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**| RESEARCH ARTICLE**

## **An Overview of International Research on Language Attrition**

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**| ABSTRACT**

This study used co-citation analysis in CiteSpace to identify trends and patterns in international research on language attrition. The analysis was based on journal articles from the Web of Science Core Collection, covering 2010 to 2020. The research showed that international studies on language attrition increased significantly over the past decade. Additionally, the citation frequency of these studies has also grown substantially. The research also showed that international language attrition studies have primarily been distributed across multidisciplinary fields such as linguistics, psychology, and education. These studies also seem to be merging with disciplines like pathology and neurology. Another research finding was that topics related to language attrition covered four main areas: first language attrition, foreign language attrition, the factors influencing language attrition, and the linguistic areas impacted by language attrition. Additionally, this study evaluates the research trend of language attrition by analyzing burst keywords. The research concludes with a summary of current international studies on language attrition and offers insights into prospects in this field.

**| KEYWORDS**

Language attrition; visualization-based analysis; research topics; burst keywords; research prospects

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### **1. Introduction**

Language attrition is “the non-pathological decrease in proficiency in a language that has previously been acquired by an individual” (Köpke & Schmid, 2004, p. 5). The Conference on the Loss of Language Skills, held at the University of Pennsylvania in 1980, marked the emergence of language attrition as an independent research field. Over the past 40 years, language attrition has received significant attention from foreign scholars, who have produced many influential academic studies. These studies have helped clarify natural language development, including both positive and negative growth, and have led to effective language retention strategies that are highly relevant to studying foreign language (FL) development.

The author of this paper used co-citation analysis of the bibliometric analysis software CiteSpace (Chen, 2006) and the Web of Science (WoS) to visualize and analyze international research on language attrition. Next, the current research situation, main research topics, and major concerns regarding language attrition research were reviewed and summarized. Furthermore, the author provided insight into the potential future direction of language attrition research to inspire domestic research on the topic.

### **2. Methodology**

#### **2.2 Data Source**

The WoS Core Collection was utilized as the database for this study, with “language attrition” as the theme and 2010–2020 as the publication period. The literature type was set as “paper” and the language of literature as “English.” The search results were further filtered using the title, abstract, keywords, and other information from the journal articles. A total of 261 journal articles were obtained after eliminating the articles that did not meet the requirements.

## 2.2 Analysis Tools

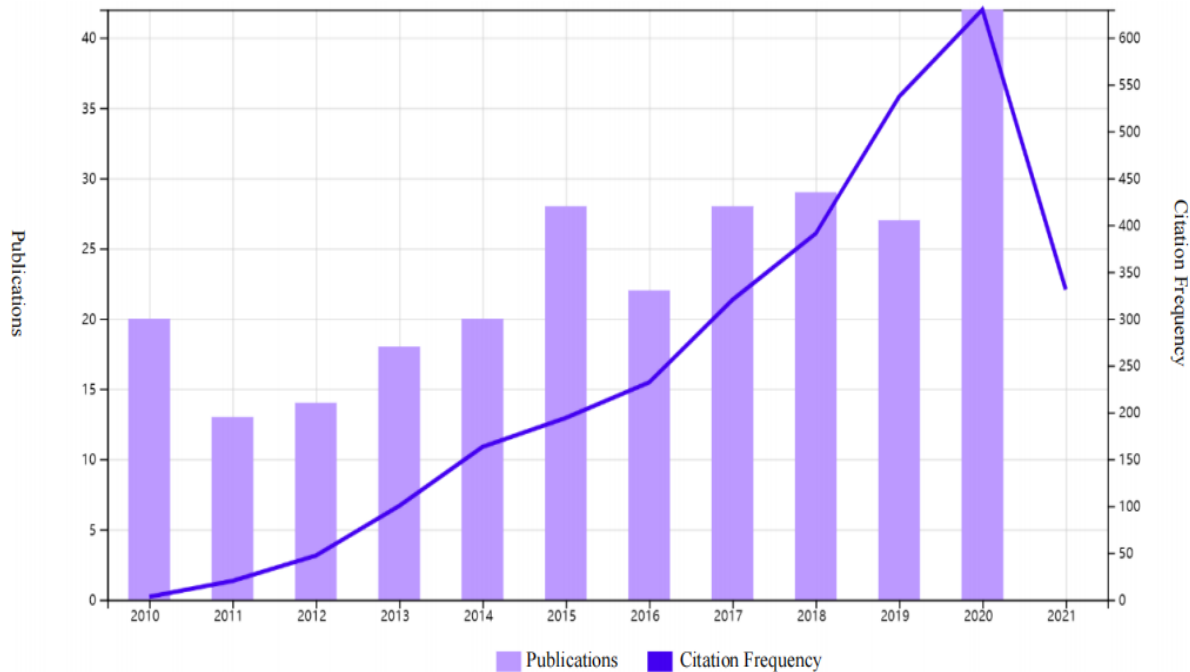
In this research, WoS and CiteSpace were used as tools for analysis. The author employed a visual representation of the knowledge domain and evaluated the advancement of selected journal articles through indicators such as cited references and keywords. This approach enabled the examination of publication trends, the analysis of key articles, and the identification of focal points for research, resulting in an understanding of the main research content and progress in international research on language attrition.

