



# Multilingualism in underprivileged contexts:

Cognition in children from urban slum and non-slum schools and different medium-of-instruction

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## AIM OF THE STUDY :



To explore social, geographic and educational factors affecting cognitive abilities of bilingual children who grow up in underprivileged contexts

Study Methodology and preliminary results

# MULTILILA TEAM



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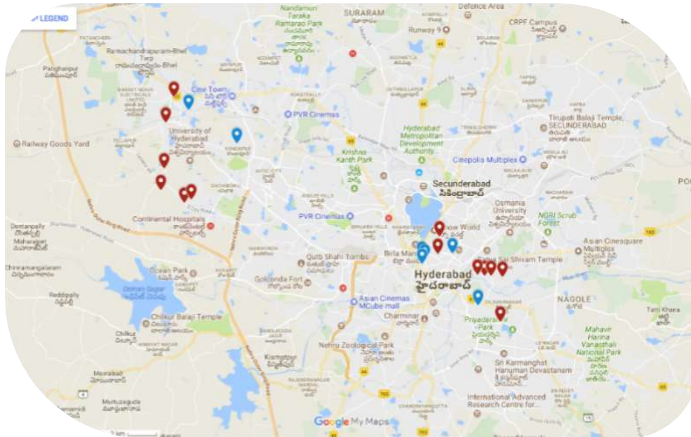
# CITIES WHERE PROJECT IS GOING ON.....



# DEMOGRAPHIC CHARACTERISTICS OF COHORT



	HYDERABAD	DELHI
Number	461	444
Boys: Girls	208 :253	218:226
Location of school Slum: Non slum	241 : 220	194 :203







# LIST OF SCHOOLS

## HYDERABAD

S.No.	SCHOOL NAME
1	Govt PS(SS)
2	Govt PS(PR Vidhyalaya)
3	Govt PS
4	Govt PS
5	Govt PS
6	Govt PS
7	MMPS
8	Govt PS
9	Govt PS(Mehabboia)
10	Govt PS
11	Govt PS
12	Govt PS
13	Govt PS(Alia)
14	govt ps
15	Govt PS
16	Govt PS
17	Govt PS
18	Govt PS
19	Govt PS
20	Govt PS

## DELHI

S No	School Name
1	Govt. Sarvodaya Co-ed Vidyalaya
2	Sarvodaya Vidyalaya Sr. Sec. School
3	Sarvodaya Vidyalaya
4	Amar Shaheed Major Sehwat
5	Sarvodaya Vidyalaya
6	Primary Boys School
7	EDMC Primary School
8	Sarvodaya Kanya Vidyalaya



## **MEDIUM OF INSTRUCTION:**

### **English:**

- Officially assigned by the board of education as English;
- textbook of use, language of assessment and classroom teaching is also carried out in English.

### **Hindi or Telugu:**

- Officially assigned by the board of education as Hindi or Telugu.
- textbook of use, language of assessment and classroom teaching is also carried out in Hindi or Telugu.

### **Hindi/English:**

- Officially assigned by the board of education as English;
- textbook of use, language of assessment carried out in English.
- However, unofficially, classroom teaching is carried out in Hindi (based on data from classroom observations).

## **DIVISION OF STUDENTS WITH MOTHER TONGUE AND SCHOOL LANGUAGE : HYDERABAD**

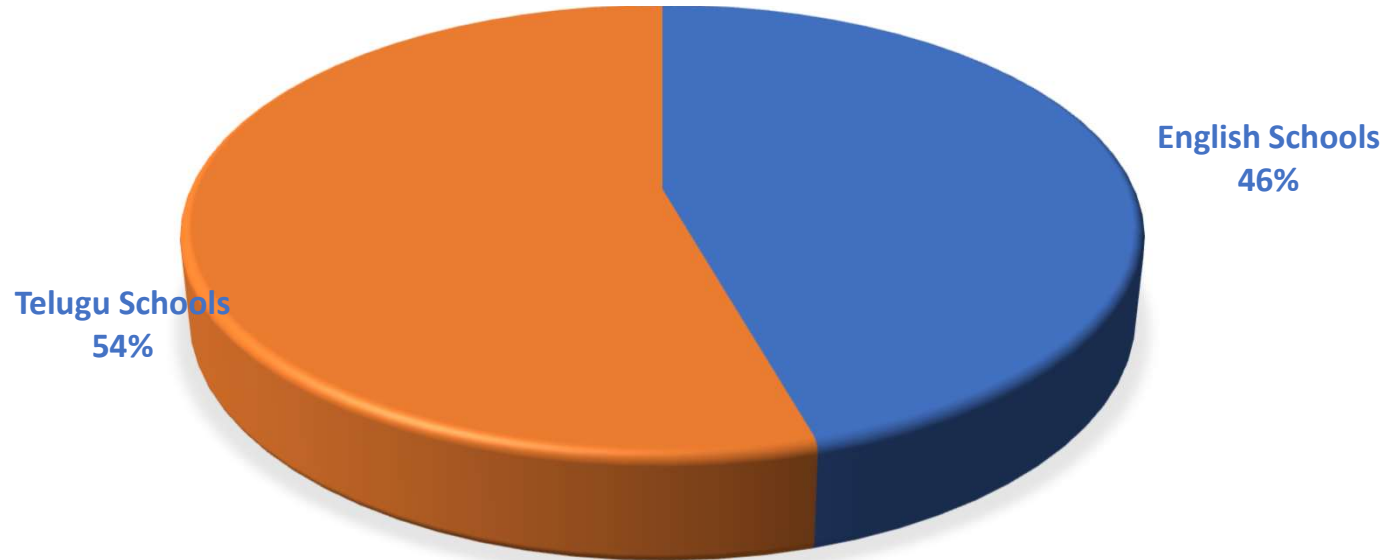
<b>MOTHER TONGUE</b>	<b>SCHOOL LANGUAGE</b>	<b>NUMBER</b>
TELUGU	ENGLISH	85
NON-TELUGU	TELUGU	90
NON-TELUGU	ENGLISH	61
TELUGU	TELUGU	225



