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### RESEARCH ARTICLE

#### PHONETIC AND COGNITIVE DEVELOPMENT IN BILINGUAL TWINS: A FORENSIC PHONETICS APPROACH TO FRENCH AND MAURITIAN CREOLE

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#### Abstract

Growing up with two languages also has different ways by which the developmental of speech and cognitive abilities are affected. Bilingualism is associated with different factors such as Problem solving is sharpened, Memory enhanced and an improvement in mental flexibility is also experienced. This paper describes how twins acquire and interact with two languages and examines forensic phonetics in understanding phonetic transfer and interference between the two languages. Same-sex siblings such as twins are especially suitable for research on bilingual acquisition because of the similarities in genetics and the early environment that cause differences in language. This research contributes to the understanding of children's language acquisition and the phonetic frameworks of bilingual contexts as applied to educational practices, speech-language therapy, and forensic linguistic analysis. Last of all, this work underlines the significance of environmental as well as cognitive factors for twins with regards to Language development earlier suggested that bilingualism and forensic phonetics could gain a lot of impulse from more in-depth studies of language acquisition in twins; it is suggested that bilingualism and forensic phonetics might be among the several areas that will benefit if more attention is paid to the analysis of twins.

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#### Introduction:-

##### Background of the Study

The investigation of bilingualism in young children aged between 4 to 8 years provides a lot of information about language acquisition and processing. Construed as the capacity to learn and utilize two languages concurrently, entails extra psycholinguistic raises and demands that are acutely distinct from those characteristics of monolingual acquisition. At the development stage of early childhood including children aged 4 to 8 years, the brain continues to mature, and the child must cope with phonological, syntactic, and semantic systems of two different languages that can be a challenge for working memory, cognitive flexibility, and attention control. For these reasons, early bilingualism is an important research topic because it provides an understanding of how young children cope with two linguistic systems simultaneously.

Twins aged between 4 to 8 years as a case bring out an even more compelling research situation for bilingualism to be investigated. Since twins are genetically related and experience almost the same environment in their developmental periods, they are a suitable group for assessing the correspondence of language systems.

Nevertheless, the twins studying and growing within one environment may have different patterns of language development.

This study may be especially relevant in the case of the considered languages, namely, French and Mauritian Creole, as far as the latter is concerned since these languages possess quite different characteristics. French is part of the family of Romance languages having an articulated phonetic and syntactic structure; differently Mauritian Creole is a simplified creolized language with vocabularies borrowed from French and other languages from Africa and Asia. This makes it possible to learn about the interactions and separations of phonologically bilingual twins despite being in two related languages. Learning how such twins deal with and develop these two languages may hold important implications regarding broader bilingualism issues as well as children's cognitive development and twins' characteristics and effects during language learning.

### **Synthesis of Existing Literature**

Bialystok and Craik (2010) focuses on how bilingual children acquire a second language differently from monolingual children in aspects like cognitive flexibility working memory and phonological processing. Early differentiation of the rhythmic structures of language is possible although bilingual children may experience delays in the mastery of the prosodic structures. In the same way, Buckley (2002) made attempts to describe, how adjustments of the bilingual child, observed when managing two languages could have a non-linear nature to it. Nevertheless, there is a shortage of research that would investigate bilingual twins only, which is why the role of twin relations in the bilingual language learning process remains questionable.

### **Literature Gap:-**

To the best of the researcher's knowledge, there is a lack of empirical research on bilingual twins especially in forensic phonetics though there is extensive literature on bilingualism and language acquisition. The part on the interaction of phonetic and phonological properties of the two languages that twins face when acquiring them, for example, French and Mauritian Creole remains a lacking area in the literature. Additionally, there is limited literature on the relationship between "twin language" and bilingualism, and therefore the present study aims to contribute knowledge on how twins manage their way of communicating and learning another language.

### **Significance of the Study:-**

This study is highly relevant as it delves into two relatively underexplored areas: The fact and nature of bilingualism in twins and the utilization of forensic phonetics for speech comparison. This provided a unique opportunity to find out how bilingual systems acquire and process languages and how they distinguish between the two since twins not only share genes but also grow up in the same household. Twins may often have different language milestones and sometimes are known to develop what is known as cryptophasia, which creates additional layers towards the way twins acquire two standard languages. By paying attention to how phonetic transfer takes place between French and Mauritian Creole, this study unveils the dynamics of two related languages in a bilingual environment.