## 3. Results and Analysis

### 3.1 Number of Publications and Citation Frequency

Figure 1 illustrates the annual distribution of the number of publications and the citation frequency for studies on language attrition. In terms of the former, an overall increase can be observed, which can be roughly divided into two stages of development. The first stage is a period of slow growth (2010–2014) in which the overall number of publications was low, with a slight decrease between 2010 and 2011 and a steady, slow increase between 2011 and 2014. The second stage is a period of more rapid development (2015–2020), marked by a sudden increase in the number of publications in 2015, a significant decrease in 2016, and subsequent fluctuations with an overall upward trend, peaking in 2020. The trend of the citation frequency line graph also indicates an annual increase in the influence of language attrition research in the international academic field. The number of international publications on language attrition is expected to continue fluctuating, attracting more attention, and leading to academic growth.

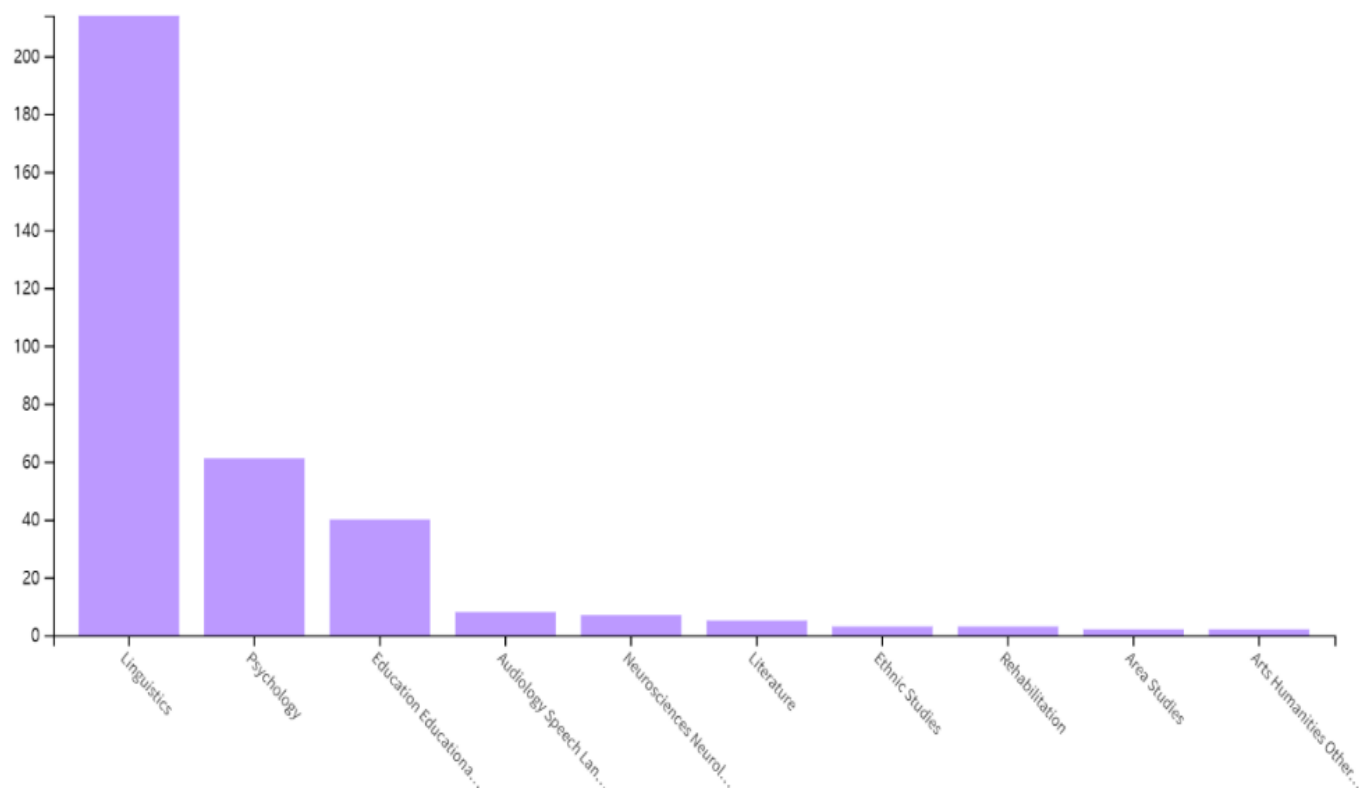
**Figure 1 Distribution of the Number of Publications and Frequency of Citations (2010–2020)**



### 3.2 Subject Distribution

Over the past decade, multidisciplinary merging has led to the rapid development of language attrition research, with research results emerging continuously. As shown in Figure 2, language attrition research abroad adopts an interdisciplinary approach; the distribution of disciplines is concentrated in three major fields, namely linguistics (214 articles, 81.99%), psychology (61 articles, 23.37%), and education (40 articles, 15.33%). In addition