

A STUDY ON BILINGUAL VERBAL FLUENCY TASK TO MEASURE THE EFFECT OF INSTRUCTION IN FIRST AND SECOND LANGUAGE PERFORMANCE

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Verbal Fluency Task is a neuropsychological tool to measure lexical organization and retrieval in an individual. We used Phonetic Fluency Task and Semantic Fluency Task to study bilingual advantage in L1 (Nepali) and L2 (English) with two group of government school students with mean age of 14.46 years (SD 2.02 years). Participants were given 60 seconds each to create words from the given semantic category or letter/phonetic category. One group received instruction in L1 and another in L2. We found that the participants receiving instruction in L2 performed better even in L1 compared to the participants receiving instruction in L1.

Keywords: verbal fluency task, first language, second language, instruction, bilingual advantage

1. Introduction and background

In recent days, interest has been growing on the implementation of mother tongue education and mother-tongue based multilingual education in Nepal (Yadava & Awasthi, 2020; Pathak, 2019). Language Policy Recommendation Commission of Nepal in 1994 (see Dhakal, 2007) recommended for the inclusion of mother tongue as the subject and medium of instruction and paved the way for mother-tongue based multilingual education (MLE) in Nepal. Government of Nepal has created provisions for multilingual education by issuing guidelines for mother tongue based multilingual education implementation (DoE, 2009). Yadava (2020) outlines the importance of considering sociolinguistic factors and language typology and appropriate pedagogies for implementation of MLE. The benefits of bilingual education on wellbeing and higher academic performances by individual students have also been recognized

recently (Awasthi, 2020). So, there is a need to look for and consider alternative models of MLE that will help in successful implementation of MLE in the country (Dhakal, 2020).

1.2 Constitutional provisions related to language education and research in Nepal

Part 3 of the Constitution of Nepal (2015) under Fundamental Rights and Duties ensures the Rights relating to education under Article 31. Section 5 of Article 31 states “Every Nepalese community residing in Nepal shall have the right to get education in its mother tongue and, for that purpose, to open and operate schools and educational institutes, in accordance with law”. In order to fulfil the language related responsibilities of the State, the Constitution envisages Language Commission in Article 287. Section 6 of Article 287 deals with “The functions, duties and powers of the Language Commission”. Sub-section (c) of Section 6 of Article 287 states its function “to measure the levels of development of mother tongues and make suggestions to the Government of Nepal, on the potentiality of their use in education”. Sub-section (d) entrusts the Language Commission “to study, research and monitor languages”. This research helps to fulfil the constitutional responsibility of the Language Commission by extending the current state of the knowledge in the use of language as medium of instruction.

1.3 Language issues and medium of school education in Nepal

At the school level, there are two types of educational institutions: (a) community schools managed by the state where the school infrastructure and human resources is managed by

the government and (b) institutional schools also known as boarding schools which are run privately by the investors of these schools. Boarding schools focus on the use of English in the school premises. On the other hand, government schools are run mostly using Nepali, the official language, as the medium of instruction and private schools are run through English as a medium of instruction. State run schools also have started the use of English as a medium of instruction. Some state run (government) schools also promote mother-tongue education where the speakers of minority languages having sizeable population is also taught using the local language. Besides these schools there are also Gurukuls where they teach mostly Sanskrit, Gumbas for teaching Buddhist school of philosophy and scriptures of Buddhist religion (CERID, 2008a) and Madarsas where mainly Koran is taught to the children of the followers of Islam religion (CERID, 2008b). As a regulatory and implementing state agency, Curriculum Development Center (CDC) under the Ministry of Education, Science and technology prepares materials for mother tongue education.

Constitutionally, Nepal is a multilingual country and according to 2011 census there are 123 (Yadava, 2014a) languages where 19 mother tongues are spoken by 96% of population and 104 languages spoken by 4% of the population with Nepali spoken by 45 % of population. The majority of the population (59%) was reported to be monolinguals (monolinguals in Nepal are either those who never went to school or are very old people from some indigenous communities) and 41% of the population speaks at least one second language (CBS, 2012). In this background of natural bilingualism and multilingualism that exist in Nepal, it is important to understand how language context interacts with bilingual education and biliteracy. How to enhance the quality of education by incorporating over 100 languages in the country is a major concern (Nurmela, Awasthi & Skutnabb-Kangas, 2010). Addressing the language issues in education and proper planning of language and how to address the local languages as a medium of instruction for education in Nepal has been felt acutely (Phyak, 2011, 2012, 2013). Against such a backdrop, in order to understand

and formulate appropriate literacy programs and educational policies, investigation into cognitive processes and mechanisms of learners mediated by their linguistic context is imperative.

