Contents lists available at ScienceDirect

Journal of King Saud University – Science

journal homepage: www.sciencedirect.com

Original article

An empirical survey of statistical research methods in applied science

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ARTICLE INFO

ABSTRACT

With the continuous development and improvement of China's social economy, and the improvement of social living standards and abilities has led to increasingly strict requirements on the quality of life, more and more attention has been paid to education in China. Driven by the current social development, applied linguistics is developing and making progress. Its corresponding language research methods and the reform and innovation of language application have undergone further changes, and great research achievements have also been achieved. At present, with the open development of social economy and the comprehensive coverage of scientific information technology, language learning and communication have gradually become an important part of learning and education. With the emergence and development of cognitive linguistics, corpus, statistics, special English and computer languages, applied linguistics has become a nationalized research system in its research development. This paper makes an empirical investigation and analysis of the corresponding situation through the research method of applied linguistics, and reflects the development of current applied linguistics through data.
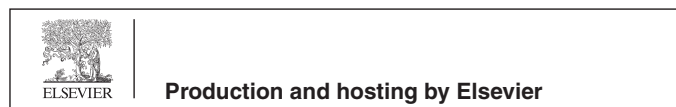
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1. Introduction

Applied linguistics is an important part of language learning in China (Farsani et al., 2021), which is widely used in various industries and fields. As a relatively large linguistic branch of practical language, applied linguistics usually focuses on solving practical problems. Applied linguistics (Vincent and Ian, 2021; Felix, 2021) is mainly based on the actual situation of practice and actual needs to carry out reasonable analysis and research, without contact with historical language and not involved in the general applied language. The current applied linguistics is mainly embodied in machine applied linguistics and general applied linguistics. This paper analyzes the knowledge practice of quantitative statistical methods of applied language by Chinese foreign language researchers, and makes an empirical investigation of the main attitudes and methods of some research students and professional foreign language teachers and students. So as to ensure the accuracy of applied linguistic statistical research methods, as well as the rationality and scientificity of the data.

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Peer review under responsibility of King Saud University.

Production and hosting by Elsevier

2. Relevant research on applied linguistics abroad

Foreign scholars have experienced a long period of development in applied linguistics (Mahsa et al., 2021; Huat and Jacobs, 2021; McKinley and Rose, 2021). From the fuzzy boundary of philosophy and linguistics at the beginning to the current independent language discipline. Applied linguistics has gone through the full development stage of historical language. In order to effectively improve the development of applied linguistics, foreign language scholars through the study of the historical development of applied linguistics, in the process of the establishment of the continuous development of language system, the historical comparison of linguistics, and to promote the independent formation and development of applied linguistics.

In the research of applied linguistics abroad, explore the insufficient expenditures exposed by applied linguistics in the actual situation of social development, and form a reasonable and objective linguistic theory. The construction of a series of linguistics related theories laid a solid foundation for the development and progress of applied linguistics. Joombs put forward a creative research theory on the syntactic structure of linguistics. He put forward a creative theory on the syntactic structure of linguistics published at that time, and fully grasped the structure generation of linguistics. And then after the 19th century. Applied linguistics has gradually developed independently in the world linguistics. Polish linguists have put forward a relatively specific classification of its linguistics, which is divided into pure linguistics and applied

linguistics. Thus applied linguistics has formally moved towards the trend of independent development. In the 20th century, with the continuous development of social science and technology, foreign language teaching model gradually formed a unique teaching industry, and applied linguistics began to develop more rapidly. People also defined the effective development stage of applied linguistics in the United States. Since then, the development of applied linguistics is mainly reflected in the development of English language, and the establishment of English college has become an important symbol of the formation of applied linguistics abroad.

3. Analysis of the research status of applied linguistics in China

The development of applied linguistics in China also has a relatively complete stage (Lee, 2021; McKinley and Rose, 2021). The development status of applied linguistics in my country is mainly based on the empirical research of *Chinese Foreign Language.* In its corresponding applied language and literature related research articles, adopt the form of statistical research. Through quantitative analysis and processing of the data, the development trend of applied linguistics is obtained through descriptive statistical calculation.

