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Lexical Retrieval in Typical Hindi-English Bilingual Children

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Abstract: Bilingualism cannot be understood as a simple additive system in which two languages function independently; rather, it is a dynamic interaction where both languages remain active and continuously influence each other. The present study examined lexical retrieval in Hindi–English bilingual children aged 8 to 12 years, a group that has received relatively limited attention even though bilingual exposure is common in urban India. A total of 60 typically developing children, divided equally into two age groups: 8–10 years and 10–12 years participated in the study. Each participant completed a picture-naming task in four conditions: Blocked English (BE), Blocked Hindi (BH), Mixed English–Hindi (MEH), and Mixed Hindi–English (MHE). To account for the participants' distinct developmental levels, grade-stratified stimulus sets were used, and performance variations were analysed using a Two-Factor Mixed ANOVA framework. Performance in the Blocked English condition did not differ across the two age groups ($p = .939$), suggesting that single-language English retrieval mechanisms optimise early and successfully scale alongside advancing, age-appropriate vocabulary demands. In contrast, the Hindi and mixed-language conditions revealed significant age-related differences ($p < .001$), as older children demonstrated greater accuracy on their age-adjusted item sets. The most pronounced developmental gain emerged in the Mixed English–Hindi condition, indicating the specific cognitive load that sequential language switching places on developing dual-language control systems. Overall, these findings indicate that bilingual children's vocabulary performance reflects changing patterns of dual-language control across different task contexts, rather than a consistent, linear developmental trajectory. By focusing on an underrepresented population, the study contributes to the current understanding of bilingual lexical processing and offers preliminary observations for culturally relevant clinical and educational contexts.

Keywords: Bilingualism, Lexical Retrieval, Language Switching, Blocked Naming, Mixed Naming.

1. Introduction

Language is one of the most fundamental achievements of the human mind. However, for many children growing up in multilingual environments, this process is inherently more complex as they are not simply acquiring a single language, but learning to manage two, often from a very early age. India offers a particularly striking example of this reality. With over 1,600 mother tongues and 22 officially recognised languages, it is a linguistically rich and cognitively demanding environment (Agnihotri, 2007). In cities such as Delhi, a child may speak Hindi at home, use English in school, shift between the two with friends, and return to Hindi with family, all in the same day. This kind of switching is not just a social habit. It shapes how lexical information is stored, accessed, and controlled. Exploring these processes forms the basis of the present study. The study specifically examines how Hindi-English bilingual children retrieve nouns under blocked and mixed naming conditions, as well as how their performance evolves across two stages in middle childhood.

Bilingual lexical processing has been explained through several well-established theoretical models. One of the most influential is the Revised Hierarchical Model (RHM) proposed by Kroll and Stewart (1994), which suggests that the two languages of a bilingual individual are interconnected, though not symmetrically. In less proficient bilinguals, the lexical links from the second language (L2) to the first language (L1) are usually stronger, while more direct conceptual links develop as proficiency increases. This implies that bilinguals do not maintain two isolated

lexical systems. Instead, both languages remain active, even when only one is being spoken. Evidence for such parallel activation has been consistently reported (Costa *et al.,* 1999; Green, 1998), showing that lexical retrieval in one language is continually shaped and mediated by the conceptual and semantic depth of the other (Kan *et al.*, 2024). Within this broader framework, models of bilingual language control further propose that managing two active languages requires constant monitoring, selection, and inhibition, especially in language switching situations (Green & Abutalebi, 2013).

Levelt's (1989) model of speech production, later extended to bilingual contexts by De Bot (1992) describes language production as a sequence of stages, namely conceptualization, formulation, and articulation each of which may be shaped by the interaction between the two language systems. In this account, lexical selection is viewed as inherently competitive. When a speaker names an object, several lexical candidates across both languages may become active, and the correct item must be selected from that set. Studies on bilingual naming have shown that this competition can produce measurable switching costs, especially when speakers alternate between languages (Meuter & Allport, 1999). For bilingual children, this competition is not static. It changes with proficiency and exposure. Research further indicates that even in childhood, switching languages carries cognitive cost because one language must be disengaged while the other is activated (Gross & Kaushanskaya, 2015). Developmental work supports this view and shows that language control in bilingual children is closely tied to the maturation of executive control during middle childhood (Kubota *et al.*, 2020).

Hindi-English bilingualism has a distinctive sociolinguistic profile, within the Indian context. English, though usually learned as a second language, carries considerable institutional and educational value, often serving as the medium of instruction in schools (Kachru, 1983). Hindi, by contrast, is more closely linked to home use and daily interaction. Rather than functioning as separate systems, the two languages often operate in a fluid and integrated manner. Bhatt (2008) describes how Indian bilinguals create hybrid linguistic identities by using both languages as complementary resources. Similarly, Grosjean (1989) emphasised that bilinguals should not be viewed as two monolinguals in one individual, but as speakers with a distinct and integrated linguistic competence. Along the same lines, studies in Indian educational contexts have shown that both the quantity and quality of English exposure children receive plays significant role in shaping vocabulary development (Treffers-Daller *et al.,* 2022).