to humanities and social sciences, natural science disciplines such as audiology/speech-language pathology (8 articles, 3.07%), neurosciences neurology (7 articles, 2.68%), and rehabilitation (3 articles, 1.15%) also feature in language attrition research. Language attrition research is evidently no longer limited to descriptive or empirical studies focused on analyzing the phenomenon itself, but it has begun making more use of scientific data to explore the mechanisms of attrition.

Figure 2 Distribution of Research Direction Disciplines



### 3.3 Frequently Cited Articles

Table 1 lists the 10 most frequently cited international research articles on language attrition, according to the WoS citation report statistics.

**Table 1 Information on the 10 Most Frequently Cited Articles**

No.	Author(s)	Publication Year	Journal	Title	Citation Frequency
1	Sorace, A.	2011	<i>Linguistic Approaches to Bilingualism</i>	Pinning down the concept of "interface" in bilingualism	356
2	Benmamoun, E., Montrul, S. & Polinsky, M.	2013	<i>Theoretical Linguistics</i>	Heritage languages and their speakers: Opportunities and challenges for linguistics	172
3	Polinsky, M.	2011	<i>Studies in Second Language Acquisition</i>	Reanalysis in adult heritage language: New evidence in support of attrition	130
4	Putnam, M. T. & Sanchez, L.	2013	<i>Linguistic Approaches to Bilingualism</i>	What's so incomplete about incomplete acquisition?: A prolegomenon to modeling heritage language grammars	110
5	Schmid, M. S. & Köpcke, B.	2017	<i>Linguistic Approaches to Bilingualism</i>	The relevance of first language attrition to theories of bilingual development	64
6	Montrul, S.	2011	<i>Lingua</i>	Multiple interfaces and incomplete acquisition	64