According to the statistical analysis (Masaki, 2021; Junqiang, 2021), the number of applied linguistics research articles published in The Journal of *Chinese Foreign Language* is still in a relatively stable numerical presentation stage, and there is a trend of upward development. Statistics show that from 2005 to 2009 there were 93 papers published in applied language and literature journals, accounting for about 18% of the total number of papers published in this journal. The data shows that China attaches great importance to the research of applied linguistics. At the same time, applied linguistics has a high research status in China.

3.1. Relevant studies in English applied linguistics

At the same time, according to the analysis of applied linguistics in China during this period, in the process of investigation and analysis of journal literature, it is found that applied linguistics research is mainly divided into teaching and learning. English teaching and English language learning are studied and explored from different analytical levels, which is also the focus of current applied linguistics. In the study, there are 57 papers on English teaching and 36 papers on language learning. In the process of statistical analysis of these 93 papers, they can be divided into eight different teaching categories. From including audiovisual listening, speaking, reading and writing English skill category analysis, including English teaching assessment and the analysis of the English teaching mode, teaching method, includes English teaching related to teacher training and tools to analyze its education teaching class analysis to the analysis on the teaching of English, English learning content analysis, the analysis of the learning process, the analysis of the learning interest and learning Shi's analysis.

3.2. Research on English teaching in applied linguistics

In the process of research and analysis of relevant journal papers, that is, 286 English papers, the corresponding journal classification statistical analysis is carried out. Among them, the teaching topics about English special topics account for about 20%, the corresponding proportion about learning skills is 47.3%, and English teaching methods account for 18.2%. Finally, the study on classroom teaching accounted for 14.5% of the total papers and journals (As shown in Table 1). English teaching can be analyzed and studied (Zotzmann and Sheldrake, 2021; Alison, 2021). In the process of English teaching, audio-visual speaking, reading and

writing skills are the main focus and research focus in the current English teaching process. In this period of paper research has a certain basis of paper research, which is mainly reflected in the theoretical deficiencies in the process of listening teaching, in the relevant English teaching papers typical English listening and speaking teaching comprehensive scheme. In the process of research and analysis of English teaching, insufficient attention has not been paid to the reading of the research content. There are only about four journals on this topic. However, there is a certain proportion of empirical data analysis in the study of English teaching methods. During the development of applied language learning (Sharma, 2021; Guinda, 2018) in the same period, there were three papers on the experimental research direction of English teaching mode and its teaching system, which focused on the analysis of the reform and method innovation of English teaching mode in the new era under the current background, and made in-depth research and exploration of the development and progress of current English teaching. Moreover, it provides strong scientific and empirical basis for its development. In addition, the research on teaching tools and their English teaching hardware facilities is relatively lower than other parts. At the same time, there are only a few papers on the training of English teachers and the arrangement of English textbooks.

3.3. Research on English language learning in applied linguistics

At the same time, in addition to the teaching methods of English teaching related journals research data analysis statistics. As for the paper research on language learning (Abdalla, 2021; Yuanyuan, 2021), the total amount of research and analysis on English teaching content accounts for 40.5% of the whole paper journal. In the process of English learning, the analysis of papers and journals related to the impact of personal factors on learning accounted for 24.3%, the series of phenomena in the process of English learning accounted for 16.2%, and targeted English learning solutions accounted for 19% (as shown in Table 1). Compared with English teaching methods, English language learning is a way of learning English language from another perspective, which is another correspondence analysis mode for English language learning skills and skills. The content of English learning (Mohsen and Rojan, 2021; Vander et al., 2021) focuses on the use of English vocabulary and its relative English language ability. Data analysis results show that in the process of English language learning, the number of documents studying English grammar has been greatly reduced compared with the past. At the same time, the writing of English content and vocabulary is still a key part of the English language learning process, and English intercultural communication skills are also on the rise (Fig. 1).

Statistical analysis of the articles published in "Chinese" papers in this period, five journal papers mainly analyzed the personal factors of foreign language learners, including factors due to individual differences and their tendency to learn English. In the paper and journal content of individual differences, the corresponding courses are divided into classes mainly through the relevant test of their English linguistics ability, so as to carry out different course training for different classes. To some extent, these papers focus on the individual differences of language learners in the learning process, but their shortcomings are obvious, and there are not many studies on the learning phenomenon. According to the current research of applied linguistics, the curriculum test of corresponding language is indeed a highly stimulating teaching method. There are also a lot of journals researching on such issues. These series of journal papers (Xiaoyi and Shuangling, 2021) reflect the function of English learning tests to a certain extent, and also reflect the creativity of language learners to improve their opportunities in autonomous learning.

