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The Impact of Age of Acquisition on Cross-Linguistic Influence in Children's Linguistic Competence

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Abstract:

Bilingual language development is shaped by multiple factors, among which age of acquisition (AOA), cross-linguistic influence (CLI), and linguistic competence play central roles. AOA determines whether a child acquires two languages simultaneously or sequentially, with earlier exposure often associated with more native-like proficiency, while later exposure tends to strengthen CLI. CLI is a natural and systematic process that reflects the interaction between two languages. It can extend beyond target-like forms to include ungrammatical or pragmatically inappropriate structures. Linguistic competence, particularly in syntax and semantics, both shapes and predicts the degree of CLI, demonstrating its importance in understanding bilingual development. Current studies reveal that CLI is universal, and its form and intensity vary according to timing of exposure, type of structure, and input quality. However, much of the existing research is limited by small sample sizes, homogeneous participant backgrounds, underrepresentation of sequential bilinguals, and a lack of longitudinal designs. Future research should adopt larger and more diverse samples, include control groups, and make greater use of longitudinal approaches to better capture developmental patterns. Expanding the scope to less studied areas such as pragmatics, phonology, and discourse will further enrich the understanding of bilingual development.

Keywords: Bilingual, Age of Acquisition (AOA), Cross-linguistic influence (CLI), linguistic competence

1. Introduction

Bilingualism has always been a popular topic in the field of education. There are millions of children grow up learning two or more languages through family or formal education systems. Therefore, understanding how bilingualism develops, and its impact factor is importance in educational practices,

language policies, and family decisions about language use at home and in school.

Recent studies show that bilingualism has positive effects on children's cognition, but there are also some challenges in the process [1,2]. cross-linguistic influence (CLI) is one major challenge in bilingual learning. CLI is a natural and systematic phenomenon in bilingual development, reflecting the interaction of a child's two languages rather than confusion [1,3]. Some articles suggest that age of acquisition (AOA) and the development of linguistic competence influence the degree of CLI [4,5].

Although there is many research exploring the relationship among the AOA, CLI, and linguistic competence, there are still some gaps that need to be addressed. Some research remains limited by narrow linguistic focus, small sample sizes, or underrepresentation of sequential bilinguals. These gaps restrict the generalizability of findings. Against this background, this paper reviews how AOA, CLI, and linguistic competence interact in shaping bilingual development. It also elucidates the relevance of these factors to understanding bilingualism and the necessity of giving them further attention.

2. Key Factors in Bilingual Development: AOA, CLI, and Linguistic Competence

2.1 Age of Acquisition(AOA)

Currently, bilingual individuals are generally defined as people who can use two languages fluently. Bilingual children refer to those who have learned two or more languages extensively during childhood [6]. Age of Acquisition (AOA) is one of the important factors in bilingual language development [7,8]. The academic definition of AOA is the age at which an individual is first exposed to a second language. AOA can be divided into simultaneous bilinguals and sequential bilinguals. Simultaneous bilingualism refers to children exposed to two languages from birth to age two, while sequential bilingualism refers to children who acquire a second language after the age of two found that earlier AOA leads to better grammatical mastery in bilinguals [6,7]. Granfeldt also showed that an early AOA results in a more native-like command of grammatical gender in French [9]. Other studies further indicate that AOA influences the form of CLI.

2.2 Cross-linguistic Influence (CLI)

The process of becoming bilingual is not always positive. During bilingual learning, children may face CLI related challenges, for example applying L1 syntactic structures or semantic patterns when speaking L2. CLI refers to the use of syntactic knowledge from one language in the other when children mix languages [3, 4, 10]. It is important to note that CLI is not a mistake or confusion, but an unexpected use of language forms [1, 3]. In other words, CLI is normal and part of bilingual development. CLI is bidirectional rather than strictly L1-to-L2 and can emerge in both languages [1]. There are some studies showed that AOA influences the form of CLI, with later AOA learners exhibiting stronger CLI because their learning takes place beyond the early stage of language development [4,10]. This means that the later the AOA, the more likely bilinguals' L1 knowledge structures will affect their L2, resulting in stronger CLI.

2.3 Linguistic Competence

Linguistic competence differs from linguistic performance. It does not refer to language use in practice but rather to the internal understanding of language structure, such as syntactic competence and semantics [4,5]. Research has shown that the syntactic competence of bilinguals' two languages can influence each other, and the development of syntactic competence affects the strength of CLI [11]. This also implies that the strength of CLI can be predicted or explained through syntactic competence.

3. Insights from Studies

3.1 Research Evidence from Motion Events, Structural Priming, and Gender Learning

Engemann examined how CLI affects the syntax of simultaneous bilinguals [4]. At the same time, the author explored whether CLI is bidirectional and whether it persists over development. The study compared the structural overlap hypothesis and the co-activation account. The structural overlap hypothesis posits that CLI occurs when the structures of two languages overlap and lie at vulnerable interfaces, whereas the co-activation account argues that in production, the syntactic–semantic frames of both languages are simultaneously activated and compete. The sample included 96 English–French simultaneous bilingual children aged 4–10 and 96 English and French monolingual controls, divided into younger (age 4-6) and older groups (age 8-10). Participants were asked to watch 12 short videos depicting motion events and provide oral descriptions.