7	Gibson, T. A., Oller, D. K., Jarmulowicz, L., & Ethington, C. A.	2012	<i>Bilingualism: Language and Cognition</i>	The receptive-expressive gap in the vocabulary of young second-language learners: Robustness and possible mechanisms	56
8	Hopp, H. & Schmid, M. S.	2013	<i>Applied Psycholinguistics</i>	Perceived foreign accent in first language attrition and second language acquisition: The impact of age of acquisition and bilingualism	55
9	Pavlenko, A. & Malt, B. C.	2011	<i>Bilingualism: Language and Cognition</i>	Kitchen Russian: Cross-linguistic differences and first-language object naming by Russian-English bilinguals	52
10	Henry, A.	2017	<i>Modern Language Journal</i>	L2 motivation and multilingual identities	50

Sorace (2011) is the most frequently cited article. Her work reveals the multidisciplinary, multimethodological development of her interface hypothesis in bilingual research and elucidates recent progress regarding the interface hypothesis in the first language (L1) attrition research field. The study focuses on the influence of optionality at the syntactic-pragmatic interface on early L1 attrition. Bilingual processing patterns, language input, and resource allocation constrain this process.

Benmamoun et al. (2013) provide a comprehensive review of recent research on heritage language, describing, in particular, the performance of heritage speakers in grammatical phenomena such as aspect, case, and consistency. They argue that special attention should be paid to language attrition in heritage speakers, as they are bilinguals who speak minority or immigrant languages and whose L1 often does not reach the native level by adulthood. The study suggests that significant language input and use is the key to avoiding language attrition and that the critical period has important implications for second language acquisition (SLA) and later language maintenance.

Polinsky (2011), one of the most frequently cited studies in empirical research, uses a picture-matching task to compare the comprehension of Russian relational clauses by L1 Russian speakers and Russian heritage speakers in an English-speaking environment, with each group of subjects subdivided into two groups of children and adults, to quantify the factors affecting comprehension. The results showed that adult heritage speakers' grammar depletes over time, independent of fossilization or language transfer. However, the study fails to provide a plausible explanation for the subject preference mechanism found, and further research is needed.

Putnam and Sánchez (2013) present a preliminary idea for building a model of the heritage language grammar. They point out that heritage speakers who have experienced incomplete acquisition and L1 attrition have difficulty mapping grammatical features such as phonology and semantics to each other in the expected way, which is an essential point for the model. Additionally, the model proposed in the study breaks new ground by focusing more deeply on the acquisition process and retention strategies of heritage language grammar than previous models.

Schmid and Köpcke (2017) review research on how later-learned languages reshape L1 in the short and long term and describe the effects of L1 attrition on bilingual development, noting that cross-linguistic effects are not unidirectional. Instead, the subsystems of multilingual systems are connected and continuously interact in a constant state of change and adaptation.

Montrul (2011) summarizes the results of recent research on attrition-prone interfaces based on earlier empirical studies of incomplete acquisition and heritage language acquisition, explores grammatical properties involving multiple interfaces, and points out the shortcomings in studies of internal and external interfaces and L1 attrition. The paper concludes by pointing out that future research needs to expand language typology and improve experimental techniques and that processing patterns, task difficulty, language input, and language complexity should be considered.

Gibson et al. (2012) conducted an empirical study among 124 Spanish-English bilingual children to examine the receptive-expressive gap, in which bilingual learners have difficulty accessing expressive vocabulary extracted from their L1 as receptive vocabulary. This difference was found to be a completely natural phenomenon in L1 and may be due to an inhibitory mechanism limiting L1 interference in bilingual lexical access, thus accelerating the conversion from L1 to the second language (L2), independent of the level of L2 exposure. The receptive-expressive differences covered in the study have important implications for modeling bilingual lexical access and for the clinical diagnosis of language disorders.

