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Exploring the Factors of Multilingual Code-Mixing: From General Influences to L1 and L3 Interaction in L2 Contexts

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Abstract. It is common that multilingual speakers, during a conversation in a target language, may exhibit a mixing of non-target languages. Driven by this interesting phenomenon, much research has been conducted on the causes. Many studies on language mixing mainly explore bilingual contexts. However, this study focuses on a question: What are the contributing factors of factors contributing to the mixing of non-target languages among multilingual speakers in a second language environment? The aim of the present study is to examine the contributing factors to multilingual code-mixing. Specifically, it focuses on the interaction between the native language (L1) and third language (L3) in a second-language (L2) context. For this purpose, this study examined linguistic structure, language proficiency, psychological and cognitive processes, socio-cultural contexts, and physiological and pathological conditions. The study finds that lower L2 proficiency usually means greater reliance on L1 and L3 and that the interlingual structural similarities have a positive influence on multilingual code-mixing. Contributing factors observed include cognitive mechanisms, such as parallel activation and translation asymmetry. These factors also cover contextual factors, like formality and cultural expectations, as well as individual differences in language proficiency and cognitive control. These contributing factors together influence multilingual code-mixing. This study suggests that more in-depth studies be conducted to further reveal multilingual language use and to help with language acquisition and communication strategies.

Keywords: multilingual speaker, code mixing/language mixing, phonological similarity, language proficiency.

1. Introduction

Code-mixing, or language mixing, means a hybrid of two or more languages in the same sentence or conversation. This phenomenon is a very common occurrence in multilingual contexts and significant in L2 environments[1]. It is manifested as the incorporation of L1 and L3 elements into what is expressed in L2. More often than not, code-mixing remains a difficult issue that multilingual speakers are beset with during communication in foreign languages. In response, this study has

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decided to explore the contributing factors in depth. Although general contributing factors have been explored, existing research overlooks how multilingual speakers mix L1 and L3 in L2 contexts.

The aim of the present study is to examine the contributing factors to multilingual code-mixing. Specifically, they include language structure factors, language proficiency factors, psychological and cognitive factors, socio-cultural and contextual factors, and physiological and pathological factors. We then focus specifically on the unique case of L1 and L3 interaction in L2 environments. By analyzing how these factors contribute to the mixing of L1 and L3 in L2 contexts, our research deepens the theoretical understanding of code-mixing but also provides practical insights for language learners, educators, linguists, and policymakers on how to better facilitate language acquisition and multilingual communication.

2. Linguistic structural factors

Phonological similarity, lexical similarity, and genetic similarity contribute to language mixing among multilingual speakers. Among these, genetic similarity is particularly reflected in lexical borrowing and grammatical fusion. Phonological similarity is how similar the sounds of words are between or more languages. Lexical similarity is a measure of the degree to which the word sets of two given languages are similar. Genetic similarity is a measure of the relatedness between two languages based on their historical origins and linguistic family connections.

One study explored the exact mechanism behind the positive correlation between phonological similarity and linguistic mixing. The study analyzed Voice Onset Time (VOT) in German, English, and French and focused on the voiceless stop consonants /p/, /t/, and /k/. VOT is the time between the release of a stop consonant and the onset of vocal cord vibration. Data was collected on the VOTs for these consonants across the three languages. French was classified as a voicing language (short VOTs), and German and English as aspirating languages (long VOTs). The results showed that German VOTs for /p/, /t/, and /k/ were 67 ms, 71 ms, and 84 ms, respectively, while in English, they were 64 ms, 74 ms, and 83 ms. It was found that these similar phonetic patterns between the two languages could confuse multilingual speakers and further cause mixing. The findings suggest that the typological proximity between German and English, specifically their similar VOT patterns, increases the likelihood of cross-linguistic influence and feature mixing, supporting the research question that structural similarity between languages promotes such interference[2].