The results showed that bilingual children used more V-framing features in English and more S-framing features in French. V-framing denotes encoding path in the main verb, while S-framing encodes manner in the verb

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and path in satellites. For example, French typically uses a path verb like 'enter', whereas English expresses manner in the verb with a satellite for path, as in go into the room. Both languages displaying patterns typical of the other, indicating bidirectional CLI. Moreover, CLI did not diminish with age but rather increased as children grew older. This also support the co-activation account because CLI had occurred even in the absence of structural overlap (e.g., in boundary-crossing contexts). Since all participants were simultaneous bilinguals, the findings suggest that even an early AOA does not avoid CLI. The study also revealed that CLI involves semantic competence, indirectly demonstrating the link between linguistic competence and CLI. Limitations of the study include the exclusive focus on simultaneous bilinguals, making it difficult to generalize the conclusions to sequential bilinguals. Another limitation is the absence of longitudinal tracking, which prevents determining whether CLI reflects delayed acquisition or a long-term characteristic.

Unsworth investigated whether CLI occurs through between-language priming, that is, whether the syntax of bilingual children's two languages is shared [12]. The study used a structural priming paradigm solely targeting possessive constructions (prenominal vs. postnominal). The researchers selected 30 English–Dutch bilingual children aged 5–7 as participants, with an equal gender distribution. In the experiment, the researchers presented the children with English possessive constructions and observed their responses in Dutch. The results showed that after being primed in English, the children were more likely to use English syntax in Dutch. This indicates that CLI can be triggered across the two languages, suggesting that bilingual children's syntax is shared between languages. Moreover, since the researchers tested CLI through a syntax task, the study demonstrates that bilinguals' understanding of syntax (linguistic competence) can reflect the degree of CLI. However, because most participants were simultaneous bilinguals, the study cannot determine the effect of AOA on CLI. The sample size is small, and the participants largely came from middle-class educational backgrounds, so the external validity is limited. Another limitation is that the syntax tasks in the experiment focused solely on possessive constructions, which cannot capture the influence of other aspects of linguistic competence on CLI.

Granfeldt examined how the age at which bilingual children are exposed to French and input quantity influence their understanding of French grammatical gender, that is, how AOA affects grammatical development [9]. The study included 12 children. There are 4 French monolinguals, 4 Swedish–French 2L1 (simultaneous bilinguals), and 4 Swedish–French cL2 (sequential bilinguals). The study used a longitudinal design, with data collected every 3–5 months up to 3 years (around 6-10 sessions per child). Data were gathered through free conversations, narratives, and elicited tasks. Participants' understanding of French grammatical gender was assessed by the correctness of lexical usage in their corpora. The results showed that the acquisition of grammatical gender in French was influenced by multiple factors, with both AOA and input quantity playing important roles. In particular, the performance of cL2 children demonstrated that AOA affects linguistic competence, and the earlier the AOA, the closer bilinguals' language development is to native-like levels. Limitations of the study include its small sample size (n=12), which restricts the generalizability of the findings. Moreover, since all participants came from the same school, the external validity is limited. Finally, the study focused mainly on grammatical gender, a feature that exists only in certain language systems, meaning the conclusions cannot be generalized to other systems (like East Asian languages).

Overall, the studies by Unsworth, Granfeldt, and Engemann all focus on the issues of AOA and CLI in bilingual acquisition, as well as on how linguistic competence reflects the degree of CLI [4, 9, 12]. A common finding is that all three acknowledge CLI as a natural phenomenon in bilingual development and point out that the degree and form of CLI are influenced by AOA and language type differences. However, their aims are different. Granfeldt mainly examined French grammatical gender, finding that early learners achieve more native-like mastery, which emphasizing the relationship between syntactic competence and AOA [9]. Unsworth's research have a larger sample and longitudinal data, confirmed the persistence of CLI [12]. It highlighted that later AOA learners exhibit stronger CLI, making the conclusions more generalizable. Engemann, by contrast, extended the analysis to semantic competence, showing that simultaneous bilinguals also demonstrate bidirectional CLI and that CLI becomes stronger with age [9].

3.2 Comparing Structural Priming Studies on CLI

Van Dijk and Unsworth examined the relationship between CLI and structural priming in bilingual children [13]. Experiment 1 included 29 Spanish–Dutch children, mostly simultaneous bilinguals. Experiment 2 included 30 French–Dutch bilingual children. All participants were 4–8 years old and had similar educational backgrounds. The researchers tested whether Romance N-Adj orders could prime ungrammatical Dutch N-Adj. The proficiency was measured with vocabulary and digit span tasks. Ex-

periment 1 showed that children produced ungrammatical N-Adj in Dutch, and those with lower proficiency were more easily primed. Experiment 2 showed similar results, but priming was limited by the type of adjective translation, such as 'green' vs. 'big'. No significant priming was found from Dutch to French, possibly because of a strong baseline CLI. The study shows that CLI appears through priming and reflects syntactic competence. However, since most participants were simultaneous bilinguals, the role of AOA in CLI is unclear. The limitations are the narrow focus on adjective position and the homogeneous SES of participants, which may restrict the generalizability of findings across broader populations.