Table 1
Paper content classification.

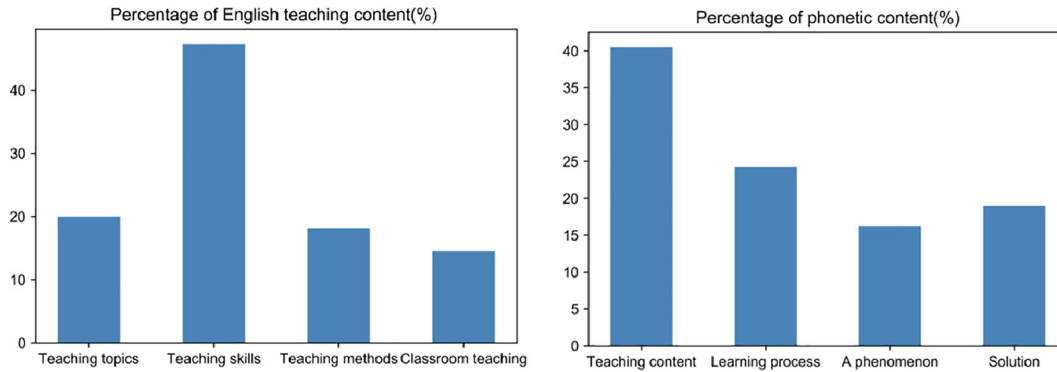|	English teaching				Language learning			
Paper content	teaching topic	learning skills	teaching methods	teaching classroom	teaching content	learning process	phenomenon	solutions
Proportion	20%	47.30%	18.20%	14.50%	40.50%	24.30%	16.20%	19%

Fig. 1. The proportion of statistical learning in the literature.

3.4. Research on statistical methods of applied linguistics

In view of the current applied linguistics analysis, the current applied linguistics has made some achievements. Researchers at home and abroad have conducted specialized research on it. Through the empirical analysis of the research in this paper, in the process analysis of its statistical research methods, it mainly carries out systematic, planned and correlation research of the empirical research materials, which can effectively realize the quantitative and qualitative analysis of the research materials. In addition, through the analysis and exploration of non-research materials, personal experience and opinions are summarized. In this paper, the relevant journal papers of "China Foreign Language" are used for certain analysis. In the journal papers, 68.5% papers are about empirical research while the other part is about the research and analysis of non-research materials. From the perspective of the current development rate of applied linguistics, the development rate of applied linguistics has been improving in recent years, and has reached 94% of the total. At present, the research and analysis of applied linguistics focus on systematic data collection, integration and analysis, which to a certain extent replaces the personal experience in traditional applied linguistics research. In the current rapid development process, applied linguistics has attracted more and more attention from the majority of scholars, so its development needs more powerful empirical investigation to effectively prove the author's point of view. At the same time. The correlation analysis of empirical materials of applied linguistics also effectively expanded the thinking of corresponding researchers to a certain extent.

3.5. Empirical investigation and analysis

Current on the investigation and analysis of applied linguistics in statistical research methods, through the data survey reflects the current China's foreign language researchers in quantitative statistical knowledge and practice in the process of the status quo, as well as the current foreign language researchers attitude towards its statistical methods and practices, as well as the studies of the statistical method of the scholars research the problem analysis. In this study, 150 people were selected for questionnaire survey, among which 2 questionnaires were invalid, so only 148

people were actually investigated. It is divided into two parts for investigation and analysis. Sixty-eight were delegates to relevant applied linguistics research conferences, while the remaining 80 were partial foreign language teachers and graduate students from two local universities. Choose two parts of research object, it is because it has large universality, the object of the gathered crowd has certain regional diversity, can provide a certain academic research background, effectively improve the accuracy of the data investigation and scientific rationality. Table 2 and Table 3 shows the basic situation of investigation.

3.6. Terminology research on statistical methods

In the process of corresponding statistical method research, we should have a certain degree of understanding of the statistical terminology, and be familiar with the application of statistical methods. The current survey respondents were able to scientifically rate themselves on 25 commonly used statistical terms. About statistical terms of commonly used terms include "language study statistical method", "test statistic method" and "two combination" three categories, including professional term of the statistical methods of language have 11, for example, analysis of variance, correlation and academic terms about test statistic method has eight, including "content analysis, the degree of differentiation, peak", etc. Finally, there are six statistical terms commonly used in both types of statistics, which are "average value, percentage and reliability". These statistical terms are based on the principle of commonality.