# MEDIUM OF INSTRUCTION, HYDERABAD



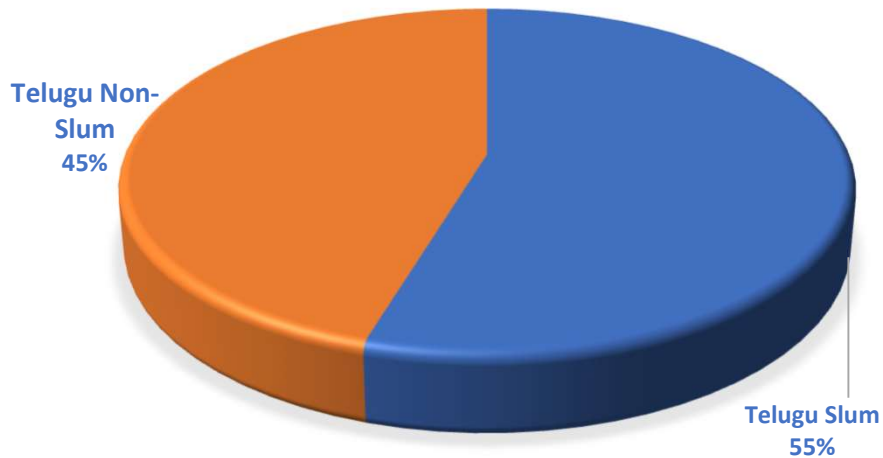
## TELUGU VS ENGLISH



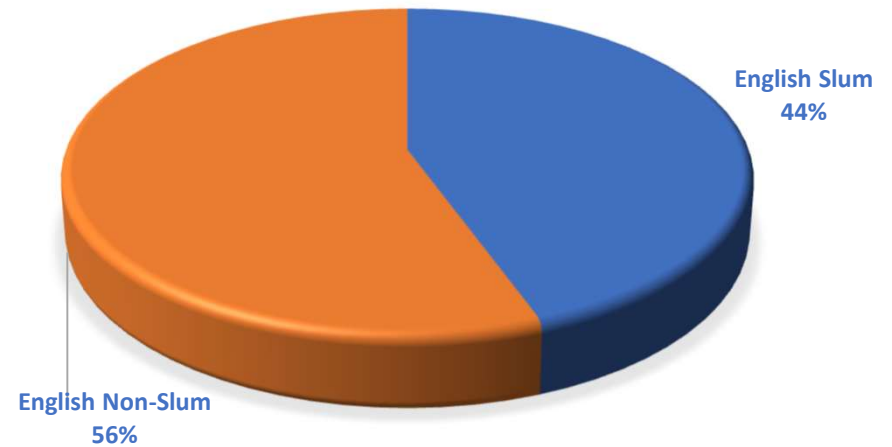
# MEDIUM OF INSTRUCTION IN SLUM AND NON-SLUM AREAS