The application of forensic phonetics has therefore helped to increase the solidity and specificity of the research under consideration. While forensic phonetics deals with fine acoustic details of speech sounds, it is an appropriate method to examine phonetic transfer and interference between two languages. Concerning the bilingual twins, it will help explain how constituents of phonetics such as vowels, intonation, and syllable chunks are impacted by the process of bilingualism, and if at all, they are transferable from one language to another.

The findings of this study not only give insight to the theorists and linguists but also apply across the board. Through research, they can be useful in areas such as speech pathology where there is a want for knowledge and comprehension of bilingual phonetic development to be of better help in dealing with speech issues. Furthermore, they may help in the bilingual approach to teaching in education. Finally, in forensics linguistic, expertise is needed in cases when identification of the language and/or profiling of the speaker is needed in the context of legal proceedings. Thus, the study is an attempt to provide answers to gaps in both theoretical and applied literature on bilingualism and speech development with twins.

## **Review of Previous Studies and Gap Identification**

### **Bilingualism in Early Childhood**

Second language acquisition or the capacity to learn and employ two languages as a resource has been fascinating investigators from the domain of linguistics and psycholinguistics for a rather long time. In early childhood, bilingualism generally manifests in two primary forms: bilingualism which begins at the same time as the recipient's life, and bilingualism which begins at some point in the recipient's life. In this, when the child has been raised to learn two languages since birth, the process is referred to as simultaneous bilingualism while when a child learns a second language after having learned the first language, the process is referred to as sequential bilingualism (Buckley, 2002). Investigations into bilingual child development have shown that the child goes through a different developmental process in the learning of language than the child who is in the process of learning only one language.

According to Flege (1988), bilingual infants can differentiate the rhythmic difference in different languages, and this is evidence of enhanced phonetic awareness. However, these infants may possess delays in the face perception and the prosodic features of the given language. This means that there is clear evidence that bilingual infants can distinguish linguistic features from a very tender age however; the process of mastery of the prosodic and phonetic properties of both languages may take a much longer time as compared to the monolingual infants.

Flege & MacKay (2004) researched the complexity of developing bilinguals when they are learning at the same time as opposed to the development of the monolingual child. De Houwer's study shows that the bilingual child may or may not show normal linear incremental development depending on his linguistic domain, a domain such as syntax and phonology. Such sequence can be explained by the fact that the learner is expected to control two linguistic systems at once which makes the process of learning a language multilayered. The necessity of studying the process of bilingual children's language development that involves managing two languages at the same time is highlighted during the study as it can potentially affect the child's language and thought processes.

The problems that are associated with bilingual language acquisition are further magnified when studying twins. Children who are twins present a very interesting context of study as they grow up in households where they learn more than one language. Another factor is the "twin speak" or cryptophagid which is the development of a special language of twins that can bring some delay in the formation of a standard language. It has been found that the factors attributed to twins, genetic as well as shared environment, can cause different patterns of language development that are not seen in single-born children.

### **Twins and Language Acquisition**

Studying twins to some extent has revealed aspects of language development that are different from that of non-twin children. It is less methodologically complex than the other natural experiments since it holds genetic and environmental constancies. The use of twins is useful here since it defines and isolates the effect of these factors on the development of language.

Another example of such tendencies, which is often reported in twins, is the so-called cryptophagid – when siblings create a language only, they can understand. Such private languages can sometimes slow down the processes of their acquisition of the linguistic normatively common language. Cryptophagid is believed to have arisen from twin interaction as well as the social context that they establish with inevitable susceptibility to their developing language environment. The delay is due to extra difficulties accrued by twins exposed to bilingual settings in the acquisition of language. It does however mean that in general there is likely to be greater disparity in language acquisition between twin siblings since so many factors are affected when two languages are used, and these include the quantity and quality of the language input to the twins as well as the twins' abilities respectively.