Another study investigated whether lexical similarity leads to code-mixing in multilingual speakers. To investigate this question, researchers observed a native French speaker, who spoke Spanish and was learning Italian, speaking Italian and found that she frequently used Spanish words or words influenced by Spanish in place of Italian equivalents. For example, the subject used "comer" (to eat in Spanish) and "pequeño" (small in Spanish) instead of the Italian words "mangiare" (to eat) and "piccolo" (small). One explanation for this result is the similarity between Italian and Spanish. A second study asked whether multilingual speakers consciously recognize the source of non-target words when shifting between non-native languages. Ten English L1 learners of Italian, with low proficiency in Spanish, translated words between English, Italian, and Spanish. The results showed frequent use of Spanish words during Italian translations, without conscious recognition of their origin, supporting the hypothesis that multilinguals may undergo a "system shift" where words are incorrectly attributed to the wrong language. A third diary study explored how multilinguals manage lexical confusion between two closely related non-native languages. An English L1 speaker who had lived in Italy and later Spain often confused Italian and Spanish words, such as mixing "dinero" (Spanish for money) with "soldi" (Italian for money). This highlights how system shifts impact daily language use, with the speaker struggling to distinguish between the

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languages over time. These findings suggest that multilinguals may become unable to tell the difference between similar non-native languages[3].

Baghana explored whether language interference could be caused by language mixing between genetically similar languages through lexical borrowing and grammatical fusion[4]. The authors illustrate the ways in which language mixing occurs through three case studies of language contact in French-speaking African regions. They examined interactions between French and Portuguese, Bantu languages like Kikongo, and the African language Laru. In each example, they focused on specific linguistic features like affirmative responses and the use of verbs for motion to analyze how genetic similarity influences language mixing. The first case indicated that, in French-speaking African regions, there is a phenomenon caused by French-Portuguese interaction: while in standard French, "oui" is the typical affirmative response and "si" is used to answer negatively phrased questions, African French speakers replaced "oui" with "si" as the general affirmative, regardless of questions asked. This replacement was caused by the influence of Portuguese, where "sim" is the general affirmative response without a specific counterpart for negatively phrased questions. The second case focused on French and Kikongo. In both languages, the verb "nata" means 'lead' and 'bring.' This blurred the distinction in French between "amener" (to lead) and "apporter" (to bring), merging their uses. In the third case, contact with Laru, where "yenda" refers to any land movement, led some French speakers to use "marcher" (to walk) more generally, resulting in non-standard expressions like "Je marche à vélo" (I ride a bike). These findings support the hypothesis that genetic similarity between languages fosters unconscious language mixing[4].

Based on the above, the similarity in language structures—including phonological, lexical, and grammatical elements—leads multilingual speakers to mix multiple languages simultaneously. Although not all studies explicitly focus on mixing L1 and L3 in L2 contexts, sufficient examples demonstrate that structural similarities between L1, L2, and L3 increase the likelihood of integrating L1 and L3 elements into L2 usage.

3. Language proficiency factors

The following studies discussed how language proficiency factors are key contributors to language mixing in multilingual speakers.

One study examined how language proficiency affects language-mixing behavior in multilingual speakers, aiming to determine if lower proficiency in a language leads to more frequent code-mixing. The research analyzed the speech patterns of Dutch speakers with English as L2 and French as L3, noting unintended language mixing during L3 production. The study found that speakers with lower proficiency in L3 (French) relied more on their previously learned languages (L1 or L2), often mixing English words into French sentences, such as "Ils veulent gagner more, euh, plus...". L2 was more likely to intrude than L1, particularly with function words and grammatical elements. These findings suggest that language proficiency influences language mixing, with L2 remaining influential even as L3 proficiency increases[5].

Another study focused on how low proficiency in L3 leads to reliance on L1 or L2. It observed that speakers learning French as L3, with German as L1 and English as L2, showed French pronunciation (VOT) influenced by German and English patterns. A negative correlation between self-assessed French pronunciation and VOT values ($r = -0.51$, $p = 0.03$) indicated that higher proficiency corresponded to more native-like pronunciation. A positive correlation between time spent learning English and French VOT values ($r = 0.52$, $p = 0.03$) showed English exposure affected French pronunciation, reinforcing the link between proficiency and language mixing[2].