Hopp and Schmid (2013) investigated the factors limiting the ultimate constraint of L2 phonological acquisition by comparing the accents of 40 German bilinguals and 40 German immigrants. From the natural oral production and the word-filling test, it was clear that the level of L2 use is of some importance for bilingual learners, as they do not necessarily speak the language they acquire at birth with a native accent, i.e., bilinguals' speech production is affected by cross-linguistic interference and, subsequently, attrition.

Pavlenko (2011) studied three groups of Russian-English bilinguals who were asked to name common household objects in their respective L1s according to the SLA period and compared their naming patterns to those of Russian and English native speakers to investigate whether the age of arrival (AoA) in the L2 environment affects the use of L1 vocabulary. The study showed that the earlier the AoA, the greater the interference of L2 in L1, with attrition being most pronounced at the lowest level of L1 proficiency.

Henry (2017) explored the L2 motivation of multilinguals, stating that the motivational systems of multilinguals in different languages can be understood as constituting a higher-level multilingual motivational self system with interconnected and interpenetrating subsystems. The study follows the complexity thought model proposed by Freeman and Cameron (2008). Among the core concepts of this model is emergence, which corresponds to L2 motivational change, L2 growth, or L2 attrition. It refers to language learning as a dynamic and complex process.

An examination of the 10 articles discussed above shows that, in terms of research subjects, international language attrition studies focus on heritage speakers (articles 2, 3, 4, and 8) and bilinguals (articles 7 and 9). Regarding the research content, L1 attrition is the core topic, with grammatical attrition (articles 1, 2, 3, 4, and 6) and lexical attrition (articles 7 and 9) as the primary foci. Regarding research methods, empirical studies (articles 3, 7, 8, and 9) dominate in numbers, although some are closer to the bottom of the list. This reflects a shift toward practical innovation based on solid theoretical work, with theoretical and comparative studies prominent in the 10 most frequently cited articles.

### 3.4 Main Research Content

Figure 3 shows the keyword co-occurrence mapping of the selected literature, including 209 nodes and 728 connections.

**Figure 3 Keyword Co-Occurrence Mapping**

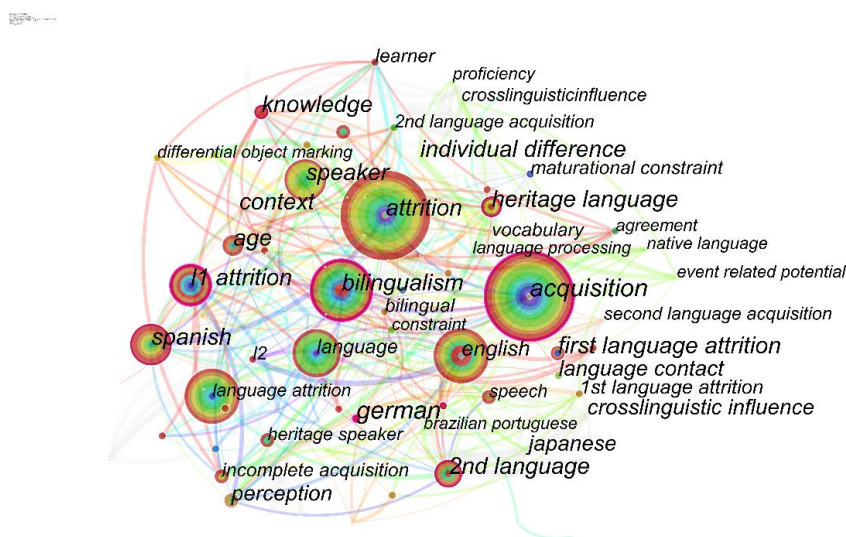


Figure 3 shows the main themes of language attrition research. According to the keyword co-occurrence mapping presented by CiteSpace, the main aspects of international research on language attrition include L1 attrition, FL attrition, influencing factors, and linguistic domains.