Regarding the use of medium of instruction in the school level, currently mother tongue based multilingual education (Yadava & Awasthi, 2020) is advocated as an alternative and is believed that it will solve much of the problems related to the choice of the language as a medium of instruction. It is also believed that the use of mother tongue in education will also enhance the cognitive development of children. Despite such discourse about the choice and use of a particular language in education, there is no scientific study that can establish with scientific reliability and validity that teaching in first language of the child actually improves cognitive performance as it is not adequately documented in the literature. A recent study by Pathak et al. (2021) investigated the effect of second language instruction on first language and found cognitive and linguistic advantage of second language instruction on first language. Pathak & Pathak (2022) found bilingual advantage in bilingual Stroop task administered on high and low proficient Nepali – English bilinguals.

This study is motivated by the idea of exploring the cognitive and linguistic performance of the children being taught either in first language or second language.

1.3 Verbal Fluency Task as a psycholinguistic tool
Verbal Fluency Task is a simple and powerful neuropsychological tool to measure the lexical organization and retrieval in an individual. This task has been used to study language production as well as to measure executive control. In most of the studies on bilingual and multilingual participants, studies have shown that bilinguals are better in cognitive tasks than linguistic tasks compared to monolinguals.

Verbal Fluency Task (Golan & Montoya, 2002) measures the ability of the participant to create as many words as possible within a given time (one minute) in phonetic and semantic category. Luo et al. (2010) found that bilinguals performed better in executive control and verbal fluency tasks compared to monolinguals.

As a neuropsychological test used both in clinical and experimental situations (Troyer et al., 1997), verbal fluency task measures the mental lexical representation and organization of words in phonetic or letter and semantic or categorical basis (Troyer et al., 1997; Friesen et al., 2015; Luo et al., 2010). Neuronally, phonetic fluency has been ascribed to frontal lobe (Coslett et al., 1991; Perret, 1974) and semantic fluency is ascribed to temporal lobe (Newcombe, 1969). Verbal fluency task is a rapid search and retrieval (Patra et al., 2020) of mental lexicon. In this task, participants are given letter or category items and they have to make as many words as they can in 60 seconds from the given item. For example, in phonetic fluency task the participants are given three letters f, a, and s to create as many words as they can. Likewise in semantic fluency task in which they are given a category like animal, vegetable, cloth and they have to make as many words as they can within the given time. Thus, it makes an excellent tool to study language production in psycholinguistic researches (Whiteside et al., 2016). Researchers have used this task in bilingual context in various language pairs like Mandarin – English (Eng et al., 2018), Spanish – English (Rosselli et al., 2000; Gollan et al., 2002), Bengali – English (Patra et al., 2020) and across different age groups like primary school children (Kormi-Nouri et al., 2012), college students (Portocarrero et al., 2007), healthy older bilinguals (Rosselli et al., 2000) and across the lifespan (Friesen et al., 2015). We have used this task in Nepali – English pair among teenager school children in this study.

1.4 Cognitive mechanism in verbal fluency task

Troyer et al. (1997) have identified two cognitive mechanisms involved in verbal fluency tasks: clustering and switching. They have identified four phonemic characteristics of clustering on phonemic fluency trials: first letters (words beginning with same first two letters, such as *arm* and *art*); rhymes (words that rhyme such as *sand* and *stand*); first and last sounds (words differing only by a vowel sound, regardless of the actual spelling such as *sat*, *seat*, *sight* and *sought*) and homonyms (words with two or more different spellings, such as *some* and *sum*). They identify clustering in semantic fluency trials consisting of

successively generated words belonging to the same subcategories which are, for example (in case of animal categories), organized by living environment, human use and zoological categories. The authors suggest “switching may be related primarily to participant’s ability to disengage from a previous strategy or subcategory and would thus be impaired by preservative behavior”. Herein lies the explanation to executive control in verbal fluency task.

