Published online: 18 December 2024 DOI: 10.54254/2753-7080/2024.18909

Visualizing the Knowledge Domain of Research on Cognates: A Bibliometric Analysis

Junlong Cheng [1, 2, a], *Yu Wang* [3, b, *]

[1] National Research Centre for Foreign Language Education, Beijing Foreign Studies University, Beijing, 100089, China
[2] School of Foreign Languages, Guizhou Education University, Guiyang, 550018, China
[3] School of Foreign Languages, Tianjin University of Commerce, Tianjin, 300134, China

a. cjl@bfsu.edu.cn, b. sonia896@163.com
* corresponding author

Abstract. Cognates constitute an essential aspect of lexical processing, and numerous scholars have made significant contributions to studying their processing patterns, influential variables, and theoretical models. However, there has been a lack of systematic reviews that comprehensively examine the body of research on cognates, including their primary research topics, theories, findings, and future directions. The present study conducted a bibliometric analysis of the 726 recordings from 2001 to 2021 retrieved from the Web of Science database. The results revealed that: (1) studies on cognates were mainly conducted in countries using alphabetic languages; (2) cognate processing remains as the focus in the research domain; (3) cognate effect are modulated by factors at word, task, and participant level; (4) BIA+ model is widely used to account for cognate processing. The limitations and potential implications for future cognate research are discussed.

Keywords: cognates, bibliometric analysis, CiteSpace

1. Introduction

A key focus of psycholinguistic research on bilingualism for the past decades has been the investigation of lexical representation and processing in bilingual individuals [1], with a particular interest in the question of whether the two languages in bilingual memory are stored and accessed together or separately [2]. In terms of representation, influential theoretical models, such as the Bilingual Interactive Activation plus (BIA+) model [3], suggest that bilinguals have a shared conceptual representation between the two languages [4-6]. As for processing, there is abundant evidence suggesting that language processing during language production or comprehension is nonselective in nature [7,8]. This means that word processing involves co-activation of lexical items within the mental lexicon [9,10]. One commonly employed approach to investigate co-activation is through the examination of cross-linguistically ambiguous items, such as homographs, homophones, and cognates [7]. Among these, cognates have been extensively studied to illustrate the nonselectivity of word processing, wherein lexical representations in both languages are simultaneously activated.

Contrary to the definition of cognates in historical linguistics as words with the same language ancestry, cognates in psycholinguistics are defined as words that share meaning and spelling/sound across languages [7,11-15]. Cognate status can be understood as a continuum [8]. This implies that there exists various types of cognates, characterized by different degrees of similarity. Identical cognates have both identical spelling and meaning (e.g., “museum” in English and Dutch). Non-identical cognates or Semi-cognates have similar meanings but slight spelling differences (e.g., “diary” in English and “diario” in Spanish). Partial cognates are words that have partial semantic overlap (e.g., “conviction” in English and “convicción” in Spanish). Furthermore, cognates can be translation equivalents in two languages that share similar meanings and exhibit phonological similarities (e.g., “レモン” in Japanese and “lemon” in English, “坦克” /tan3ke4/ in Chinese and “tank” in English) [16,17]. Thus, cognates are words that share the same or similar meaning and often have similar or overlapping orthographic or phonological characteristics. They exist in both same- and different-script languages.

Co-activation of lexical items that share form and meaning in two languages gives rise to the emergence of cognate effect [18]. Numerous studies have evidenced that bilinguals process cognates faster and make fewer mistakes relative to noncognates in language related tasks [7,19-21], and this kind of facilitation is referred to as cognate facilitation effect. To wit, cognates have

advantage over non-cognates in terms of the speed and accuracy at which they are recognized and produced during various language tasks [22], and this advantage can also be termed the cognate advantage effect [7]. Additionally, since cognates exist in both languages, frequent exposure to them also contribute to the facilitation effect observed in language processing tasks. In a way, this effect can be understood as a cumulative frequency effect [23]. Various techniques, such as reaction time measures, eye-tracking [24,5], event-related potentials (ERPs) [26,27], and functional magnetic resonance imaging (fMRI) [28], has been employed to investigate the impact of cognate processing.

Cognate facilitation effect, evidenced by response time data, eye-tracking data, and amplitudes of event-related potentials, has been frequently observed in different tasks related to language comprehension and language production [7]. Lexical decision (i.e., making judgments on whether a set of letter strings are real words or not), employing masked and unmasked priming paradigm [21,29], has been the primary task in the majority of studies investigating the effect. In addition, various tasks, such as reading [25,30], naming [15,31], and translation [32,33], have also been used in research studies to investigate the effects of cognates on language processing. These tasks use either visual and/or auditory modalities to explore how cognates influence different aspects of language processing. Cognates in these experiments are present either in isolated single words [13,34] or within a sentence [32,35].