Telugu Medium Schools



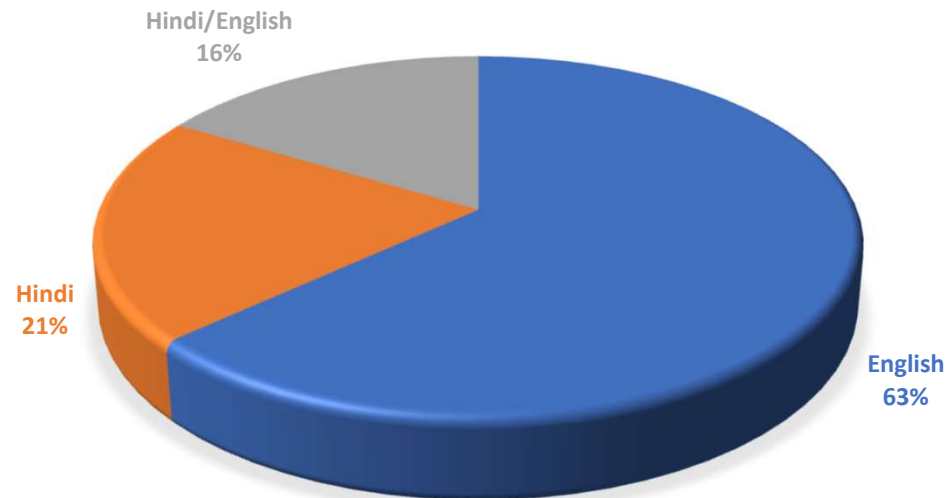
English medium schools



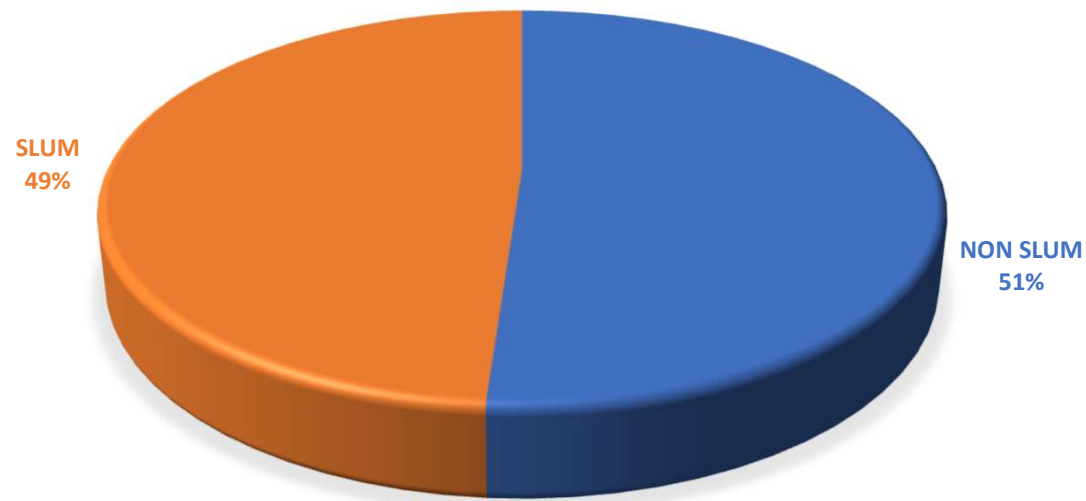
# MEDIUM OF INSTRUCTION-DELHI



English vs Hindi vs English/Hindi Mediums.



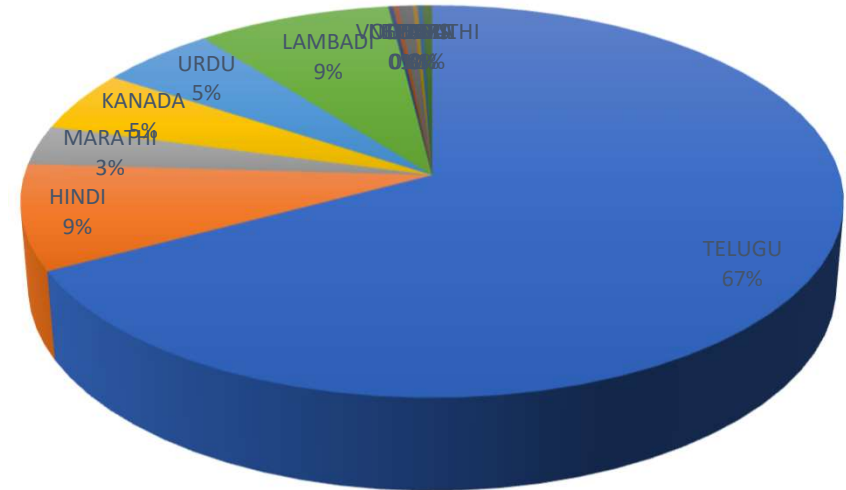
# SLUM vs NON-SLUM Schools DISTRIBUTION IN DELHI