Research on bilingual development has consistently shown that bilingual children follow trajectories that differ from those of monolinguals, though these differences do not imply deficit. Bialystok et al. (2012), for instance, have highlighted advantages in executive functioning among bilinguals, particularly in domains such as attention and cognitive control skills that are directly relevant to managing competing lexical systems. Importantly, bilingualism itself is not a uniform experience but exists along a continuum shaped by factors such as proficiency, exposure, and context of language use (Luk & Bialystok, 2013). Cummins' (1979) Linguistic Interdependence Hypothesis further suggests that development in one language can support growth in the other, an idea supported by findings in bilingual academic and literacy development. Extending this perspective, Verhoeven (1994) demonstrated that skills in the first language can positively influence second language reading outcomes. Developmental studies have further shown that bilingual lexical processing continues to evolve across childhood, with improvements in naming accuracy and efficiency reflecting increasing proficiency and experience (Jia *et al.,* 2006). Additionally, longitudinal research on bilingual children has demonstrated rapid gains in second language vocabulary during the school years, often accompanied by shifts in language dominance and patterns of lexical access (Kohnert *et al.,* 1999; Kohnert, 2002). This pattern is further supported by evidence suggesting that as bilingual children gain proficiency in their second language, shifts in language dominance may occur, sometimes accompanied by a relative slowing in first language development (Kohnert and Bates, 2002). This dynamic transition often triggers rapid vocabulary acceleration in the institutional language while the home language stabilizes (Sheng, 2014) - a developmental trajectory also observed in recent cross-linguistic studies tracking bilingual children within urban Asian educational environments (Zhou *et al.,* 2025).

Despite the growing body of research in this area, relatively little attention has been given to lexical retrieval specifically in Hindi–English bilingual children. Nouns, especially concrete and easy to visualize, play a key role in early vocabulary development and are commonly used in picture-naming tasks in both research and clinical settings. They are also among the first word categories targeted during intervention. A substantial body of picture-naming research in bilinguals has shown that performance varies depending on language exposure, dominance, and task conditions (Kohnert *et al.,* 1999; Kohnert, 2002). The present study directly addresses this gap by examining how

typical Hindi–English bilingual children retrieve nouns based on their age and changing linguistic environments. Crucially, the unique contribution of this study lies not merely in tracking vocabulary scores, but in exploring how developmental stage intersects with other factors. (8–10 vs.10–12 years) and online cognitive control demands by contrasting single-language blocked naming with alternating mixed-language naming. Understanding how these variables interact is important from both theoretical and clinical perspectives, providing preliminary insights into how dual-language systems are managed in underrepresented, non-Western populations (Ebert *et al.,* 2014; Kohnert & Medina, 2009).

1.1 Need of the Study

To advance psycholinguistic models, research must move beyond populations to explore how specific task structure and sociolinguistic environments interact. The present study addresses this gap by investigating the underrepresented Hindi–English language pairing in urban India, a setting defined by differing institutional and home language roles, along with flexible code-switching patterns. The structural novelty of this design is threefold: it enables a precise developmental comparison between two age groups (8-10 and 10-12 years) by using grade-stratified, textbook-based stimuli to avoid floor and ceiling effects; it implements a systematic task-manipulation approach that contrasts single-language blocked conditions with dual-language mixed conditions (MEH and MHE) to pinpoint the cognitive load of online language switching; and it carries preliminary relevance for clinical assessment. By providing localized reference observations of typical bilingual processing, this study offers a necessary framework to help clinicians distinguish normative language-switching costs from actual structural language impairments.

2. Methodology

2.1 Aim

The present study aimed to analyse and compare the lexical retrieval of common nouns in typical Hindi–English bilingual children and to determine whether performance varies across two developmental age groups.

2.2 Objectives

1. To analyse age-related differences in lexical retrieval by comparing noun processing across two groups of Hindi–English bilingual children (8–10 and 10–12 years).
2. To analyse lexical retrieval under blocked versus mixed language conditions.

2.3 Subjects

A total of 60 typical Hindi–English bilingual children from government schools in Delhi participated in the study. The participants were equally divided into two age groups: Group 1 (8–10 years, n = 30) and Group 2 (10–12 years, n = 30). To characterise the participants' bilingual backgrounds and confirm typical development, general language proficiency and academic performance were verified through school academic records and inputs from both classroom teachers and parents. These sources provided contextual data regarding the children's language background, including general language dominance, everyday usage patterns, and functional communicative competence in both Hindi and English. Across both groups, all participants were enrolled in schools where English served as the primary medium of instruction, while Hindi was utilized as the primary language for home and informal community interactions, ensuring a comparable sociolinguistic profile across participants.

2.4 Ethical Considerations

Ethical approval was sought from the concerned authority before conducting the study. Informed written consent was taken from the parents/legal guardians of all participants and verbal assent was obtained from each child prior to the initiation of the data collection procedure.