Performance in semantic fluency is relatively easier as the words to be generated resemble the pattern to everyday language use as the participants have to recall items from everyday life like cloths, animals, vegetables whereas in letter fluency is more challenging as the words have to be generated from a given letter which is not like the everyday normal pattern and requires participants to suppress the activation of words from semantic category (Luo et al., 2010; Friesen et al., 2015)

We administered Verbal Fluency Task in L1 (Nepali) and L2 (English) in Phonetic Fluency and Semantic Fluency. Participants were given 60 seconds to create words from the given semantic category or letter/phonetic category. The participants were government school students with mean age of 14.46 years (SD 2.02 years). One group of participants received instruction in L1 medium and another group received instruction in L2 medium. We found an overall advantage of receiving instruction in L2 to the extent that they performed better even in L1 tasks compared to the students who were receiving instruction in L1. We report our findings along the bilingual advantage framework.

2. Method

2.1 Participants

Data were collected from the teenagers (13-16 years age group) with mean age 14.46 (2.02) years from the students between grades 7 to 10. In order to test the effect of L1 and L2 mediated instruction sample of participants (students) were recruited from public schools of Kathmandu who were taught in Nepali (L1) and English (L2) medium of instruction. All participants were the speakers of Nepali as L1 whose L2 was English (through medium of instruction). Data was collected from

70 participants: 35 participants from each group including both the genders. We controlled measures like their age, socio-economic status (SES), age of acquisition of L1 and L2, exposure to both the languages in all the four skills of listening, speaking, reading and writing.

Table 1: Demographic profile of the participants

Measures	Full sample	Group 1	Group 2
Age (yrs)	14.46(2.02)	14.66(1.24)	14.63(1.33)
Father's edu (yrs)	9.08(5.02)	7.06(4.26)	11.42(4.92)
Mother's edu (yrs)	6.44(4.66)	8(5.35)	5.09(5.56)
AoA L1	3.03(1.8)	3.4(2.05)	2.67(1.49)
AoA L2	6.30(2.68)	6.74(2.78)	5.94(2.57)
Profic.in L1 speaking	8.04(1.7)	7.86(1.83)	8.4(1.17)
Profic.in L1 listening	8.45(1.58)	8.34(1.55)	8.76(1.17)
Profic.in L1 reading	8.24(1.76)	8.09(1.76)	8.59(1.42)
Profic.in L1 writing	7.90(1.74)	7.82(1.96)	8.16(1.17)
Profic.in L2 speaking	7.35(1.77)	7.09(1.85)	7.77(1.4)
Profic.in L2 listening	7.53(1.96)	6.97(2.23)	8.26(1.15)
Profic.in L2 reading	8.19(1.66)	7.8(1.78)	8.77(0.94)
Profic.in L2 writing	8.28(1.77)	7.91(2.06)	8.83(0.82)

Table 1 shows the mean age of full sample and both the groups which shows the mean age is similar in both the groups of around fourteen and half years. The participants' parental education is also similar, in group one mother's qualification is higher than father's whereas in group two father's education is higher than mother's. In both the groups the participants had acquired their L1 by age 3 and their L2 by age 6. Participants in both the groups rated themselves around 8 out of 10 in all the four language skills of listening, speaking, reading and writing in both L1 and L2. This demographic information was obtained from the respondents who participated in the study.

2.2 Stimuli and procedure

Participants were given 60 seconds to create words from the given semantic category (clothes, animals, fruits, vegetables, flowers) or letter/phonetic category. Verbal Fluency Task is also used to measure verbal cognitive control as words in semantic category are easier to produce than the words in phonetic category.

Phonetic Fluency L1: क, ग, म

Phonetic Fluency L2: F, A, S

L1 Semantic Fluency: जनावर, लुगा, फल, तरकारी, फूल

L2 Semantic Fluency: Animals, cloths, fruits, vegetables, flowers

Tables 2 through 5 present the sample of verbal fluency task production in L1 and L2.

Table 2: L1 Phonetic Fluency

क	१	कमल, कलम, कोपिला, केरा, केराउ, कम्प्युटर, क्यामरा
	२	कमल, कपाल, कपुर, कागज, काँच, काग
	३	कमल, कलम, कछुवा, काउली, कङ्गारु
	४	कमल, कापी, कलम, कपाल, कागज, काग, काक्रो, केटी, केटा, कोट
	५	कमल, कलम, काग, कालो, काम
ग	१	गमला, गम, गेम, गर, गिलास
	२	गमला, गाँजर, गाँउ, गाँउने
	३	गैंडा, गोरु
	४	गमला, गाँई, गोरु, गीत, गाउँ
	५	गाँई, गमला, गोली
म	१	मकै, माउरी, माउसुली, मामा, माईजु, मानिस, मसला, माउस, मुसा
	२	मकै, मेरो, माज्यो, माग्यो, माइयो, मात्यो
	३	मकै, मेवा, माकुरा, माउसुली, मुसा
	४	मकै, मान्छे, मासु
	५	माउरी, माउसुली, मुसा, माकुरा, माछा