3.7. Analysis of empirical investigation conclusions

The statistical method is set to two items of attitude and practice, including 18 related quantitative research methods. Attitude is about "I don't understand the research method can carry out language research", "foreign language researchers should be able to research methodology and statistics", etc., and related problems about practice Settings, are mainly "I never watch data statistical analysis part of the research report", "meet need of statistical place I ask others for help", etc. At the same time, the questionnaire has certain requirements on the answering mode. The answers in the questionnaire are divided into 5 items, with 5 being strongly in favor and 1 being strongly against.

Table 2
Methods of material/object collection Research tools data analysis data processing.

Material/object	Methods	Research tools	data analysis	Data processing
148 subjects	Electronic and written questionnaires	SPSS statistical software	Mean, standard deviation, ranking	T - test, variance analysis, reliability analysis

148 subjects received electronic and written questionnaire SPSS statistical software mean, standard deviation, ranking T-test, analysis of variance, reliability analysis.

Table 3
Basic information of respondents.

	Male	Female	Research	Teacher	Graduate	Title degree (%)			Degree (%)
						senior	intermediate	primary	Master/above
Conference delegates	54.4	45.5	5.8	58.8	35.2	63.1	29.4	7.3	83.8
Teachers/students	42.5	57.5	0	46.2	53.7	41.2	40.2	18.5	52.5
Total	48.5	52.5	5.8	52.5	44.4	52.1	34.8	12.9	68.1

For the relevant research and analysis of applied linguistics, statistical judgment should be made on specific problems in the corresponding questionnaire survey process, and data analysis and calculation of each sample should be carried out through statistical methods. At the same time, do a good job of data collection, and conduct a small-scale experimental study on the survey content in the form of question-answering among 15 graduate students in a local university, so as to meaningfully modify and supplement the rationality of the existing questionnaire and the validity of its questions. Therefore, 90 delegates out of 200 delegates are randomly selected to conduct a questionnaire survey through the relevant email addresses provided in the address book. The survey of English teachers and graduate students in colleges and universities mainly adopts the mode of E-mail or questions from aspects, and a total of 180 questionnaires were issued (Fig. 2). This questionnaire has a high rate of return, among which 8 questionnaires have been returned due to other reasons, 17 written questionnaires have not been sent back, and 7 questionnaires have incomplete answers to questions. The above 32 questionnaires were invalid and not included in the final statistical study. Therefore, according to the significance of the current recovery rate greater than 60% and the routine of effective sampling, the results of this questionnaire survey are shown in the following Table 4.

With SPSS statistical software to process the data and calculate its average. The standard deviation and the corresponding average are the three parameter descriptions of descriptive statistics

Table 4
Statistics of questionnaire distribution and collection.

Classification Incomplete questionnaire (copies) Recovery rate (%)	Meeting represents	Teachers/Students	Total
Theoretical sample (person)	90	90	180
Actual sample (person)	8	80	148
Issue of questionnaires (copies)	90	90	180
Return of questionnaire (copies)	68	80	148
Return of questionnaire (copies)	6	2	8
Unanswered questionnaires (copies)	11	6	17
Incomplete questionnaire (copies)	2	5	7
Recovery rate (%)	75.55	88.88	82.22

(Table 5). Independent sample T test was performed on two different samples (Table 6). Corresponding paired t-test was performed on the terminology understanding and method application of the two sets of samples. There are significant differences between the research groups, and the results are shown in the table below.