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The third study investigated the question: does higher language proficiency reduce code-mixing among trilingual speakers? Does lower proficiency increase this phenomenon? The research analyzed trilingual speakers who primarily used Kazakh and Russian at work and seldom used English (L3), with a focus on the influence of varying language proficiency of these three languages on their code-mixing. After investigation, several critical interference patterns, including phonetic under-differentiation, over-differentiation, re-interpretation of meaning, and substitution, were found. Researchers discovered that the higher the proficiency in Kazakh and Russian, the less the language mixing there is. In comparison, due to lower English proficiency, speakers more frequently used structures and vocabulary from Kazakh and Russian, which they often used, with many types of interference caused, such as phonetic under-differentiation (inability to distinguish between specific phonemes), over-differentiation (excessive phoneme distinction), re-interpretation (misunderstanding words as having the same meaning across languages), and substitution (using incorrect phonemes or structures from a more familiar language, affecting pronunciation accuracy). These results confirm that the degree of language mixing significantly depends on the level of proficiency. That is, in this case, a lower proficiency in English L3 was associated with a higher contribution of Kazakh and Russian elements[6].

Some L1 and L3 elements are also mixed into the L2 in L2-dominant environments. Researchers have found that lower target language proficiency speakers rely on the languages they use more frequently. That is to say, multilingual speakers who possess lower L2 proficiency might unconsciously use L1 or L3 elements especially for the unfamiliar vocabulary or grammatical structure in L2.

4. Psychological and cognitive factors

Code-mixing is also influenced by parallel processing, bilingual Interactive Activation Model, parallel activation, and translation asymmetry.

The first study demonstrates how parallel processing contributes to multilingual speakers' language mixing. Parallel processing is how multiple language systems are simultaneously activated —each with its own vocabulary, grammar, and phonology—and how they engage in mutual interaction and interference. The study aimed to identify interference at the lexical-conceptual, predicate-argument, and morphological realization levels, finding that at the lexical-conceptual level, multilingual speakers often rely on L1 and L2 words when they are lacking in L3 vocabulary, and this reliance often comes with incorrect language usage. For instance, in the sentence "Er hat das Geschirr getan," there is an incorrect transfer of the English verb "do" to the German verb "tun," instead of using the correct verb "spülen." There may be an influence on verb phrase structures at the predicate-argument level. Here is a case in which the word order of the Chinese sentence is influenced by English: "wo fang nazhang zhuozi zai shufang li." For the correct sentence, there should be a "ba" construction: "wo ba zhang zhuozi fang zai shu fang li." Morphological errors were also found. For example, in the German sentence "Wir sollen heute übersetzen den Text," the verb should be placed at the end: "Wir sollen heute den Text übersetzen." These findings confirm that due to the simultaneous activation of multiple language systems, parallel processing contributes to language mixing[7]. As such, it can be argued that in L2-dominant environments, multilingual speakers, due to parallel processing, may exhibit a mixing of L1 and L3 with their L2. L1 and L3 are also activated once L2 is used. Subsequently, there would be interference in vocabulary, grammar, and phonological rules.

The second study examined how bilinguals used the Bilingual Interactive Activation (BIA) model to manage inter-lingual competition, with the objective of revealing the cognitive processes involved

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in word recognition words in one language and minimizing interference from a non-target language. The study designed a lexical decision task for a group of Dutch-English bilinguals. They were presented with real words and pseudowords in both Dutch (L1) and English (L2), with their reaction times measured to analyze word recognition and language interference. The findings showed that similar words from both the target and non-target languages are activated when a word is presented. However, the cognitive mechanism of the BIA model helps activate target language nodes and, in the meantime, inhibits words from the non-target language, which increases the effectiveness of word recognition and reduces language mixing. What should be noted is that the inhibitory effects were more significant on L2 words than on L1. This difference indicated that language activation strength significantly influenced language interference minimization[8]. The BIA model is mainly applied to bilingual contexts, but its cores are also applicable to trilingual ones. In multilingual language production), both L1 and L3 words and grammatical rules may also be activated when L2 is used. Interference from L1 and L3 may be caused by this parallel processing of language systems and proceeds to influence L2 usage.