Different patterns of bilingual language development can be observed in twins because learning two languages at once increases the cognitive load in both components. For example, differences in language input, socio-educational context as well as the mode of information processing can in some way affect language learning (Gao, 2022). These findings therefore offer a clear perspective into such factors that should be taken into consideration when conducting research on bilingual language acquisition in twins especially when it comes to the way their language development pattern is likely to unfold.

However, the literature review reveals the following lacunae in the extant research on bilingual L2 acquisition in twins. For instance, the existing literature would point out how bilingualism has been known to generally affect language learning and development, all of which gives a general outlook but for twins this is a gap that is yet to be filled. There is limited research on how cryptophagid relates to bilingualism or how both interfere with the general language acquisition of twins.

### **Forensic Phonetics and Speech Analysis**

Forensic phonetics is a sub-discipline of phonetics that employs the study of physical characteristics of speech sounds to analyze the acoustic and articulatory features. It is especially helpful when it comes to early bilingual development and how we as human beings produce sound and recognize the sounds of language. In bilingual children, forensic phonetics can be very useful in charting the developmental path of how they can differentiate the two languages as well as the other, and how the phonetic inventory of one language impacts the other language.

A very significant component in forensic phonetic analysis is phoneme detection, which are units of language that provide different pronunciations. When the phonemes in two languages are closely related, a bilingual child encounters difficulties in identifying phonemes in the two languages in which he or she is bilingual. Luna (2016) appreciates these differences, as forensic phonetic techniques, involve the examination of other characteristics of sounds such as the frequencies, duration, and amplitude of the sounds produced.

Other components include intonation which is the nature of pitch while uttering a particular word, phrase, or sentence, and prosodic features which include accent, rhythm, and stress. These elements may differ greatly in different languages and are rather important for understanding the meaning and an emotional message. In young bilinguals, the speaker's tone and pitch, which can be analyzed using forensic phonetics, change when he or she is speaking in a different language. This is particularly so in as much as it wants to explain how bilinguals manage the melodic aspect of speech when switching between different languages.

The fascination with how bilingual children utilise the phonetics of their first and second languages is best demonstrated in a classic work by Flege (1988) on the second language vowel and consonant accuracy. Flege (1988) also found that the amount of contact and experience in each of the languages determines how bilingualism affects the phonetic aspects of comprehending and producing sounds. For example, a second language learner who codeswitches between the first and second language, will have different patterns of pronunciation for vowels as well as for consonants depending on the language used. Thus, Flege's results prove that the role of exposure in phonetic production and perception in bilingual people is rather significant.

In the differentiation between French and Mauritian Creole, forensic phonetics can provide an elaborate analysis of the phonetic differences between the two languages. Luna (2016) describes the phonetic contrast between French and Mauritian Creole by pointing out that both languages belong to the colonial category; however, the phonetic features differ. For instance, Mauritian Creole has a vowel system that is much less complex than that of French; it also has African and Indian substratum. These differences are profound in forensic phonetic analysis particularly when the study focuses on the phonetic features that the two bilingual twins bring or integrate in their speech systems.

The changes in French sound patterns and their counterparts in Mauritian Creole must be thoroughly distinguished to identify the changes in the twins' bilingually produced speech. When the mode of English and Spanish phoneme usage is revealed along with acoustic characteristics, information about the integration of two linguistic modes used by bilingual children can be obtained.

### **Limitations in the Existing Studies**

This is a research area that has benefited from numerous research studies, bilingualism in twins more so; however, a few studies have offered the forensic phonetic analysis of bilingual twins. Only a few previous studies have focused on bilingual language acquisition and most of the research has studied monolingual development or simple bilingualism without considering the specificity of bilingual twins.

It appears there is still space that is still unexplored when it comes to research on twin children learning two languages at once from a forensic phonetics perspective. Though there is a tremendous amount of literature about bilingual language acquisition and phonetic transfer in general, research on bilingual twins is scarce, particularly,

when it comes to French and Mauritian Creole. Such a gap is felt, especially when considering the use of forensic phonetics in the context of normal development of bilingualism in twins.