2.5 Inclusion and Exclusion Criteria

Children between 8 and 12 years of age who were regularly exposed to both Hindi and English at home and/or school, and reported by parents and teachers to be typically developing, with no history of language, learning, hearing, neurological, or psychiatric conditions, and were enrolled in schools following a bilingual curriculum were included in the study.

Children were excluded if they had been diagnosed with developmental or language disorders, had hearing impairment, used a language other than Hindi or English at home or school, or if reports indicated concerns regarding cognition.

2.6 Stimuli

The stimulus set consisted of 20 colour photographs representing common, high-frequency nouns selected from categories such as animals, food, household objects, and everyday items. All stimuli were adapted from Hindi and English primary school textbooks and educational materials to ensure contextual and curricular relevance. To ensure the task remains cognitively appropriate across different age groups and to protect the data against psychometric biases, two distinct, grade-appropriate item sets were designed. The younger group (ages 8–10) received simpler, early-acquired items (e.g., cat, ball, mango, teacher, house), while the older group (ages 10–12) received more conceptually complex items reflecting their advanced academic exposure (e.g., hospital, scientist, library, mountains). This deliberate stratification was designed to avoid ceiling effects in the older group and floor effects in the younger group, making sure the tasks accurately assessed lexical retrieval and control processes instead of reflecting baseline vocabulary deficiencies.

Three criteria were used to select items for each age group to control for other language variables (1) high subjective familiarity within the urban Delhi school context, (2) high imageability, verified by two independent raters to ensure the photographs unambiguously depicted the target noun, and (3) full translation equivalence, meaning each item possessed a direct, single-word corresponding label in both Hindi and English (e.g., cat/बिल्ली, house/घर). Potential confounding variations in word length and phonological complexity were minimized by selecting brief, structurally straightforward nouns across both languages. The specific set of 20 pictures designated for each age group was held constant and used across all four experimental conditions.

2.7 Procedure and Scoring

Participants completed the task under four conditions: Blocked English (BE), Blocked Hindi (BH), Mixed English–Hindi (MEH; naming first in English, then in Hindi), and Mixed Hindi–English (MHE; naming first in Hindi, then in English). Instructions were given in both Hindi and English before testing, followed by a brief practice session to ensure task familiarity. The images were presented from Microsoft PowerPoint on an HP laptop (model: 15-da0xxx). The recordings were completed in a quiet classroom where children were seated comfortably in front of the laptop. To reduce the impact of progressive learning and item-order effects, the order in which pictures were presented was systematically rotated across participants by changing the starting item.

Responses were audio-recorded for later analysis. Scoring was coded dichotomously (1= correct, 0= incorrect). In mixed-language conditions, participants earned 1 point only if they produced the correct lexical item in the specified target language for that trial; any code-mixed responses received 0 points. Successful self-corrections made within the trial window were accepted and given full credit (1 point), indicating complete retrieval success. The examiners knew the age groups of the participants when scoring post-hoc, but the rigid, binary evaluation method grounded in a predefined vocabulary matrix helped reduce the risk of expectation bias.

2.8 Statistical Analysis

Data were analysed using a Two-Factor Mixed Analysis of Variance (Mixed ANOVA) with Naming Condition, namely Blocked English [BE], Blocked Hindi [BH], Mixed English–Hindi [MEH], and Mixed Hindi–English [MHE]) as the within-subjects factor, and Age Group (8–10 years vs. 10–12 years) as the between-subjects factor. Descriptive statistics, including means (*M*), standard deviations (*SD*), and 95% confidence intervals (CIs), are reported for each

condition and age group (see Table 1). All analyses were performed using SPSS Version 23.0 (IBM Corp., 2015). The significance threshold was set at α = .05, with $p < .01$ interpreted as highly significant (HS) and $p > .05$ as non-significant (NS). Post-hoc pairwise comparisons were conducted using the Bonferroni correction to control for Type I error inflation across multiple comparisons (see Tables 2 and 3).