# LANGUAGE DISTRIBUTION AMONG STUDENTS HYDERABAD

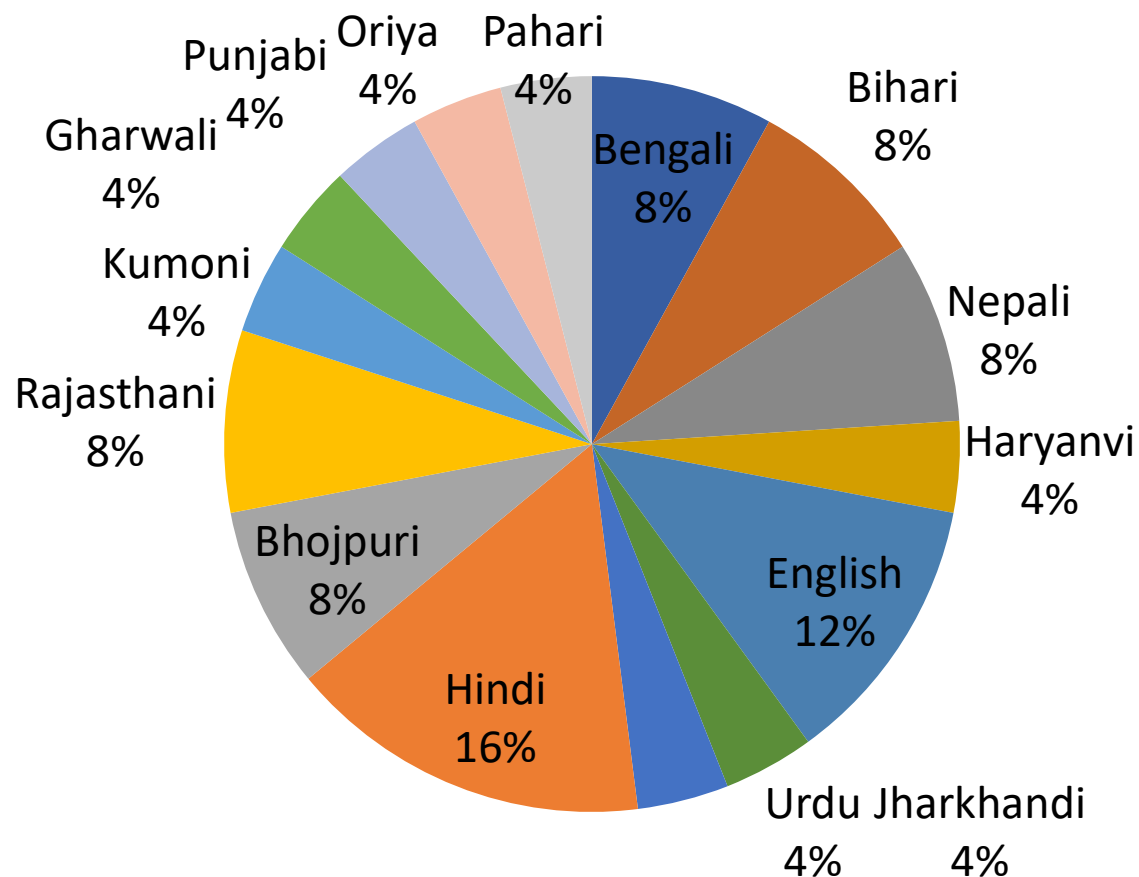


1. TELUGU:	310
2. HINDI:	40
3. MARATHI:	15
4. KANNADA:	23
5. URDU:	24
6. LAMBADI:	40
7. NEPALI:	1
8. VODDERA:	1
9. BIHARI:	3
10. ORIYA:	1
11. TAMIL:	1
12. GUJARATHI:	2



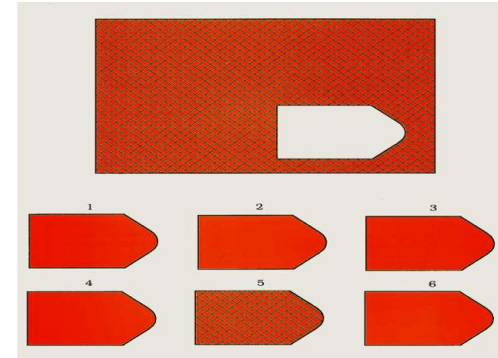
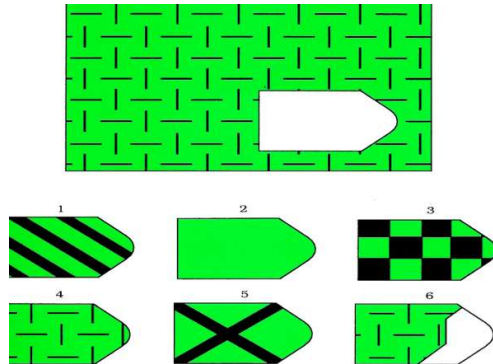
■ TELUGU ■ HINDI ■ MARATHI ■ KANADA ■ URDU ■ LAMBADI  
 ■ NEPALI ■ VODDERA ■ BIHARI ■ ODDISI ■ TAMIL ■ GUJRATHI

# LANGUAGES SPOKEN BY STUDENTS IN A SCHOOL DELHI





# COGNITIVE TESTS



## RAVEN'S COLOURED PROGRESSIVE MATRICES

### GENERAL INTELLIGENCE

# FLUENCY TEST



## Semantic Fluency Task

RA ID:	
Child's ID:	
School ID	

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

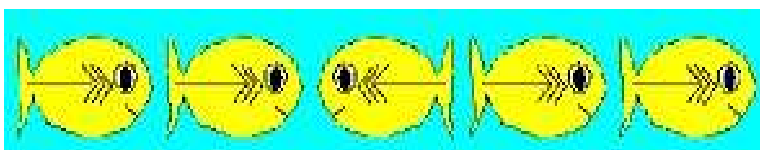
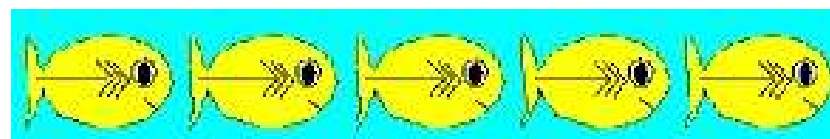
Audio Recording done: Yes/NO