Some existing literature like Maher (2017) have helped in explaining bilingualism, but the present study will endeavor to fill the gap in understanding bilingualism among the French-Creole-speaking twins in Mauritius. Grosjean's work on bilingualism does not include children and even though he has studied bilingual children, he has not gone deep down to discover how twin children with two different languages find it difficult to say some phonetics. Likewise, Bialystok has not addressed the forensic phonetic and linguistic or cognitive differences in the duo of bilingual twins' language acquisition in her work.

Furthermore, the role of forensic phonetics has existed in legal procedures and in the diagnosis of speech disorders which has not been given enough attention in investigating the normal bilingual development of twin children. It appears that forensic phonetics might open new horizons in the examination of how bilingual twins cope and organize two languages, however, this possibility has not been explored further.

The lack of studies in this area provides scope for future research that would explore the role of forensic phonetics in the study of bilingual twins' language learning. Studying how twin children in two languages cope with the phonetic demand of learning two languages at the same time can be informative concerning their phonological progress. Studying how the twins switch between French and Mauritian Creole phonetically, researchers' mobility is seen to advance knowledge of forensic phonetics and broad bilingualism. Filling this gap will improve knowledge of bilingual language acquisition and how forensic phonetics can be used to analyse and facilitate this process.

## **Discussion:-**

### **Influence of Bilingualism on Phonetic Development**

Bilingual children's phonetic and phonological growth appears to be considerably more intricate as compared to that of monolingual children. This study shows that bilingualism brings in other factors that affect the development and mastery of phonetic and phonological aspects. In contrast to a monolingual child who learns the language features embedded in a single language environment; the bilingual child must perform in both languages. This dual exposure can lead to borrowings of the features which in turn can be merged by language exposure, cognitive development, and other social factors.

Bilingual children are learning two languages – French and Mauritian Creole both of which have distinct phonetic structures, which makes the child handle an extra requirement on phonetic development. Precisely, the phonological structure of French raised more complexities due to the intricate vowels on one hand in contrast to the simpler vowels as found in Mauritian Creole on the other. The above disparity can come up as differences in how the bilingual child articulates and perceives the vowels in each of the languages.

For instance, it is possible to subdivide the French vowels into a greater number of phonemes than those existing in the Mauritian Creole. This often causes difficulties for the Bilingual Children as; they are required to comprehend the difference between the French Vowels while at the same time learning the Mauritian Creole system which is a lot simpler. For this reason, variability of vowels in speaking may be observed in children learning two languages the first language and the second language, and this may depend on the first language or the context through which they are speaking. This method of analysis known as Forensic phonetics can thus assist in exposing these variations and gain insight into how the bilingual child copes with and exercises differentiation in the phonetic systems of the two languages.

Maher (2017) conducted a study that might help to explain how bilingual children might converge the complex phonetic structures in one language due to the influence of the other language. This is referred to as phonetic transfer whereby there are interferences involving sounds of the second language from features of the first language. This transfer may lead to a different pattern of vowel production compared to monolingual children when there are two languages involved especially French and Mauritian Creole learned by the twin. For instance, a developing bilingually can accommodate the French vowel system by altering the vowel sounds when speaking Mauritian Creole or vice versa, depending on the language's dominance or present frequency of use.

Thus, bilingualism affects not only the ability to produce vowels but phonetic development in general. It also includes other phonological entities, consonant features, tone, and intonation. Forensic phonetics aims at identifying

the tools and methodologies that can be applied in studying such aspects in bilingual children including the way phonetic markers of one language affect the other. Since in forensic phonetics, one can analyze various acoustic features of speech including frequency, duration, and intensity, the researcher can establish how bilingual children meet the phonetic challenges of the two languages that they use.

Since twins are exposed to more than one language, it can become even more challenging when they engage in the interaction of these phonetic features. As we know twins have a relatively similar communicative setting and may have specific tendencies at the level of language usage and language acquisition. It can lead to various features of the twin's specific intonation or coloration or variations in phonetic production that may be due to both bilingualism and the fact that the twins are siblings. The child's unique phonetic development also includes a detailed phonetic audit with a focus on forensic phonetics that distinguishes individual philology and language patterns in context with the environment that influences the child's phonetic development.