The first aspect is L1 research. L1 attrition is an essential topic in the study of language attrition, especially regarding L1 attrition in heritage speakers or the study of heritage language's linguistic characteristics. A characteristic group is heritage speakers whose L1 is attrited after migration to a different linguistic context. Moreover, the mechanisms by which the latter acquired language negatively affects the L1 have also become a practical issue investigated by researchers.

The second aspect is FL attrition, most notably L2 attrition, or the changes in the learner's bilingual system. Moreover, as the inverse of language attrition, language acquisition is vital for both L1 and FL attrition. Therefore, language acquisition and language attrition should not be viewed in isolation but as a complex, dynamic continuum. Furthermore, the distinction between incomplete

acquisition and language attrition should be noted. Cross-linguistic influence, language maintenance strategies, and efforts involving multilingualism have also become central issues in the study of FL attrition.

The third aspect is the influencing factors. Language contact and use are among the most important external factors of language attrition. Internal factors (e.g., initial proficiency in the attrited language, age, and individual differences) all impact the degree of language attrition. The process of language attrition should be analyzed with a focus on the synergy of multiple internal and external factors.

The fourth aspect is linguistic domains. International research on language attrition has focused on various linguistic domains, such as vocabulary, grammar, semantics, speech, syntax, and the interface between components. Empirical research on language attrition in typology, psychology, neuroscience, and education has also attracted attention. For example, language attrition studies have mainly dealt with languages (such as English, Spanish, German, Brazilian Portuguese, and Japanese) in the Indo-European family, where language family affiliation is debated, contributing to the development of a typological perspective on language attrition.

Additionally, language attrition research uses psycholinguistic techniques such as event-related potentials (ERPs) to observe language processing and changes in learners’ brain activity and to explore learners’ learning styles and perceptions of language authenticity and difficulties in using the language. This has helped researchers to gain a more comprehensive understanding of the language attrition process. Empirical studies of FL attrition in classroom settings are becoming an important part of language attrition research.

**3.5 Research Hotspots**

This study used CiteSpace to extract and analyze keywords from selected articles on language attrition, thereby obtaining 15 burst keywords, indicating that a specific keyword variable has changed significantly in a short time. These hotspots can characterize the latest evolutionary dynamics in the field of language attrition and predict future development trends.

**Figure 4 Mapping of Burst Keywords**

**Top 15 Keywords with the Strongest Citation Bursts**

Keywords	Year	Strength	Begin	End	2010 - 2020
bilingualism	2010	3.1	2011	2012	
l2	2010	3.02	2011	2012	
perception	2010	1.92	2011	2014	
age	2010	1.14	2011	2012	
2nd language	2010	2.25	2012	2013	
identity	2010	1.89	2013	2015	
english	2010	0.78	2013	2014	
knowledge	2010	2.88	2014	2015	
learner	2010	2.84	2014	2015	
syntax	2010	1.27	2014	2015	
heritage language	2010	1.83	2015	2016	
multilingualism	2010	1.62	2015	2017	
cross-linguistic influence	2010	2.52	2018	2020	
vocabulary	2010	1.82	2018	2020	
l1 attrition	2010	1.47	2018	2020	

Figure 4 shows the top 15 burst keywords in terms of intensity, sorted by year of occurrence. The burst keywords “bilingualism,” “L2,” “perception,” and “age” are all distributed from 2011, and the third-ranked burst keyword, “perception,” has the most extended duration (2011–2014). This suggests that subjective evaluations such as native speakers’ perceptions of foreign accents and language fluency, as well as bilinguals’ perceptions of the level of L1 exposure, are valuable in early studies to explain the causes of language attrition. Moreover, burst keywords such as “cross-linguistic influence,” “vocabulary,” and “L1 attrition” all emerged until 2020 and have maintained a strong trend over the past three years, which indicates that these three research areas

will likely have a significant impact on future trends and shifts in language attrition research. The strongest burst keyword is “cross-linguistic influence,” with an intensity of 2.52, indicating that researchers are beginning to focus on whether language attrition among bilinguals and even multilinguals is due to the influence of different languages in the linguistic repertoire. Recent empirical longitudinal studies provide a comprehensive picture of language development and change within individual learners.