Table 3: L2 Phonetic Fluency

F	1	Fall, flow, feeling, first, fish, figure, fan, fun, fog, Frock
	2	Fish, finish, fast, festival
	3	Fox, fish, frog
	4	Fish, flower, fighter, fisherman
	5	Fish, frog, fry, finger
A	1	Apple, ant, animal, all, aunt, across, agree, angry
	2	Apple, animal, angle, accuracy
	3	Apple, ant
	4	Aero plane, ant, aunt, art
	5	Apple, ant, aero plane
S	1	Sun, sunflower, sand, sunny, send, small, swim, sparrow, start
	2	Start, star, ship, scene, share
	3	Shirt, socks
	4	Snake, shirt, sunflower, sun
	5	Star, straight, square, sparrow, snake, small

Table 4: L1 Semantic Fluency

जनावर	१	बाँदर, कुकुर, बिरालो, बाघ, सिंह, सर्प, गँड्यौला, शंखे किरा, मुसा, माउसुली, माउरी, अष्ट्रिच
	२	खरायो, जरायो, कुखुरा, कुकुर, मृग, चितुवा, सिंह, अष्ट्रिच, हाती
	३	गाँई, भैंसी, स्याल, चितुवा, मृग, जरायो, हरिण, सिंह, जिआफ, गोही, गोरु
	४	बाघ, भालु, हाती, गैडाँ, गाँई, गोरु, भैंसी, ब्राखा, बिरालो, कुकुर, कुखुरा, काग
	५	भेडा, बाघ, भालु, चितुवा, घोरल, ब्वासो, स्याल, हाती, गैडाँ, गाँई, भैंसी, कुकुर
तरकारी	१	मेवा, स्याउ, सुन्तला, आँप, केरा, अंगुर, अनार
	२	साग, काउली, बन्दा, सिमी, स्सकुस
	३	आलु, भेन्टा, बन्दा, काउली, बोडी, सिमी, च्याउ
	४	साग, आलु, गोलभेडा, बोडी, गुन्दुक, खुर्सीनी
	५	काउली, फर्सी, भेन्टा, रायो साग, आलु, बन्दा,
फल	१	मेवा, स्याउ, भुईकटहर, सुन्तला, आँप, केरा, अँगुर, अनार
	२	स्याउ, सुन्तला, मौसम, भुईस्याउ, नासपाती, उखु, स्ट्रबेरी
	३	स्याउ, आँप, मेवा, केरा, नरिवल, अम्बा, आरु
	४	स्याउ, सुन्तला, केरा, खरबुजा, भुईकटहर, कटहर, आँप
	५	स्याउ, सुन्तला, केरा, आँप, अंगुर, अनार, लिचची, मेवा
फूल	१	कमल, लिली, सयपत्री
	२	कमल, तोरी को फूल, गुलाफ
	३	गुलाफ, कमल, लिली, लालिगुरास, सयपत्री, सूर्यमुखी
	४	लालिगुरास, सूर्यमुखी, गुलाफ, मखमली, गोदावरी, कार्तिके
	५	लालिगुरास, गुलाफ, कमल, घन्टी फूल, सयपत्री, मखमली, गोदावरी
लुगा	१	मोजा, गलबन्दी, कुर्था सुरुवाल, लेहंगा, दौरा सुरुवाल, ढाका टोपी, सट, टिसर्ट, ट्राउजर
	२	जुता, पाइन्ट, टिसर्ट, टोपी, गलबन्दी
	३	कुर्था सुरुवाल, सर्ट, पेन्ट, ज्याकेट, टप्स

	४	साडी, टिसर्ट, पाइन्ट, सर्ट, ज्याकेट, स्कट, ट्राउजर, कोट, जरिकोट
	५	कुर्था सुरुवाल, पाइन्ट, टिसर्ट, साडी, लेहंगा