The third study explored the parallel activation of multiple languages with respect to language mixing. More precisely, this study focused on how different language systems are activated simultaneously when multilingual speakers use one language. In the case of 39 Dutch speakers aiming at French and English, formal and informal use was studied; the result was that in L3 use, the L1 vocabulary was less activated compared to L2. Therefore, L2 had a more significant impact on the production of L3. Most of the 218 cases were put down to L2 interference, which confirms that when L2 is a dominant language, parallel activation imposes a huge influence on language mixing[9]. This study builds on what has been discovered by De Angelis and Selinker (2001) and give a hypothesis that parallel activation may have a similar influence on language mixing in an L2 environment. Based on the observed activation of L2 vocabulary over L1 in an L3 context, it may seem reasonable that with L2 as the target language, both L1 and L2 might also be simultaneously activated, which could lead to interference from L1 and L3 in L2 expression and thus cause language mixing. This extended hypothesis leads to an assumption that language activation and interference remain consistent, no matter what language context is involved in the process.

The fourth study examined how the factor of translation asymmetry influences language-mixing behavior in multilingual speakers. According to the Revised Hierarchical Model (RHM), which focuses on bilingual language processing, despite separate lexical stores, L1 and L2 share a common conceptual store. Translation asymmetry is a major concept in RHM, and it suggests that it is faster to translate from L2 to L1 than from L1 to L2, mainly because during language acquisition, learners often comprehend L2 with L1 as the medium, so L2 and L1 lexical items form stronger connections. Lower L2 proficiency corresponds to a higher probability of depending on L1 for translation and expression, and thus, there is a greater likelihood of language mixing[10]. Although the RHM is mainly applied to bilingual processing, it is also suitable for trilingual speakers in language mixing. When it is hard to deal with vocabulary from a less familiar language, trilinguals might resort to their most familiar language, whether L1 or L3. This hypothesis assumes that trilingual language mixing is also subject to cognitive processes in bilinguals, such as translation asymmetry and shared lexical connections.

4.1. Socio-cultural and contextual factors

Socio-cultural and contextual factors play a significant role in shaping language mixing behaviors among multilingual speakers. Formal contexts, such as meetings, tend to enforce more rigid language norms, while informal settings allow for greater flexibility in language use. Additionally,

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cultural factors dictate which languages are regarded as prestigious or dominant, further influencing language choices and the degree of code-mixing. In highly multilingual environments, speakers are likely to activate multiple languages simultaneously, leading to interference in vocabulary and grammar, even when only one language is required[4].

One study utilized three case studies to examine language mixing in French-speaking African regions. The authors collected linguistic observations from speakers in various social settings, analyzing how interactions with genetically similar languages—such as French, Portuguese, and Bantu languages like Kikongo and Laru—affected language use. They documented changes in specific linguistic features, including affirmative responses and motion verbs. For example, in the case of French-Portuguese contact, they observed a shift from “oui” to “si” as a general affirmative, regardless of question type. A comparative analysis was conducted on speech patterns in different social contexts to analyze this shift, revealing similar affirmative forms in both languages caused speakers’ unconscious adaption of Portuguese structures. These studies demonstrated the promoting effect of cultural and social factors, such as the formality of the context and the linguistic background of the interlocutors, on language mixing and interference[4].

Language mixing in the workplace is a common phenomenon in multilingual societies. How language interference is manifested is determined by the specific linguistic demands of the workplace and the social structure of interactions. In industries involved in multilingual environments, it is common for workers to change between languages in response to their different work requirements and to colleagues from diverse language backgrounds. For instance, due to the linguistic demands of their workplace, there is frequent mixing of Kazakh, Russian, and English among workers in the oil industry in Kazakhstan. The formality of the context, professional hierarchy, and social expectations are the main influencing factors of this cross-linguistic interference. The authors focused on 30 trilingual oil workers and collected data through spontaneous speech samples, structured interviews, and observations in different social and professional contexts to analyze the influence of different social contexts and varying educational backgrounds on specific types of interference. Their findings underscored that social and cultural factors, such as the nature of interactions, professional hierarchy, and the multilingual environment, significantly shaped the nature and frequency of language interference observed in the workers' speech[6].