#### 4. Summary and Prospects

Language attrition research appears to be developing steadily, gradually attracting the attention of scholars from various disciplines. This is clear when considering the number of publications, citation frequency, research aspects, most frequently cited articles, high-frequency keywords, and emerging hotspots in international research on language attrition. International research on language attrition is still dominated by L1 attrition, but with the rising demand for learning FLs due to globalization, research on bilinguals and multilinguals is becoming popular. Attention is increasingly being paid to analyzing the causes of language attrition through empirical research.

Although many scholars have been working on language attrition in recent decades, some limitations remain in the existing research on language attrition, with room for improvement. Therefore, the following prospects are proposed, particularly for theoretical and empirical research on language attrition in China.

First, language attrition research should expand research variables, enrich research perspectives, and focus on the commonalities and differences of learners from different language backgrounds. To date, most international studies of language attrition have centered on English, and the research subjects are mostly L1 attrition in immigrants or L2 attrition in native English speakers, whose L2 often also belongs to the Indo-European language family and is typologically close to English. Therefore, these research results do not precisely match the FL attrition pattern in Chinese EFL learners. Moreover, attention should be paid to the interactions between multiple variables of language attrition. Furthermore, the correlation between language attrition and language acquisition needs to be strengthened, as focusing on language attrition or language acquisition in isolation cannot give a complete picture of the language learning process. It is crucial to consider both together and to try presenting both stages in the same longitudinal study, which can help to better determine the nature of language attrition.

Second, the paradigm of language attrition research should stay current and continue to strive for theoretical innovation. International research on language attrition currently focuses mainly on L1 attrition, with the methodology of L1 attrition research being relatively complete and widely applied. However, as society becomes more multilingual, L2 attrition and FL attrition in multilingual learners have gradually become research hotspots. Therefore, future research needs to confirm the applicability of existing research paradigms for Chinese EFL learners and actively explore multilingual attrition methods. Additionally, attention should be paid to research on language retention and maintenance efforts, focusing on developing students’ meta-linguistic awareness. The research results can also improve students’ learning strategies and help teachers make adequate and appropriate instructional interventions. For example, researchers could focus on large-scale quantitative studies and the long-term longitudinal study of individual language development, fully considering the dynamics, complexity, and variability of multilingual learners’ language system development. Previous studies have focused on determining the degree of attrition through paradigms such as grammatical judgment tasks, which measure the pre-post differences in learners’ receptive knowledge. Future research can expand the research paradigms of attrition to include productive skills, such as translation tasks, time-limited oral production tasks, and online writing tasks, and strive for more research variables, specific research aspects, and precise measurements.

Third, language attrition research should promote the development of innovative measurement technology and pay attention to disciplinary integration and innovation. Analysis of the cross-disciplinary distribution mapping of language attrition research abroad shows that this research has solid psycholinguistic characteristics. Therefore, the advantages of language attrition research can be strengthened by combining empirical studies in psychology and neuroscience, for example, by combining eye-tracking, ERPs, and functional magnetic resonance imaging, among others. Mickan et al. (2021) used a picture-naming task to study the dynamics of interlingual interference in FL attrition from an electrophysiological perspective. This was the first use of neural evidence from electroencephalograms to demonstrate that the interference of other FLs might cause FL attrition. However, few Chinese scholars have attempted to integrate language attrition and psycholinguistic approaches in empirical studies. Consequently, using advanced cognitive research methods to study language attrition offers many research prospects and is expected to break new ground for language attrition research.

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