Table 5: L2 Semantic Fluency

Animal	1	Buffalo, cow, goat, tiger, lion, snake, snail, frog, dog
	2	Dog, zebra, cat, fish, donkey, yak
	3	Rhinoceros, dinosaur, crocodile, cow, buffalo, fox, tiger, lion
	4	Cow, buffalo, tiger, elephant, lion, hyena
	5	Lion, tiger, elephant, fox, dog, cow, cat, monkey, donkey, deer
Vegetable	1	Potato, onion, tomato, cauliflower
	2	Tomato, potato cauliflower
	3	potato
	4	Pea, ginger, potato, tomato, onion, cucumber
	5	Potato, cauliflower, tomato, chilly
Fruit	1	Mango, guava, pineapple, papaya, orange, grapes, banana
	2	Apple, mango, orange, banana, grapes
	3	Apple, pineapple, mango, orange, coconut
	4	Apple, orange, mango, pineapple, grapes, banana, watermelon
	5	Mango, orange, banana, pineapple, watermelon
Flower	1	Sunflower, marigold, lotus, lily, rose, rhododendron
	2	Sunflower
	3	Lotus, lily, rhododendron, marigold, rose, sunflower
	4	Sunflower, rose, rhododendron
	5	Rose, lotus, lily, rhododendron
Cloths	1	T-shirt, shirt, pant, socks, kurtha suruwal, lehenga
	2	Jacket, shoes, track suit, pant, t-shirt, half pant, grunge pant

	3	Shirt, pant, lehenga, jacket, gown, kurtha suruwal
	4	Shirt, pant, jacket, skirt, t-shirt, half pant, socks, shoes, sweater, muflar
	5	Shirt, pant, lehenga, kurtha suruwal, frock

3. Results: Verbal Fluency Task performance

Verbal Fluency Task measures the ability of the participants to make words from the given letter or the category in L1 or L2. The mean score of Verbal Fluency Task as performed by both the groups of participants is given in Table 6. The ability to produce the amount of words in a given condition is the signature of the ability in language production task. The table presents the results of the number of mean words produced by the participants in the given time (60 seconds). The scores are presented as mean and standard deviation is given in brackets. Graphical data is presented in the plots flowing the table.

Table 6: Mean score of Verbal Fluency Task performance

Phonetic Fluency

	Mean(SD)			Mean(SD*)	
	L1 Literacy	L2 Literacy		L1 Literacy	L2 Literacy
क	6.14(3.26)	8.09(3.33)	F	7.09(3.74)	9.51(3.18)
ग	4.80(2.52)	6.06(2.60)	A	5.14(2.45)	7.46(2.20)
म	5.49(2.11)	6.86(2.91)	S	6.51(3.13)	9.49(2.91)

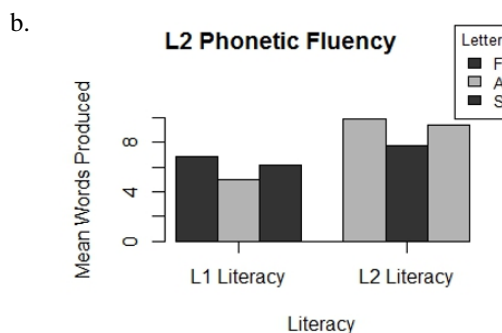
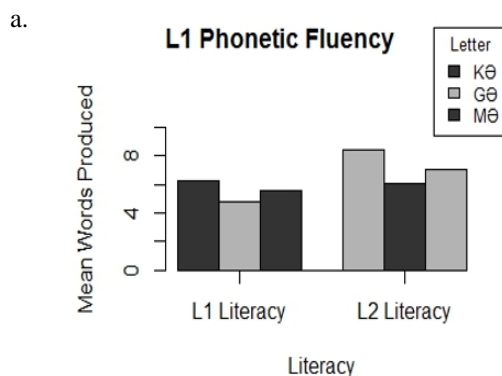
Semantic fluency

जनावर	10.03 (2.20)	11.57 (2.75)	Animals	9.31 (3.10)	13.57 (3.31)
लुगा	7.80 (2.30)	8.94 (2.34)	Clothes	7.97 (2.28)	10.91 (2.95)
फल	7.51 (2.20)	8.03 (2.32)	Fruits	6.37 (2.30)	9.23 (2.26)
तरकारी	8.31 (2.41)	10.29 (2.71)	Veggies	3.94 (2.98)	8.25 (2.93)
फूल	3.94 (1.94)	4.60 (1.90)	Flowers	3.68 (2.13)	5.60 (1.70)

* SD = standard deviation

Table 6 shows the number of words produced by both the groups. The table shows that the participants who were instructed in L2 medium

were consistently better in the linguistic task compared to the students who were taught in L1 medium of instruction. This shows that being instructed in second language does not interfere with the first language ability and does not diminish the L1 ability rather it enhances it and even improves the performance in L1. As the data above shows in every item in both phonetic fluency and semantic fluency the L2 medium instructed children performed better not only in L2 language condition but also in L1 language condition, thus showing overall enhancement in the linguistic (verbal) and non-linguistic (non-verbal cognitive) tasks. Figure 1 (a-d) presents the visualization of the data presented in Table 6.