To sum up, bilingualism adds a certain level of difficulty in phonetic and phonological development with the children speaking two languages using features of two languages. These complexities are well captured by the forensic phonetic model since it enables researchers to describe and explain the exact phonetic features that define the languages and how such features are dealt with in bilingual children. Phonetic analysis of vowels, consonants, and other aspects of phonology and phonetics in forensic phonetics make a worthy contribution towards understanding the effects of bilingualism in phonetic development and draw attention to the distinct features identified in the current study of bilingual twins.

### **Cognitive and Environmental Factors**

The child's working memory and other executive functions are very essential for bilingual language learning. These cognitive skills help a bilingual child cope with two languages at a go and move from one language to another. According to the findings of Mesquita *et al.*, it is evident that bilingual children have better cognitive control than monolingual children. This advantage is because a person must undergo two layers of syntactic and morphological patterns and lexicon. Bilingualism is the ability to learn and use two languages; as a result, by constantly switching from one language to the other, bilingual children exhibit bigger and better-developed cognitive flexibility and other executive functions including attentional control and task switching.

When it comes to twins and the cognitive benefits linked to bilingualism, such benefits may be further. Duration and interaction: twins like any other siblings bear the brunt of the various implications of bilingualism but are privileged to be with each other most of the time. This involved setting, where both children are at least exposed and can interactively and regularly use two languages, could benefit the children's higher cognitive skills. Continual practice arises out of the necessity to converse with a sibling who is also learning the same languages at the same time, which may well enhance the emergence of better executive control capacities. The close interaction between twins might favor the emergence of synchronized language since they can easily change from one language to another during play or when performing activities of daily living.

Thus, the process of cognitive development in bilingual twins is influenced by several environmental factors. The appropriate language learned at home, in school, as well as in another social setting also plays an important aspect in the language learning process of the children. In Mauritius, where the two languages, French and Mauritian Creole, are talked about, the degree of the impact that these two languages have depends on the socio-economic and educational status. In the context of interaction, Nuraida (2018) proved that children who learn French mainly at school and Mauritian Creole at home get in- variably, different levels of fluency in each language. This difference can lead to situations where a child, for instance, may end up speaking a certain language more fluently than the other, the language being used in, for instance, and classroom settings –French.

This is especially the case with bilingual twins where the amount of experience that the children have is drastically different when using one or both languages in some or any setting at all. For instance, if the twins frequent a French medium school but use Mauritius Creole at home they would perform better in French-academic language but deficient in colloidal Mauritius Creole language. Thus, the control one language has over the other depends on the intensity and context in which the language is used, showing that environmental exposure is a critical parameter in language acquisition by bilingual children. Children who are exposed to both languages equally may end up having equivalent capabilities in both languages whereas if the exposure to both languages is unequal, then the child may turn out to be limited in one language or the other.

However, the linguistic environment cannot be restricted to the home and school environment only. The Linguistic interactions of the twins are built within the wider sociocultural contexts such as peers, teachers, and community members. Interactions with the second language individuals can assist enhance specific language use and familiarise people with the use of other words, tones, and even grammar in second language acquisition. This means that twins who are raised in settings where both languages are used, and where the children get to be actively engaged are likely to have better bilingualism as compared to children who are exposed to only one language in a particular context.

### **Phone Transfers and Interference**

Some of the most fascinating processes of bilingual language development include phonetic transfers and cross-linguistic influences when the phonetic manifestations of the first language affect the phonetic manifestations of the second language. Intonation can be also influenced by the other language, for example, this phenomenon is typical for bilingual children who can transfer certain sounds, intonation patterns, and the grammatical structures of one language into the other. Transfers can happen automatically when the child lines between the two language systems and is generally more seen in kids that have different fluency in both languages.

Therefore, phonetic transfer in bilingual twins learning Mauritian Creole and French is expected to appear in vowels, prosodic features, and consonant clusters. Dialectally French has a different phonetic structure from that of operating in the present Mauritian Creole particularly when it comes to the number and kinds of vowels as well as the types and combination capabilities of consonants (Tsinivits&Unsworth, 2021). French for example has a distinction of more vowels than the Mauritian Creole due to its evolution, the African and the Indian influence that was incorporated in the language. While using the two languages, even in their twin dialect, the two languages produce acoustic-phonetic features that transfer from each other, hence producing mixed language phonetic features.