Baroncini and Torregrossa investigated how CLI in bilinguals is driven by structure and language activation [14]. The participants were 36 Greek–Italian bilingual children aged 7–11. Their socioeconomic backgrounds were diverse, and the gender ratio was balanced. The study used within- and across-language priming experiments, including three picture description tasks with 20 VSO (verb–subject–object) primes and 20 SVO primes each. Children were primed on the VSO order, which is grammatical in Greek but pragmatically inappropriate in Italian. Results showed a cumulative increase in VSO production in Italian across tasks, especially in the across-language condition, supporting the idea that cross-linguistic priming interacts with pragmatic appropriateness. This indicates that both structure activation and language activation contribute to CLI. The study provides evidence that CLI can emerge even with inappropriate structures and is modulated by dominance rather than by AOA alone. The main limitation is the lack of a monolingual control group, which makes it difficult to disentangle CLI effects from general developmental tendencies.

Both articles tested children's CLI through structure priming and agreed that CLI can extend to non-target patterns (ungrammatical or inappropriate structures) and is influenced by children's abilities. The difference is that Van Dijk and Unsworth focused on adjective position in noun phrases, while Baroncini and Torregrossa emphasized syntax structure [13, 14]. Their methods were also different. Van Dijk and Unsworth used a "Snap" card game with GLMMs and vocabulary, while Baroncini and Torregrossa used picture description [13, 14]. Although both approaches have strengths, the card game with GLMMs provides stronger statistical control. A shared limitation is the small sample size and the absence of a monolingual control group.

4. Discussion and Suggestion

These studies show that AOA, CLI, and linguistic competence are closely related in bilingual development. A consistent conclusion is that CLI is not a sign of confusion but a natural and systematic process, which reflects the interaction between a child's two languages. Research also shows that the timing of AOA has long-term effects, with direct implications for bilingual education policies and parental strategies. Earlier exposure often leads to more native-like levels, while later exposure is linked to stronger CLI. Moreover, linguistic competence, particularly syntactic and semantic competence, serves as both an outcome of bilingual development and a predictor of CLI degree. Finally, many studies show that CLI can extend non-target forms to include ungrammatical or inappropriate structures [4, 9, 12, 13, 14]. This reinforces the idea that CLI is dynamic and sensitive to individual abilities and language dominance.

These findings give several implications. First, educators and parents should view CLI as a natural stage in bilingual learning, recognizing its potential role in cognitive flexibility rather than treating it as an error. In the teaching process, children should develop a clear awareness of cross-linguistic structures and be guided to distinguish between overlapping and different features of their two languages. Second, considering the role of AOA, simultaneous (early exposure) and sequential (later exposure) are both important for supporting balanced development of two languages. Families or educational programs should take this into account and provide appropriate input in both languages. Finally, research on linguistic competence suggests that practice in syntax and semantic skills, such as targeted grammar games or narrative tasks, can reduce negative transfer.

For future research, it is important to address the limitations in the previous studies. Many studies have small sample sizes and homogeneous participant backgrounds, limiting external validity. Future work should incorporate cross-cultural and socioeconomically diverse participants. Another key limitation is the under-representation of sequential bilinguals, which makes it difficult to determine how AOA shapes CLI across different developmental paths. Including monolingual control groups is also important, as they provide a baseline to clarify whether observed effects reflect cross-linguistic processes or general acquisition trends. Additionally, future studies should employ longitudinal designs to determine whether observed CLI patterns reflect temporary delays or persistent features of bilingual grammar. Finally, future research can focus on under-explored linguistic domains, such as pragmatics, phonology, and discourse strategies, to broaden understanding beyond syntax.

Overall, the evidence highlights the importance of early exposure, balanced input, and recognition of CLI as a nat-

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ural process in bilingual development. By addressing the limitations, future research can provide more comprehensive insights into how bilingual children develop linguistic competence across different contexts.

5. Conclusion

This paper has examined the interconnected roles of AOA, CLI, and linguistic competence in bilingual development. The review highlights that bilingualism is shaped not only by AOA but also by the dynamic interactions between a child's two languages. A consistent finding is that earlier exposure often leads to more native-like proficiency, while later exposure is linked to stronger CLI. Furthermore, linguistic competence in areas such as syntax and semantics both reflects bilingual development and predicts the strength of language interaction.

There are several important implications identified. Educators and parents should view cross-linguistic influence as a natural and systematic part of bilingual learning rather than an error to be corrected. Language programs should consider the role of age of acquisition and provide balanced input to support both simultaneous and sequential bilinguals. In addition, targeted practice in syntax and semantic skills may help children distinguish between languages and reduce negative transfer.

By reviewing existing evidence and current limitations, this paper emphasizes the need for more diverse, longitudinal, and comprehensive research. It demonstrates why understanding the interplay between the age of acquisition, cross-linguistic influence, and linguistic competence is crucial for advancing knowledge of bilingual development and informing educational practice.

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