# FLANKER TASK

Congruent left



Congruent right

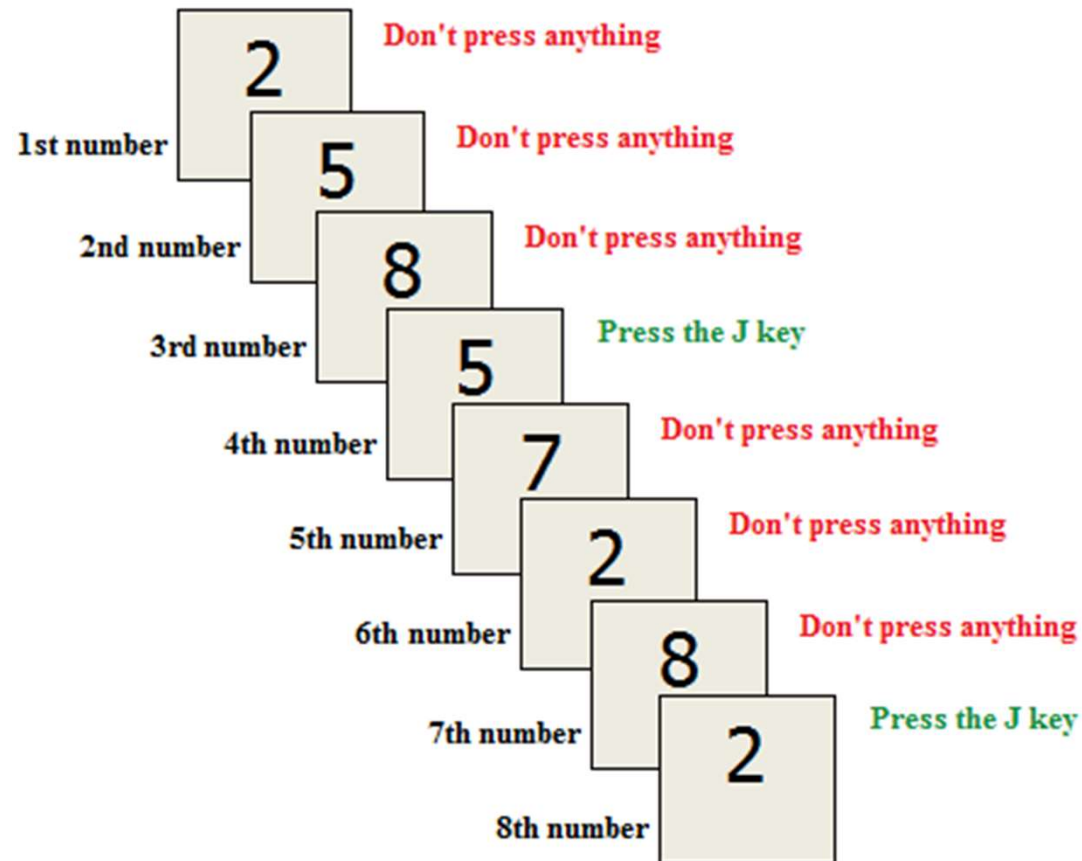


Incongruent left



Incongruent right

# N-BACK TASK





## AGE OF PARTICIPANTS ACROSS THE TWO CITIES

CITY	RANGE(in years)	MEAN	SD
DELHI	8-12	8.77	0.63
HYDERABAD	7-15	9.58	1.19

# OVERALL PERFORMANCE ACROSS THE TWO CITIES



COGNITIVE TASKS -DELHI		COGNITIVE TASKS -HYDERABAD	
RAVENS PROGRESSIVE MATRICS	55.66(15.72)	RAVENS PROGRESSIVE MATRICS	45.83(15.78)
N BACK	0.68(0.15)	N BACK	0.65(0.22)
FLANKER TASK		FLANKER TASK	
CONFLICT EFFECT(RT)	-27.98(73.70)	CONFLICT EFFECT(RT)	29.58(76.55)
CONFLICT EFFECT(ACCURACY)	45.45(21.73)	CONFLICT EFFECT(ACCURACY)	-57.85(20.38)

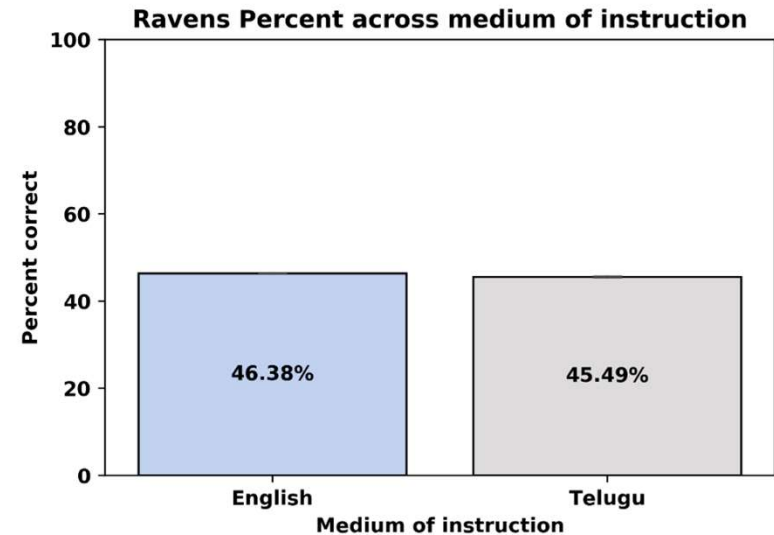


# RAVEN'S PROGRESSIVE MATRICES HYDERABAD



BOYS	GIRLS	p-value
16.51 ± 5.77	16.48 ± 5.57	0.95
SLUM	NON-SLUM	P-VALUE
16.42 ± 5.71	16.59 ± 5.66	0.775
ENGLISH	TELUGU	P-VALUE
16.70 ± 6.39	16.38 ± 5.21	0.558