In a work by Silva-Corvalán (2014), they pursue the nature of phonetic transfers in the second language of the young bilingual. The research shows that there is the fluency of copying the phonetic features of one language into the other especially if the individuals have been exposed to two languages right from childhood. These transfers can be followed and described using a technique known as forensic phonetics this is due to its ability to produce a comprehensive description of the acoustic characteristic of speech. Speaking of the research applications, forensic phonetics can tell how children adjust their Phoneme, tone, and prosodic facets in their bid to translate from one language to another. For example, the French vowels that a bilingual child learning Mauritian Creole produces may resemble the more simplified vowel system of a Creole language or vice versa the intonation patterns from the Creole language may be transferred into French.

If the phonetic differences between French and Mauritian Creole are better understood, it would be possible to get a better view of how such bilingual twins could coordinate between the two languages. It can be the case where a certain phonological feature of the first language is transferred to the second language either the vowel sounds or intonation patterns. For example, a Creole-speaking twin can take recourse to the advanced French vowel phonemes and reproduce it in Creole or vice versa, or maybe due to the influence of the Creole language, change his French vowels. Similarly, the rhythmic and stress features may also be transferred cross-linguistically where for instance, twins speaking in different languages would transfer the rhythm from one language to the other.

Such transfers as well as the effects of phonetic borrowing are important for linguists, teachers, and speech-language pathologists who deal with bilingual children. As a result, it becomes possible to identify effective ways of how bilingual twins fulfill the phonetic requirements of two languages, French and Mauritian Creole, to create more suitable approaches to developing their language skills. Thus, educators can adapt the way of teaching in a way where phonetic transfers might lead to confusion or delay the learning process.

### **Conclusion:-**

Understanding the first language of bilingual twins during their early childhood, especially through forensic phonetics is a fascinating and relatively untouched area of research. Although a lot of effort undertaken in monolingual language development and bilingualism in general, more is needed to explain the bilingual twins, specifically in the context of Mauritius.

Forensic phonetics thus provides a splendid method of analyzing the phonetic and phonological aspects of bilingual children's language acquisition and code-switching capabilities that were hitherto unavailable. Specifically, the

focus on the developmental processes that underlie second language acquisition and bilingualism offers valuable insights into the pupils' cases such as the phonetic transfer and cross-linguistic influence.

Future research should seek to apply forensic phonetics in twin experiences with more bilingual children to determine their language acquisition and the ability to distinguish the second language. Stichometry could enrich both the theoretical science of linguistics and educational practice in the conditions of multicultural multilingual societies through such studies.

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## Appendix I:-



# Open University of Mauritius

Rédout - Mauritius

**Our Ref: OU/RO/28 V3**

26 November 2024

Mrs Deepa Roy Sookara-Ramchurn  
Rishi Dayanand Lane  
Mare La Chaux  
Central Flacq

Dear Mrs. Sookara-Ramchurn,

### The Decision of the Open University Research Ethics Committee (OUREC)

The Open University Research Ethics Committee (OUREC) met on 14 November 2024 and reviewed your application for ethical clearance regarding your study, "*Early Childhood Language Acquisition in Bilingual Twins: A Forensic Phonetics Analysis of Speech Patterns in French and Mauritian Creole among Children Aged 3-8 Years Old*," supervised by Dr. S. Rajiah.

I am pleased to inform you that the Committee has approved your application, subject to the condition that the medical practitioner involved submits a consent letter confirming that he will only facilitate communication between you and the parents. It is important to note that the decision to provide information rests solely with the parents.

You are also informed that the approval is valid until the end of your proposed study.

Please ensure that you contact the Ethics Committee in case there are any changes to the study, as we will need to assess any potential implications for ethical considerations.

I wish you the best of luck with your PhD study.

Yours sincerely

Professor Reetoo Banarsee  
Chair, Open University Research Ethics Committee



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