trend)		
Math anxiety				Telugu, Hindi, Marathi more anxiety.	
Raven's					Students with medium of instruction different from home language better than students with same medium of instruction

General Linear Model to study factors affecting performance on tests

TEST	GENDER	MEDIUM OF INSTRUCTION	SLUM vs NON-SLUM	HOME LANGUAGE	HOME LANGUAGE =/≠ MEDIUM OF INSTRUCTION
SEMANTIC FLUENCY - RESPONSE IN ENGLISH					
Living things				Telugu and Urdu better compared to other languages.	
Non-living things		English better than Telugu			
SEMANTIC FLUENCY - RESPONSE IN TELUGU					
Living things		Telugu better than English (trend)		Telugu and Urdu better compared to other languages	
Non-living things		Telugu better than English(trend)			

Preliminary observations

- English medium of instruction associated with better scores on English ASER and Semantic fluency in English

- Telugu medium of instruction associated better scores on number recognition, word problems and fluency in Telugu

- Male gender and children living in non-slum areas associated with better scores on division/subtraction and less math anxiety

- Telugu and Urdu mother tongue associated with better fluencies of semantic category of living things

- Studying in a medium of instruction different from mother tongue was associated with a higher score on English ASER and a higher general intelligence.

Some field observations….

Working with children was a great experience. When explained about the questionnaires few of them understood the tasks very well and few couldn't, but all the children gave their full participation.

…………….. Dedeepya

It was a good experience to meet students from different regions, traditions and cultures. They were so innocent, affectionate to me and showed enthusiasm and interest to complete each and every task. Most of the students were from Maharashtra, Bihar, Uttar Pradesh and Telangana. They were able to understand all the languages because of influence of friends and conversation with their friends. But their class teacher was strictly speaking in English only and they were responding in English. In the last day I got some chocolates and beautiful cards from children

---------- *Deepa*

Initially, I had chosen the easiest way to work was by just following the given instructions. However I soon realized that it was not the right way; in fact it took more effort than this. Certainly each child, school, session and tasks had their own blocks. Here are few ways I had approached to coordinate with children for my overall stay at the field. I assured each child that my presence was for their support and not to examine them. Only after making them comfortable I gave them the tasks to get most out of them.
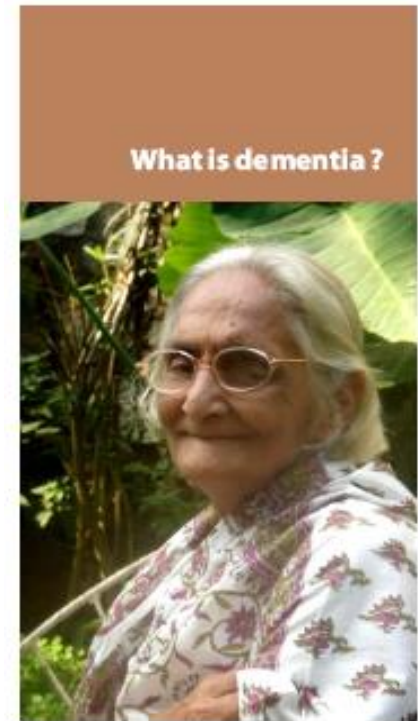
----------*Joshua*

We have seen, more often than not, that teachers and students come to school, and there is a genuine effort at teaching-learning. Teachers and the support staff ensured that the kids had their mid-day meal, which for many students is their most important meal of the day.

---------*Anu Nagalakshmi*

This is just the beginning

THANK YOU

What is dementia ?

ARDSI Hyderabad Deccan

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

BRITISH
COUNCIL