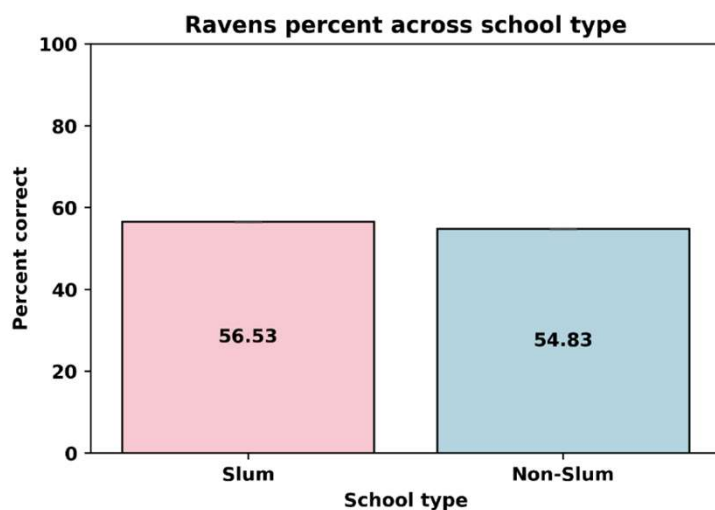
Task	English vs. Telugu
Ravens	U= 24345.50 (p =.62)



# RAVEN'S PROGRESSIVE MATRICES DELHI



BOYS	GIRLS	P value
20.35±5.861	19.72±5.448	0.541
SLUM	NON-SLUM	
19.74±5.726	20.35±5.589	0.638



Task	Slum vs. Non-slum
Ravens	$t(395) = -1.07$ ( $p=.28$ )



# FLANKER TASK (INHIBITION)-HYDERABAD

SLUM VS NON SLUM – NO DIFFERENCE

## BOYS vs GIRLS

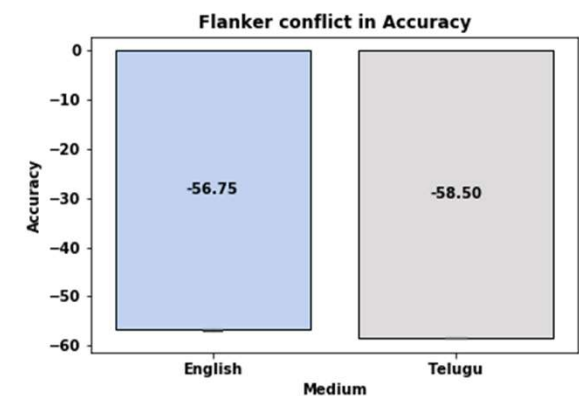
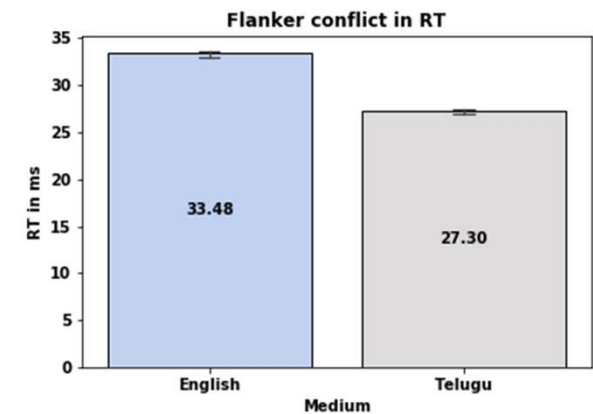
	Boys(204)	Girls(257)	P value
Congruent Response - False	1.09 ± 0.44	1.09 ± 0.48	0.941
Incongruent Response - False	1.35 ± 0.80	1.38 ± 0.78	0.664
Congruent Response - True	1.37 ± 0.41	1.41 ± 0.39	0.392
Incongruent Response - True	1.09 ± 0.48	1.50 ± 0.57	0.426

# FLANKER TEST (INHIBITION)-HYDERABAD



Telugu medium > English medium (trend)

Task	English vs. Telugu
Conflict effect (RT)	U=21654
Conflict effect (Accuracy)	U = 22788.50

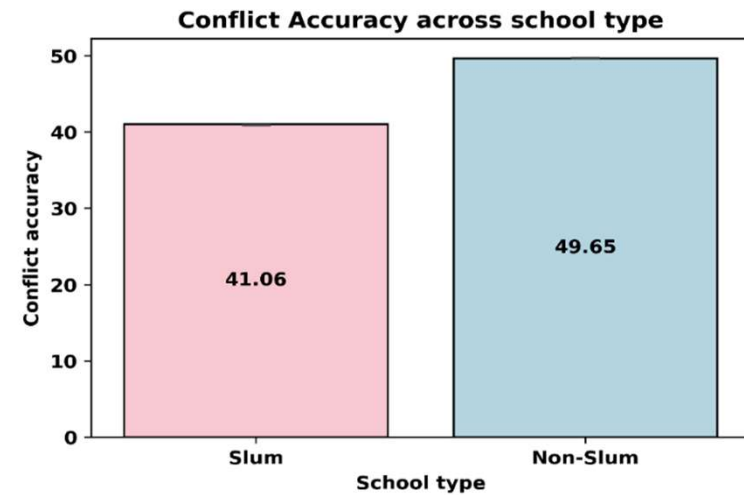




# FLANKER TASK (INHIBITION)-DELHI

**Conflict effect:** Difference between incongruent and congruent trials

Task	Slum vs. Non-slum
Conflict effect (RT)	U= 18177 (p= .18)
Conflict effect (Accuracy)	U=24217.5 (p<.001)**



Students in non slum areas had higher accuracy than students in slum area.