In L2-dominant environments, speakers may sometimes employ their L1 or L3, even when they are expected to use L2. Little research has been conducted in this regard, but there is a logic that high multi-lingual exposure can lead to the simultaneous activation of various linguistic systems. Dewaele (1998) analyzed 218 cases of 'lexical inventions' among 39 Dutch native speakers. 32 of them spoke French as L2, and 7 as L3. Dewaele compared the performance of French L2 and L3 speakers in both formal and informal contexts, finding that compared to L2 speakers, it was more likely for L3 speakers to draw on their L2 vocabulary for their L1. Dewaele concluded that the language with the highest level of activation in the speaker's cognitive system serves as the primary source of lexical retrieval, while access to the lexicon of less activated languages is relatively restricted. This suggests that in a multilingual context, especially when speakers are under high pressure or formal conditions, they may unconsciously speak in the language that they can access the most vocabulary. These socio-cultural factors highlight that multilingual language use is a complex discipline and that it is crucial to conduct an in-depth analysis on the influence of linguistic environments on language activation and interference[9,11].

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5. Physiological and pathological factors

Multilinguals' language control can be undermined by physiological and pathological factors, such as brain injury. This influence, in turn, causes involuntary code-mixing. Abutalebi, Miozzo, and Cappa (2000) conducted a case study of subcortical polyglot aphasia to investigate how subcortical structures influence language switching[12]. They focused on a multilingual patient with pathological language mixing developed after the basal ganglia was affected by a left hemispheric stroke. They designed for the patient structured language assessments, including the Boston Diagnostic Aphasia Examination and a multilingual naming task, discovering the patient's uncontrollable switching between Armenian, English, and Italian. This case demonstrated that damage to the basal ganglia disrupts the control mechanisms responsible for language selection, leading to involuntary language mixing even when the patient intended to speak in a single language. Their findings suggest that the basal ganglia is important for the management of language activation and selection, which is impaired in cases of subcortical lesions. This highlights subcortical structures significantly contribute to maintaining linguistic boundaries among multilingual individuals.

Fyndanis and Lehtonen explored how deficits in domain-general cognitive control—such as inhibitory control and set-shifting—influence pathological language mixing[13]. To conduct experiments, they recruited participants with brain damage and designed tasks to assess both verbal and non-verbal executive functions. They discovered that under impaired cognitive control mechanisms, it was hard to suppress non-target languages in high-demand contexts. The case studies demonstrated that due to damaged control systems, pathological language mixing is connected to the failure to manage language selection instead of being an indicator of a communicative strategy used to address linguistic deficits.

Therefore, in L2-dominant environments, the activation of L2 may make language control even more complex. As a result, it becomes more likely that elements from L1, L2, and even L3 are mixed. This involuntary mixing may be exacerbated in contexts where the cognitive load is high, making language management more difficult for individuals—especially those with underlying impairments in executive functions.

6. Conclusion

Research shows that when multilingual speakers engage in code-mixing in an L2-dominant environment, they are influenced by a complex interplay of linguistic, cognitive, psychological, socio-cultural, and physiological factors. Although many studies have explored language mixing in multilingual contexts, research specifically on the mixing of L1 and L3 in L2 environments remains relatively scarce. Some studies focus on the mixing between two languages, while others examine L2 use in L3 environments. However, the five-factor framework from existing studies helps us hypothesize that L1 and L3 could also mix into L2 during its use. Specifically, phonological, lexical, and genetic similarities between languages increase the likelihood of mixing, and lower proficiency in the target language often leads speakers to rely on more familiar languages (L1 or L3). Parallel activation of multilingual systems and translation asymmetry also contribute to language interference, while socio-cultural contexts (e.g., formal vs. informal settings) further affect the extent and type of mixing. In cases of neurological impairment, involuntary language mixing may occur due to deficits in cognitive control mechanisms.

While these factors offer insights into general patterns of language mixing, it is important to recognize individual variability. Not all multilingual speakers will experience language mixing to

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the same extent, as personal differences in language proficiency, cognitive control, and sociolinguistic context shape their language use. Future research should investigate the dynamics of L1 and L3 mixing in L2 environments to deepen understanding and provide practical guidance for multilingual learning and communication strategies.

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