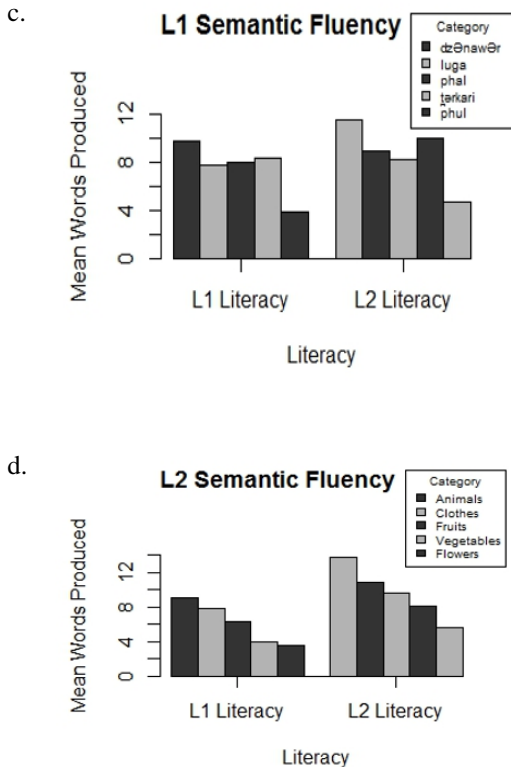


Figure 1: Bilingual Verbal Fluency Task performance

4. Discussion and conclusion

Language production in L1 and L2 was measured using Verbal Fluency Task. This is a standard neuropsychological test that measures the ability of the participants to produce the number of words in a given limited time of 1 minute (60 seconds). The participants are measured on their ability to produce words from given letters and categories. Letter fluency or phonetic fluency measures the ability to produced words from given set of letters or phonemes. In this study, participants were given three letters each from L1 and L2. Following the convention of administering three letters/phonemes in phonetic verbal fluency task, in L1, they were asked to make words from क, ग and म (as the most frequent letters in Nepali according to Nepali National Corpus maintained at Lancaster University,

(<https://cqpweb.lancs.ac.uk/nncv2/index.php?ui=freqList>)

and in L2, they were asked to make words from F, A, S., the most commonly used letters to test phonetic VFT in English (Gollan & Montaya, 2002). Participants from L2 medium instruction performed better by producing more words both in phonetic and semantic category in both the languages. Participants instructed in L2 medium performed significantly ($p < 0.05$) better in L2 phonetic and semantic verbal fluency task and in L1 verbal fluency task also they produced more words compared to the participants who were instructed in L1 medium. This finding shows that being instructed in L2 medium doesn't diminish the L1 efficiency rather it enhances it both way. Students instructed in L2 medium were better performer in both L1 and L2 language production task compared to their matched control peers receiving instruction in L1 medium.

This study has demonstrated that school students instructed in second language show enhanced performance linguistically and cognitively in task involving language production and executive control compared to the students who were receiving instruction in first language only. Particular care was taken while designing the study that the performance is not confounded by measures like difference in SES of the parents for this the SES of the parents was matched by making the years of education as the proxy for SES. On an average, parents in both the groups had similar level of education with mothers in group 1 (receiving education in their L1) more educated than the mothers in group 2 (receiving education in L2) whereas fathers in group two had more number of education years compared to group 1. The participants in matched in various measures of language and education and exposure to both the languages at school and home. The only difference was the medium of instructed they had in their respective schools. Children receiving education in L2 as medium of instructed performed better even n their L1. There is a growing body of scientific literature supporting exposure to more than one language is beneficial both linguistically and cognitively.

There is a strong movement toward implementing mother tongue education in early years of education and to introduce second language only in

later years of school education. Our study support the idea that early exposure to more than one language is beneficial to the students. It does not deprive them from achieving proficiency in their first language, rather it enhances their performance in both the languages. More studies like this across different age groups and across different SES, linguistic and clinical conditions will help refine the idea about the choice of medium of instruction further.

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