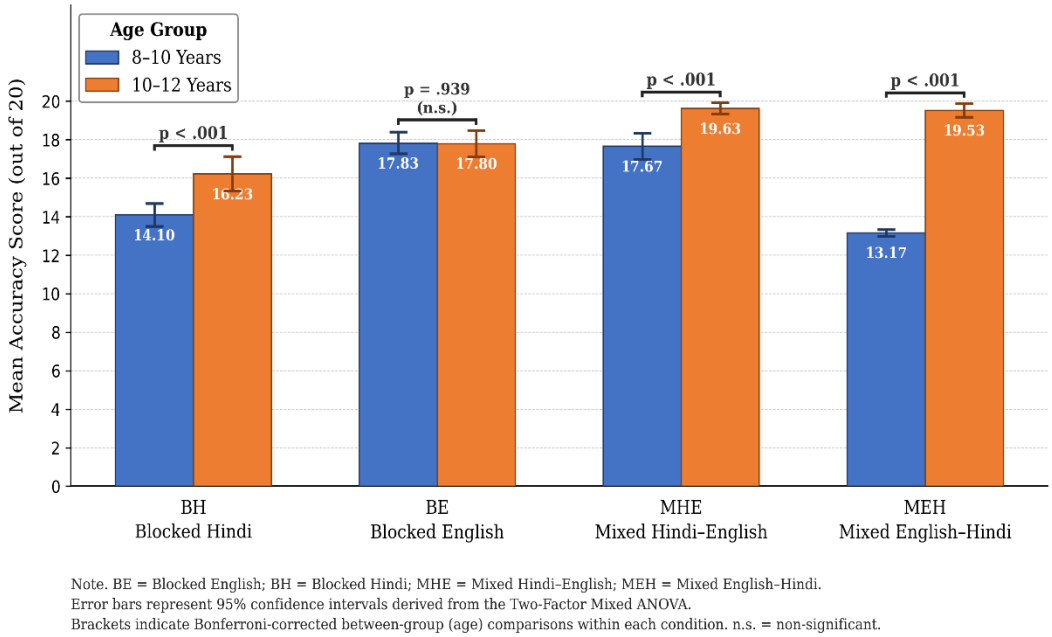
3. Results

The present study aimed to analyse and compare the lexical retrieval of common nouns among typical Hindi-English bilingual children and to determine whether the performance varies across two developmental age groups.

Table 1. Descriptive Statistics for Lexical Retrieval Accuracy Across Naming Conditions and Age Groups

Age Group	Condition	N	M	SD	95% CI Lower	95% CI Upper
8–10 Years	BH – Blocked Hindi	30	14.10	1.58	13.51	14.69
	BE – Blocked English	30	17.83	1.51	17.27	18.40
	MHE – Mixed Hindi–English	30	17.67	1.81	16.99	18.34
	MEH – Mixed English–Hindi	30	13.17	0.46	12.99	13.34
10–12 Years	BH – Blocked Hindi	30	16.23	2.43	15.33	17.14
	BE – Blocked English	30	17.80	1.83	17.12	18.48
	MHE – Mixed Hindi–English	30	19.63	0.76	19.35	19.92
	MEH – Mixed English–Hindi	30	19.53	0.94	19.18	19.88
Total	BH – Blocked Hindi	60	15.17	2.30	14.57	15.76
	BE – Blocked English	60	17.82	1.66	17.39	18.25
	MHE – Mixed Hindi–English	60	18.65	1.70	18.21	19.09
	MEH – Mixed English–Hindi	60	16.35	3.29	15.50	17.20

Note: M = mean accuracy score (out of 20); SD = standard deviation; CI = confidence interval. BE = Blocked English; BH = Blocked Hindi; MHE = Mixed Hindi–English; MEH = Mixed English–Hindi



Note. BE = Blocked English; BH = Blocked Hindi; MHE = Mixed Hindi–English; MEH = Mixed English–Hindi.
Error bars represent 95% confidence intervals derived from the Two-Factor Mixed ANOVA.
Brackets indicate Bonferroni-corrected between-group (age) comparisons within each condition. n.s. = non-significant.

Figure 1. Mean Lexical Retrieval Accuracy across Naming Conditions and Age Groups With 95% Confidence Intervals
Note: Error bars represent 95% confidence intervals. Significance brackets indicate between-group age differences within each condition based on Bonferroni-corrected post-hoc comparisons. p < .001; ns = non-significant (p = .939). BH = Blocked Hindi; BE = Blocked English; MHE = Mixed Hindi–English; MEH = Mixed English–Hindi.

3.1 Main Effect of Naming Condition

The Mixed ANOVA revealed a statistically significant main effect of Naming Condition, $F(3, 174) = 82.18$, $p < .001$, $\eta p^2 = .586$. This large effect size indicates that naming condition accounted for approximately 58.6% of the variance in accuracy scores, reflecting substantial differences in performance across the four task conditions. Collapsed across age groups, children performed most accurately in the MHE and BE conditions and least accurately in the BH and MEH conditions, though this overall ordering obscures important within-group differences that are addressed in the post-hoc analyses below.

3.2 Main Effect of Age Group

A statistically significant main effect of Age Group was observed, $F(1, 58) = 96.03$, $p < .001$, $\eta p^2 = .623$. Children in the 10–12 year group consistently outperformed those in the 8–10 year group overall, with the between-group factor accounting for approximately 62.3% of the variance in total accuracy which is a very large effect. This main effect must, however, be interpreted in conjunction with the significant Condition × Age Group interaction reported below, which reveals that the age-related advantage was not uniform across all naming conditions.