According to the current statistical results, there are obvious differences within the two groups. This shows that there is a gap between the understanding and use of statistical methods in all
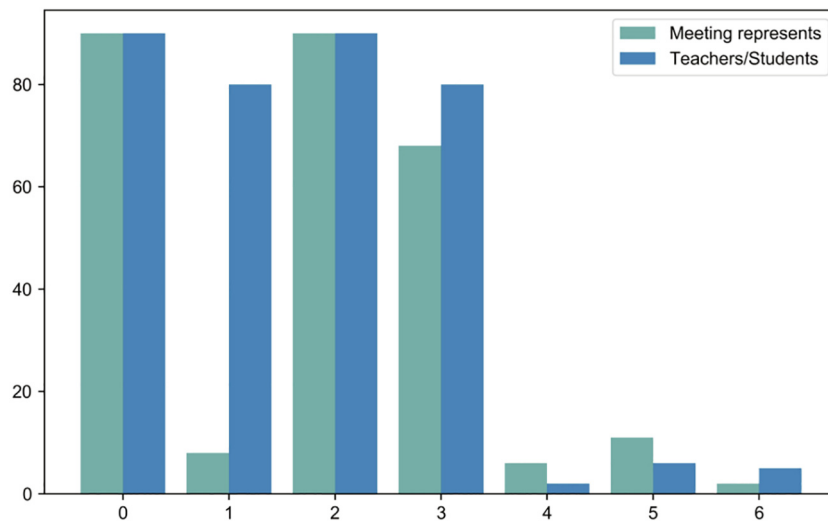

Fig. 2. Histogram of questionnaire distribution and recycling statistics.

Table 5
Independent sample T-test for the two groups of samples.

Classification	Average	Standard values	t	Significance
68	0.168	0.2988	2.811	p <.010
80	0.2128	0.1922	5.343	P <.000

Table 6
Independent sample T-test for two samples.

Classification	Sample	Average	Standard deviation	t	Significance
term understand	68	2.36	1.11	1.77	0.08
	80	1.79	1.13		
term usage	68	2.19	1.2	1.84	0.05
	80	1.58	1.13		

current targeted tests, and the understanding of statistical methods is better than the actual use of the situation. Based on the analysis of the survey results, the survey objects of this statistical method can understand the concepts of some statistical terms, but they are not able to use them correctly. The reasons for this difference can be analyzed from the following three aspects: In the corresponding statistical method research process, they know how to use a certain statistical method, but do not need to use it in the actual operation and research process. Or in the process of their research, they know how to use their statistical methods to carry out targeted operations, but they do not understand the relevant concepts of their statistical terms, and cannot determine what statistics their terms correspond to, and what their statistical significance is vague. Or they know the statistical significance of a method, but they do not know the corresponding calculation method. At the same time, it can be seen from the results of the statistical research method that there is no significant difference between the two groups in the understanding of statistical terms in the *t*-test results of the corresponding opposite samples, that is, P >.05. However, there are some significant differences between groups in the application of methods, P =.05. Among them, the group of 68 people mastered the research method better than the group of 80 people, indicating that the statistical method was used more in the group of 80 people.

The corresponding four grades in terms of understanding and using statistical analysis respectively, found that in the 1st level, the two don't exist evident differences, can be seen in human subjects to use more skilled and able to grasp the four statistics research methods, in the process of language study and foreign language teaching is widely popular. In terms of level 2, the use of statistical terms is lower than understanding, and there is a significant difference between the two. On the one hand, this indicates that the current respondents know some statistical methods, but they do not or do not use some methods in the process of language research. In fact, it is far more difficult to understand the concept of some methods. In levels 3–4. The number of unfamiliar terms reached 17, and there was no obvious difference between the use and understanding of statistical methods. The results showed that there were samples with relatively good command of difficult research methods, accounting for about 10%. Through the discovery of these raw data, the sources of these subjects are all from professional scientific research institutions and research centers, among which high-scoring samples are mainly from Hong Kong, Macao and Taiwan. The rest are a few doctoral students or researchers and teachers who have been systematically trained in scientific research methods. It can be seen that the popularity and innovation of statistical methods in applied linguistic statistical research by the former group of scholars is often higher than that of the latter group of mainland scholars.

4. Problems and analysis of applied linguistics

At present, applied linguistics research in China has made great progress, but there are still some problems and defects. With the continuous strengthening of scientific research capacity, a series of problems in applied linguistics research have been solved, but there are still some problems to be solved.

4.1. The research theme appears repeatedly

As for the study of applied linguistics (Hui and Chen, 2021), the research topic in the same type always appears repeatedly. In the research of applied linguistics, the general research Angle and theory are emphasized. In the corresponding journal papers published, there are many empirical studies on English language learning motivation or teaching methods, while there are different papers on non-English majors with their language research methods as the main research point, including different research methods. But in addition, in the statistical process of Applied linguistics in Britain, empirical studies on linguistics occupy a large part of the relatively high number of examples greatly affected the statistical development of applied linguistics.