No difference between boys and girls

# FLANKER TASK (INHIBITION)-DELHI

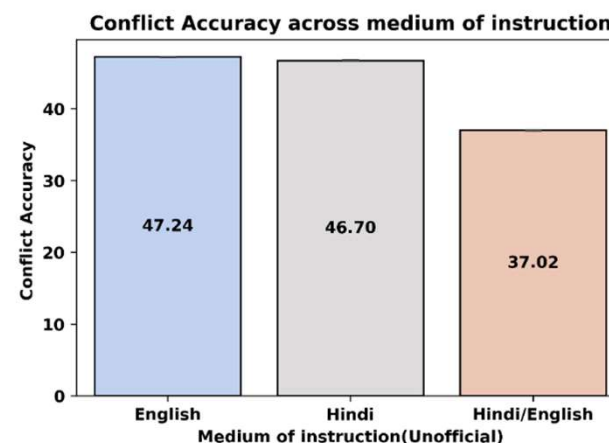
**Conflict effect:** Difference between incongruent and congruent trials



Task	English vs. Hindi vs. English/Hindi
Conflict effect (RT)	$F(2,146.72) = 1.58$ ( $p = .20$ )
Conflict effect (Accuracy)	$F(2,394) = 6.02$ ( $p = .003$ )**

Post-hoc comparisons:

On conflict effect (Accuracy),  
 English – Hindi/English ( $p = .006$ )\*\*  
 Hindi-Hindi/English ( $p = .02$ )\*



There was no difference between Hindi and English medium.

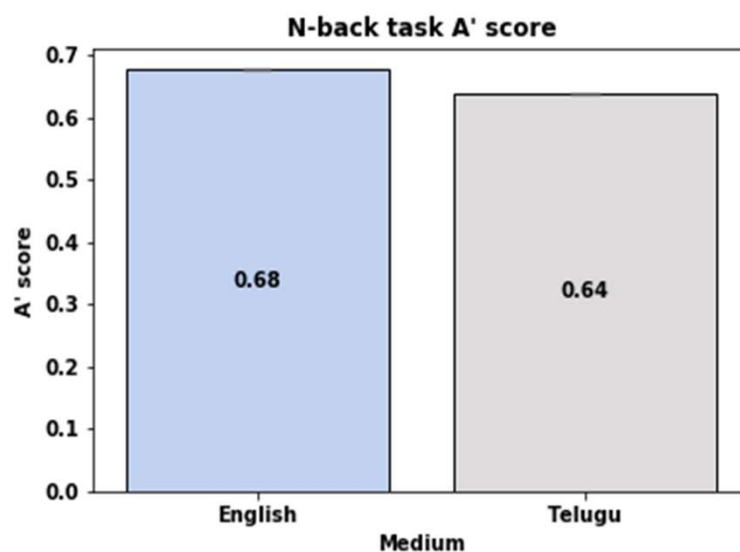
Hindi and English medium performed better than Hindi-English medium.





## N-BACK (2-BACK)-HYDERABAD

Task	English vs. Telugu
N-back	U=200032 (p =.014)*

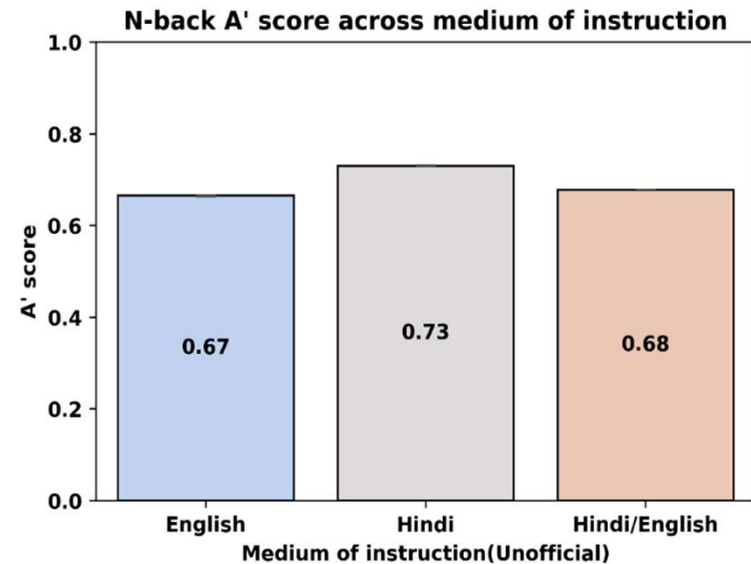


English medium > Telugu medium

# N-BACK (2-BACK)-DELHI



Task	English vs. Hindi vs. English/Hindi
N-back	$F(2, 156.13) = 6.47$ ( $p = .002$ )**



Post-hoc comparisons:

Children in Hindi medium performed significantly better than children in English ( $p = .001$ )\*\* and Hindi/English mediums ( $p = .03$ )\*

# SEMANTIC FLUENCY-HYDERABAD



	GIRLS(257)	BOYS(204)	P VALUE
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 (175)	TELUGU (286)	P VALUE
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
NON-LIVING THINGS	8.27 ± 3.002	7.91 ± 3.34	0.234