3.3 Interaction Effect: Naming Condition × Age Group

The pattern of post-hoc comparisons indicated a meaningful Condition × Age Group interaction, whereby the effect of naming condition on accuracy differed substantially depending on the developmental stage of the child. For younger children (8–10 years), performance varied widely across conditions, with MHE yielding significantly higher accuracy than MEH ($p < .001$), and BE performing comparably to MHE ($p = .712$). Among older children (10–12 years), this within-group variability contracted considerably: the gap between MHE and MEH was no longer statistically significant ($p = .083$), and BE diverged significantly from both mixed conditions. This developmental reorganisation whereby condition-level differences that were prominent at 8–10 years stabilised or disappeared by 10–12 years constitutes the central interactive pattern of the study and is formally characterised through the Bonferroni-corrected pairwise comparisons summarised in Table 3.

Table 2. Two-Factor Mixed ANOVA Summary: Main Effects

Source	F	Df	p	Sig.	ηp²
Naming Condition (Within-Subjects)	82.18	3, 174	< .001	HS	.586
Age Group (Between-Subjects)	96.03	1, 58	< .001	HS	.623

Note: HS = Highly Significant ($p < .01$). ηp² = partial eta-squared. *F* = F-statistic; *df* = degrees of freedom.

3.4 Post-Hoc Pairwise Comparisons (Bonferroni-Corrected)

To investigate the significant main effects and interaction, Bonferroni-corrected pairwise comparisons were conducted separately within each age group (comparing conditions) and between age groups within each condition. Results are presented in Table 3 and elaborated below.

3.5 Between-Age-Group Comparisons within Each Condition

Age-group differences were examined within each naming condition. Children aged 10–12 years significantly outperformed the 8–10 year group in three of the four conditions: BH ($p < .001$), MEH ($p < .001$), and MHE ($p < .001$). A theoretically notable exception emerged in the Blocked English condition, where performance was statistically equivalent across the two age groups ($M = 17.83$, 95% CI [17.27, 18.40] vs. $M = 17.80$, 95% CI [17.12, 18.48]; $p = .939$). The absence of a developmental difference in BE, in direct contrast to the highly significant age effects across all other conditions, constitutes one of the study's central findings.

3.6 Within-Condition Pairwise Comparisons: 8–10 Year Group

Among younger children, BH differed significantly from all other conditions: from BE ($p < .001$), from MHE ($p < .001$), and from MEH ($p = .004$). A critical non-significant result was observed between BE and MHE ($p = .712$; $M = 17.83$, 95% CI [17.27, 18.40] for BE vs. $M = 17.67$, 95% CI [16.99, 18.34]) for MHE): for this age group, accuracy in the Blocked English and Mixed Hindi–English conditions was statistically indistinguishable. By contrast, BE performance was significantly higher than MEH ($p < .001$; $M = 13.17$, 95% CI [12.99, 13.34]), and MHE similarly exceeded MEH significantly ($p < .001$), underscoring the difficulty posed by the Mixed English–Hindi condition for younger children. The narrow 95% CI of the MEH condition in this group (95% CI [12.99, 13.34]) indicates consistently low performance with little within-group variability.

3.7 Within-Condition Pairwise Comparisons: 10–12 Year Group

Among older children, BH differed significantly from all other conditions: from BE ($p = .001$), from MHE ($p < .001$), and from MEH ($p < .001$). BE differed significantly from both MHE ($p < .001$) and MEH ($p < .001$). A developmental shift of particular significance was observed in the comparison between the two mixed conditions: MHE and MEH did not differ significantly from each other ($p = .083$; $M = 19.63$, 95% CI [19.35, 19.92] for MHE vs. $M = 19.53$, 95% CI [19.18, 19.88]) for MEH). The near-complete overlap of these confidence intervals visually confirms the statistical equivalence. This convergence between the mixed conditions in the older group, a pattern that was absent in younger children, suggests a developmental stabilisation in the management of language-switching direction that was not yet evident at 8–10 years.

Table 3. Bonferroni-Corrected Post-Hoc Pairwise Comparisons: Within-Group (Condition) and Between-Group (Age) Results

Within-Group Comparisons	**8–10 Yrs *(p)***	**10–12 Yrs *(p)***	**Significance Note**
BH vs. BE	< .001	.001	HS both groups
BH vs. MHE	< .001	< .001	HS both groups
BH vs. MEH	.004	< .001	HS both groups
BE vs. MHE	.712	< .001	NS younger; HS older
BE vs. MEH	< .001	< .001	HS both groups
MHE vs. MEH	< .001	.083	HS younger; NS older
Between-Group Comparisons (8–10 vs. 10–12 yrs per condition)	*p*	**Significance**	**Interpretation**
BH – Blocked Hindi	< .001	HS	Older > younger
BE – Blocked English	.939	NS	No age difference — stable across groups
MHE – Mixed Hindi–English	< .001	HS	Older > younger
MEH – Mixed English–Hindi	< .001	HS	Older > younger; largest effect

Note: p-values are Bonferroni-corrected. HS = Highly Significant ($p < .01$); NS = Non-Significant ($p > .05$). BE = Blocked English; BH = Blocked Hindi; MHE = Mixed Hindi–English; MEH = Mixed English–Hindi.