4.2. Research variables are difficult to control

Meanwhile, in the process of statistical research of applied linguistics, it is found that the research variables of applied linguistics are relatively difficult to be controlled. And the corresponding statistical empirical methods (Karin and Sheldrake, 2021) of applied linguistics need to be further strengthened. In the current applied linguistics research process, the relative lack of sufficient practical demonstration, the degree of convincing is greatly reduced.

4.3. Research methods need to be improved

As for the statistical methods of applied linguistics, the corresponding methods should be further improved and analyzed. In the process of current empirical investigation and analysis, it can be found that in recent years, the relevant demonstration methods of statistical methods of applied linguistics have been improved to a certain extent, and the diversity of research methods has relatively promoted the improvement of applied linguistics. However, in the research process, the corresponding research sample is small and relatively single, which cannot provide accurate and convincing data analysis results.

4.4. Research content needs to be improved

Finally, in the study of statistical methods in applied linguistics, its related content also needs to be improved to some extent. According to the current research on statistical methods of applied linguistics, the actual research of applied linguistics is mainly focused on language skills, but it has not yet received mature guidance and attention in the field of reading. In the process of language learning, the cultivation of language listening, reading and writing ability is the most critical and important. Therefore, in view of the current development trend of applied linguistics, some research attention should be devoted to the compilation of corresponding textbook content.

5. Empirical investigation suggestions on statistical research methods of applied linguistics

In view of the above research and analysis of statistical methods of applied linguistics, some data analysis and processing are carried out on the relevant statistical data of applied linguistics through questionnaire survey and practical empirical investigation. According to the statistical analysis of the data, it can be seen that the current development of applied linguistics in China is fast. However, there are still some problems in its theory and statistical research methods, and the fundamental reason for such problems lies in the short time cycle of applied linguistics research in China, which is not solid enough and the theoretical basis is weak. However, applied linguistics itself has a strong ability to cover a wide range, which makes it difficult to generalize its theories. Therefore, in order to effectively improve the statistical analysis ability of Applied linguistics in China, we should combine theoretical practice with empirical investigation and analysis.

5.1. Strengthen the practicability of applied linguistics

To some extent, we should pay more attention to the practicability of applied linguistics. The purpose of applied linguistics is to better solve the language problems in the current social development. In order to effectively improve the statistical analysis and development of applied linguistics, the function of applied linguistics should be reasonably expanded. In the process of its research, it uses scientific cognition to strengthen part of the analytical ability of applied linguistics function, so as to reasonably promote the progress and development of its research statistical methods.

5.2. Pay attention to multi-disciplinary cross

At the same time, in the process of empirical investigation of the corresponding statistical methods of applied linguistics, reasonable attention should be paid to the multi-dimensional intersection of disciplines. At present, the speed of academic development is constantly accelerating, and the interoperability between various disciplines and fields is greatly enhanced, while applied linguistics covers a relatively wide range, so it should pay more attention to the integration of disciplines in its research process. The development of applied linguistics should be improved through effective integration of various disciplines, so as to effectively improve statistical analysis of applied linguistics.

5.3. Strengthen the application of theoretical basis

In the course of empirical investigation of statistical methods in applied linguistics, the theoretical basis of statistical methods should be strengthened to some extent. Applied linguistics mainly considers the application of language, that is, mostly practical

applications, but it does not mean that only practical applications are considered. The research and development of relevant statistical methods in applied linguistics is also based on certain theoretical basis for further in-depth research and development. On the basis of the corresponding applied linguistics, we should strengthen the study and research of corresponding theoretical knowledge reasonably, improve its theoretical basis with pertinence, and then convey ideas through the output of language. At the same time, with the stable support of theoretical basis, in-depth empirical investigation and research are carried out to improve the accuracy of research conclusions and the development of statistical methods in applied linguistics.

6. Conclusion

In this paper, the research on quantitative and qualitative methods needs to be improved. Applied linguistics covers a wide range of fields. In the process of studying death statistical methods, we should pay full attention to the reliability, credibility and scientificity of related research results, effectively improve the related functions of applied linguistics, and strengthen my country's applied linguistics research Development and progress. From the current research on statistical methods of applied linguistics, diversified research ideas will help relevant statistical research methods to be popularized to a certain extent. At present, my country has a certain understanding and application of statistical methods in applied linguistics, and has a more general recognition of them, and there is still a certain degree of selectivity in the study of statistical methods in applied linguistics.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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