# SEMANTIC FLUENCY-HYDERABAD DATA

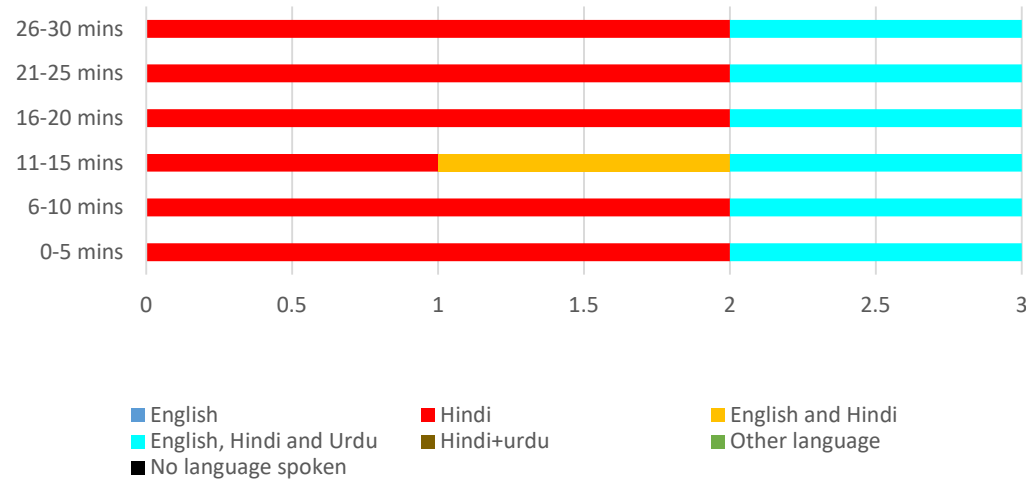


	SLUM(243)	NON-SLUM(218)	P VALUE
SEMANTIC FLUENCY - RESPONSE IN ENGLISH			
LIVING THINGS	7.32 ± 2.75	7.49 ± 2.61	0.492
NON-LIVING THINGS	7.31 ± 2.60	7.41 ± 2.21	0.659
SEMANTIC FLUENCY - RESPONSE IN TELUGU			
LIVING THINGS	5.47 ± 2.34	5.25 ± 2.38	0.331
NON-LIVING THINGS	8.30 ± 3.15	7.84 ± 2.91	0.12

# LANGUAGE USED BY TEACHERS IN ENGLISH MEDIUM SCHOOLS ACROSS DELHI AND HYDERABAD :

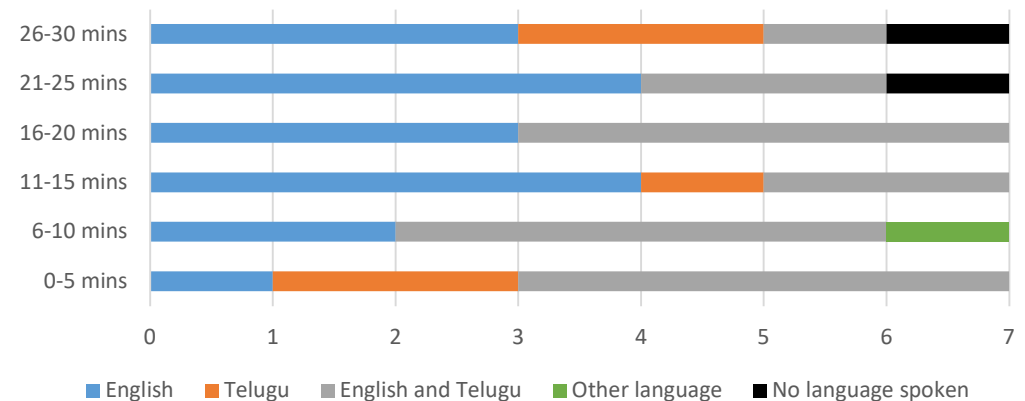


Teacher Language use (English medium schools in Delhi)



Teacher Language use (English medium schools in Hyderabad)

English medium -Teacher Language-Language classes





## **SOCIODEMOGRAPHIC VARIABLES AND COGNITIVE TASKS**

Generalised Linear Model analysis (GLM) was done on to explore associations between sociodemographic variables and medium of instruction on performance on cognitive tasks:

In Hyderabad

On Raven's task it was observed that students with medium of instruction different from mother tongue are better than children with same medium as their mother tongue

On semantic fluency tasks, English medium of instruction associated with better fluency in English and Telugu medium better in Telugu

In Delhi

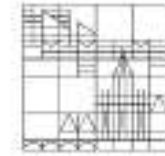
Hindi medium of instruction was associated with better performance on N-back task compared to English/ Hindi English medium



# CONCLUSIONS



- In Delhi regional language was associated better cognitive performance.
- Hyderabad schools show a cognitive advantage in those with home language that differed from school language, suggesting a possible multilingual advantage to general intelligence.
- Significant differences between Delhi and Hyderabad in cognitive task performance in relation to socio-demographic variables and medium of instruction: This could be related social diversity and differences between Delhi and Hyderabad populations. This reflects Hindi dominance in Delhi while English and Telugu are more balanced in Hyderabad.
- Further study of sociodemographic profile of students and follow up will help us understand the relationship between multilingual education and cognition.





**THANK YOU**