4. Discussion

The present study examined lexical retrieval accuracy in typical Hindi–English bilingual children across four picture-naming conditions. The analyses revealed that lexical performance varied significantly by linguistic context,

older children demonstrated higher accuracy overall, and the rate of developmental growth diverged sharply depending on language-switching demands.

4.1 Early Optimisation of English Lexical Retrieval in the Blocked Condition

A key baseline finding from this study is the near-identical performance of both age groups in the Blocked English condition (M = 17.83 vs. M = 17.80; p = .939), with overlapping 95% CIs further confirming the absence of a meaningful group difference in accuracy scores. As the groups were evaluated on grade-stratified stimuli, this equivalence reflects a successful scaling of retrieval mechanisms to navigate advanced vocabulary with the same high proficiency that younger children display for high-frequency nouns, indicating early optimization in urban Indian bilingual-medium schools.

This interpretation is broadly consistent with longitudinal evidence demonstrating that children in formal English-medium or bilingual educational environments show rapid gains in English vocabulary during the early school years (Kohnert *et al.*, 1999; Kohnert & Bates, 2002; Sheng, 2014). The institutional primacy of classroom English exposure in Delhi schools likely accelerates this consolidation (Treffers-Daller *et al.,* 2022; Zhou *et al.,* 2025), supporting the Revised Hierarchical Model (RHM; Kroll & Stewart, 1994) where robust, direct L2 concept connections develop by age 8 to maintain stable proportional accuracy as vocabulary demands increase.

4.2 Continuing Development of Hindi Lexical Retrieval

In contrast to the stability observed for English, Hindi lexical retrieval in the blocked (BH) condition showed a significant age-related increase ($p < .001$), with children aged 10–12 years outperforming the younger group by approximately two mean score points (M = 16.23, 95% CI [15.33, 17.14] vs. M = 14.10, 95% CI [13.51, 14.69]). This improvement is striking because the older group faced a more complex stimulus set, demonstrating first-language growth that outpaces the step up in task difficulty.

This reflects the unique sociolinguistic profile of urban India, where Hindi dominates informal community spaces while formal testing draws on academic lexical representations increasingly dominated by institutional English (Agnihotri, 2007; Kachru, 1983). The gradual maturation observed here suggests that L1 networks continue to expand and structurally consolidate throughout middle childhood, a trajectory potentially supported by cross-linguistic transfer as generalized academic language competence develops (Cummins, 1979; Verhoeven, 1994).

4.3 Differential Developmental Trajectories in Mixed-Language Conditions

The most nuanced set of results emerged in the mixed-language conditions, where a significant Condition × Age Group interaction revealed shifting patterns of directional difficulty. For the 8–10 year group, the MEH condition yielded strikingly low accuracy (M = 13.17, 95% CI [12.99, 13.34]), significantly below all other conditions (all ps < .01), while the MHE condition was statistically equivalent to BE in this age group (p = .712). For the 10–12 year group, this asymmetry disappeared as MEH accuracy rose substantially (M = 19.53) and converged with MHE (M = 19.63; p = .083), highlighting a structural reorganization in how language-switching overhead is managed.

Younger children's substantially better performance in MHE compared to MEH aligns with established research on asymmetric switch costs, which demonstrates that switching from a dominant to a non-dominant language is typically less cognitively taxing than the reverse direction (Meuter & Allport, 1999). Within the RHM framework, the Hindi-first sequence may also function as a temporary conceptual scaffold that becomes unnecessary by ages 10–12 as direct L2–concept links strengthen, closing the performance gap and reflecting a mature capacity to regulate bidirectional transitions (Gross & Kaushanskaya, 2015; Kubota *et al.*, 2020).

4.4 Cognitive and Linguistic Mechanisms

The steep accuracy gains in the high-demand MEH condition are consistent with the possibility of a progressive maturation of underlying cognitive control, aligning with the Adaptive Control Hypothesis (Green & Abutalebi, 2013) where dual-language environments place dynamic demands on conflict monitoring and proactive inhibition networks that develop significantly between ages 8 and 13. That said, because the present study measured

naming accuracy only and did not include response latency, switching cost calculations, or independent executive function assessments, any reference to such mechanisms must be treated strictly as cautious theoretical inference rather than empirical demonstration (Bialystok *et al.*, 2012; Gross & Kaushanskaya, 2015).

Viewed through Grosjean's (1989) framework, the blocked and mixed conditions engage distinct monolingual and bilingual processing modes that mature at different rates; while monolingual-style English retrieval stabilizes early, the capacity to efficiently regulate parallel activation in the bilingual mode may continue to develop throughout childhood (Costa *et al.,* 1999; Kan *et al.,* 2024). Ultimately, these patterns suggest that the Hindi–English bilingual children in this sample should be understood as speakers with a distinct integrated linguistic competence (Bhatt, 2008), rather than approximations of two monolinguals.

5. Summary and Conclusion

This study demonstrates that lexical retrieval in Hindi–English bilingual children is a dynamic, evolving cognitive-linguistic skill modulated by task architecture, language dominance, and institutional exposure. While single-language English retrieval optimizes early—allowing younger children to navigate age-appropriate vocabulary with the same high proficiency as their older peers—significant developmental gains continue to unfold in both single-language Hindi and mixed-language switching contexts. The highly pronounced accuracy improvements observed in the Mixed English–Hindi condition point to a critical maturation and reorganization of dual-language switching dynamics during middle childhood.

Clinically, these insights underscore the necessity of evaluating word-finding abilities in linguistically diverse populations relative to their specific dual-language environments and academic baselines. Rather than benchmarking bilingual children against rigid monolingual norms, diagnostic assessments must account for the fluid nature of processing overhead in multi-language modes, ensuring a more accurate and equitable representation of a child's true linguistic competence.

5.1 Clinical Implications

These findings highlight the critical need to account for both language dominance and developmental stage when assessing bilingual children within similar sociolinguistic contexts. While Blocked English performance optimises early, tasks involving Blocked Hindi and mixed-language conditions offer more sensitive insights into the ongoing refinement of lexical control mechanisms. Crucially, reduced performance in mixed contexts must be interpreted with caution, as it likely reflects the normative cognitive overhead of language switching rather than an underlying structural impairment. Although bounded by a cross-sectional design and a specific regional focus, this study demonstrates that future diagnostic frameworks should assess performance across both blocked and mixed conditions to capture a comprehensive lexical profile. Ultimately, these patterns underscore a pressing need for localized bilingual norms for Indian children to support precise clinical diagnosis and targeted interventions in multilingual settings.

5.2 Limitations

- Sample Restriction: The subjects were limited to a single geographic context (Delhi), restricting direct generalizability since Hindi–English bilingualism varies widely across socio-economic and regional landscapes in India.
- Accuracy-Only Design: The study measured naming accuracy only, omitting response latencies. This restricts a more comprehensive mapping of real-time processing speed and immediate switching costs across conditions.
- Background Characterization: Individual differences in language dominance were monitored via qualitative reports and school records rather than standardized psychometric profiling, leaving sub-threshold sample variance statistically uncontrolled.

- Grade-Stratified Stimuli: The cross-sectional use of age adjusted word lists prevented direct item-level comparisons across cohorts. Consequently, the findings reflect structural changes in age-appropriate language control profiles rather than a linear trajectory of identical vocabulary items.

5.3 Future Directions

- Incorporate response latencies: Future studies should pair accuracy with reaction time measures to capture processing efficiency and inhibitory dynamics, particularly under high-demand mixed conditions.
- Longitudinal tracking: Longitudinal designs with parallel testing matrices would offer clearer insight into how individual bilingual lexical dominance and retrieval strategies evolve over time.
- Localized standardisation: There is a clear need to establish standardized, culturally grounded bilingual norms within Indian context to support precise clinical assessment and differential diagnosis for children with word-retrieval difficulties.

References

Agnihotri, R.K. (2007). Towards a Pedagogical Paradigm Rooted in Multilinguality. *International Multilingual Research Journal,* 1(2), 79–88. https://doi.org/10.1080/19313150701489689

Bhatt, R.M. (2008). In Other Words: Language Mixing, Identity Representations, and Third Space. *Journal of Sociolinguistics,* 12(2), 177–200. https://doi.org/10.1111/j.1467-9841.2008.00363.x

Bialystok, E., Craik, F.I.M., Luk, G. (2012). Bilingualism: Consequences for mind and brain. *Trends in Cognitive Sciences,* 16(4), 240–250. https://doi.org/10.1016/j.tics.2012.03.001

Costa, A., Miozzo, M., Caramazza, A. (1999). Lexical Selection in Bilinguals: Do Words in the Bilingual's Two Lexicons Compete for Selection? *Journal of Memory and Language,* 41(3), 365–397. https://doi.org/10.1006/jmla.1999.2651

Cummins, J. (1979). Linguistic Interdependence and the Educational Development of Bilingual Children. *Review of Educational Research,* 49(2), 222–251. https://doi.org/10.3102/00346543049002222

De Bot, K. (1992). A bilingual production model: Levelt's "speaking" model adapted. *Applied Linguistics,* 13(1), 1–24.

Ebert, K.D., Kohnert, K., Pham, G., Rentmeester Disher, J., Payesteh, B. (2014). Lexical Profiles of Bilingual Children with Primary Language Impairment. *Bilingualism: Language and Cognition,* 17(4), 766-783. https://doi.org/10.1017/S1366728913000825

Green, D. W., & Abutalebi, J. (2013). Language Control in Bilinguals: The Adaptive Control Hypothesis. *Journal of Cognitive Psychology, 25*(5), 515–530. https://doi.org/10.1080/20445911.2013.796377

Green, D.W. (1998). Mental Control of the Bilingual Lexico-Semantic System. *Bilingualism: Language and Cognition,* 1(2), 67–81. https://doi.org/10.1017/S1366728998000133

Grosjean, F. (1989). Neurolinguists, Beware! The bilingual is not Two Monolinguals in One Person. *Brain and Language, 36*(1), 3–15. https://doi.org/10.1016/0093-934X(89)90048-5

Gross, M., Kaushanskaya, M. (2015). Voluntary Language Switching in English Spanish Bilingual children. *Journal of Cognitive Psychology,* 27(8), 992–1013. https://doi.org/10.1080/20445911.2015.1074242

Jia, G., Kohnert, K., Collado, J., Aquino-Garcia, F. (2006). Action Naming in Spanish and English by Sequential Bilingual Children and Adolescents. *Journal of Speech, Language, and Hearing Research,* 49(3), 588–602. https://doi.org/10.1044/1092-4388(2006/042)

Kachru, B.B. (1983). *The Indianization of English: The English language in India.* Oxford University Press, 241-261.

Kan, P.F., Yim, D., Brennan, C. (2024). Exploring the Interplay of Semantic Knowledge in Bilingual Children: Heritage Language and Second Language. *Frontiers in Language Sciences*, 3, Article 1325344. https://doi.org/10.3389/flang.2024.1325344

Kaur, R. (2024). Lexico-semantic production and cognitive processing in Indian bilinguals. *Journal of Child Language Acquisition and Development*, 12(1), 950–962. https://doi.org/10.5281/zenodo.11436359

Kohnert, K. (2002). Picture naming in early sequential bilinguals: A 1-year follow-up. *Journal of Speech, Language, and Hearing Research,* 45(4), 759–771. https://doi.org/10.1044/1092-4388(2002/061)

Kohnert, K., Bates, E., Hernandez, A.E. (1999). Balancing Bilinguals: Lexical-Semantic Production and Cognitive Processing in Children Learning Spanish and English. *Journal of Speech, Language, and Hearing Research,* 42(6), 1400–1413. https://doi.org/10.1044/jslhr.4206.1400

Kohnert, K., Medina, A. (2009). Bilingual Children and Communication Disorders: A 30-year Research Retrospective. *Seminars in Speech and Language,* 30(4), 219–233. https://doi.org/10.1055/s-0029-1241721

Kohnert, K.J., Bates, E. (2002). Balancing Bilinguals II: Lexical Comprehension and Cognitive Processing in Children Learning Spanish and English. *Journal of Speech, Language, and Hearing Research,* 45(2), 347–359. https://doi.org/10.1044/1092-4388(2002/027)

Kroll, J.F., Stewart, E. (1994). Category Interference in Translation and Picture Naming: Evidence for Asymmetric Connections between Bilingual Memory Representations. *Journal of Memory and Language,* 33(2), 149–174. https://doi.org/10.1006/jmla.1994.1008

Kubota, M., Chevalier, C., Byers-Heinlein, K. (2020). How Bilingual Experience and Executive Control Influence Development in Language Control among Bilingual Children. *Developmental Science,* 23(6), e12969. https://doi.org/10.1111/desc.12865

Levelt, W.J.M. (1989). Speaking: From Intention to Articulation. *MIT Press*.

Luk, G., Bialystok, E. (2013). Bilingualism is not a Categorical Variable: Interaction between Language Proficiency and Usage. *Journal of Cognitive Psychology,* 25(5), 605–621. https://doi.org/10.1080/20445911.2013.795574

Meuter, R.F.I., Allport, A. (1999). Bilingual Language Switching in Naming: Asymmetrical Costs of Language Selection. *Journal of Memory and Language,* 40(1), 25–40. https://doi.org/10.1006/jmla.1998.2602

Sheng, L. (2014). Lexical-semantic skills in bilingual children who are becoming English-dominant: A longitudinal study. *Bilingualism: Language and Cognition*, 17(3), 556–571. https://doi.org/10.1017/S1366728913000746

Treffers-Daller, J., Mukhopadhyay, L., Balasubramanian, A., Tamboli, V., Tsimpli, I. (2022). How ready are Indian primary school children for English medium instruction? An analysis of the relationship between the reading skills of low-SES children, their oral vocabulary and English input in the classroom in government schools in India. *Applied Linguistics,* 43(4), 746–775. https://doi.org/10.1093/applin/amac003

Verhoeven, L. (1994). Transfer in bilingual development: The linguistic interdependence hypothesis revisited. *Language Learning,* 44(3), 381–415. https://doi.org/10.1111/j.1467-1770.1994.tb01112.x

Zhou, J., Mai, Z., Lau, E., Lum, C., Thian, A.L., Yip, V. (2025). Cross- and within-language associations between phonological, lexical, and grammatical domains in Mandarin–English bilingual preschoolers in Singapore. *Journal of Speech, Language, and Hearing Research*, 68(2), 636–653. https://doi.org/10.1044/2024_JSLHR-24-00310

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Conflict of interest

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