Findings of these research studies suggest that cognate facilitation effect can be bidirectional (i.e., in a forward or backward direction, from L1 to L2 or from L2 to L1) [18,36], task-specific (i.e., the effect is contingent upon the specific demands of the task at hand) [20,37], and be restricted by whether the sentence context is semantically constraining or not [38-40]. A handful of studies also indicate that cognate facilitation effect is not significant and even cannot be observed in certain conditions [21,32,41,42]. This effect can be modulated by the composition of stimulus lists and individual differences of participants. Cross-linguistic similarities of stimulus lists have been found to influence the magnitude or presence of the effect, and the removal of identical cognates or the reduction in orthographic overlapping contribute to the vanishing effect [11,13,21]. Word frequency, word class, and word concreteness of cognates in stimulus lists also influence the manifestation of the effect. Prior studies suggests that cognates with low frequency may demonstrate a greater cognate effect compared to those with high frequency [26]. And the effect tends to be more robust and larger for cognate nouns compared to cognate verbs since verbs have less similarity in their forms and meanings across languages [40]. Furthermore, concrete cognates are processed faster than abstract ones [5]. Apart from the aforementioned factors, participants' age of acquisition (AoA) and language proficiency can also be a factor influencing cognate effect [10,18]. Typically, those who acquire their L2 at a younger age tend to attain a higher level of language proficiency. As a result, they are more likely to exhibit a larger cognate facilitation effect. However, previous studies suggest that this effect is more prominent at lower level of proficiency [43,44].

The Bilingual Interactive Activation plus (BIA+) model [2] is a widely recognized theoretical model that provides an explanation for cognate processing. According to this model, cognates are assumed to share a single, integrated lexicon, and bottom-up activation occurs during the processing of cognates [45]. However, its account of cognates focuses primarily on orthographic recognition [4] and places less emphasis on phonological similarity [13]. Thus, BIA+ model does not provide a realistic account of the interconnections between orthographic and phonological representations of cognates. It also have difficulty in accommodating the contradictory effects observed in nonidentical cognates [7]. While Multilink model [4] and its updated version Multilink+ model [29] are computational models that can simulate the comprehension and production of cognates by considering various factors, more empirical studies are needed to validate and refine this model.

Although these studies have provided a strong research base for cognate processing, discrepancies in the above-mentioned studies suggest that the consensus about cognate effect and its influencing variables remains inconclusive and there are still unanswered areas that require additional exploration. Besides, the existent reviews, using meta-analytic and research synthesis approaches, covers only a limited topic of cognates, such as cognate effect and its influencing factors [46]. A comprehensive understanding of research on cognates, however, requires an analysis of the abundant literature. Therefore, this study conducts a bibliometric analysis to probe into the literature on cognates and examine its development over the past two decades. Given such interest in this research domain, several questions arise as follows: (1) What are the key research areas and recent advancements in cognate study? (2) What limitations exist in current research? (3) What are the potential implications for future studies in this field? To address these inquiries, we will depend on the fundamental framework established: gathering information to derive our conclusions [47].

2. Methodology and Data

As a quantitative approach, bibliometric analysis aims to provide a holistic understanding of the knowledge base and intellectual structure within a research topic [48]. By employing this approach, analysts can conduct a longitudinal analysis of a research topic by examining the various aspects of the literature [49]. Co-citation network analysis is an essential part of bibliometric analysis. It showcases the co-citation relationship between two references and indicates the frequency with which they are cited together by other articles [50]. Thus, bibliometric analysis enable analysts to investigate the current state of a research field, assess its development over time, and identify potential trends for future research [51,52].

CiteSpace is one of the several visual tools commonly used in bibliometric studies for data visualization and co-citation network analysis [49,53]. This analytic tool, developed by professor Chen Chaomei, is instrumental in facilitating the visualization of knowledge mapping in various hot topics within academia [55,54]. For this reason, CiteSpace (version 5.8.R3) was used to visualize the dynamic progress in the study of cognates. The overall development of cognates study is visualized in terms of

collaboration network analysis and document co-citation analysis. Collaboration network analysis can reveal the collaborative relationship of authors, institutions and countries, showcasing the cooperation dimension within articles related to cognates [55]. And document co-citation analysis is used to identify the network of co-cited papers, allowing for the clustering of research topics in the study of cognates [56].

The publications of cognates were retrieved from Web of Science (WoS). WoS is a high-quality digital database with broad acceptance among researchers and is widely used for bibliometric analysis [49,57,58]. The Core Collection of the database covers a wide range of top-ranked journals and reputable academic publications. Peer-reviewed published articles is more suitable for analysis because they can be seen as "certified knowledge" to guarantee the reliability of the results [59]. Five out of the seven Core Collection were selected, including Science Citation Index Expanded (SCI-EXPANDED), Social Sciences Citation Index (SSCI), Arts and Humanities Citation Index (A&HCI), Conference Proceedings Citation Index-Science (CPCI-S), Conference Proceedings Citation Index-Social Science and Humanities (CPCI-SSH). The time frame for this study was set as 2001-2021 because the theoretical model BIA+ was introduced in 2002. And we aims to capture the developments related to the application of the BIA+ model within the study of cognates.

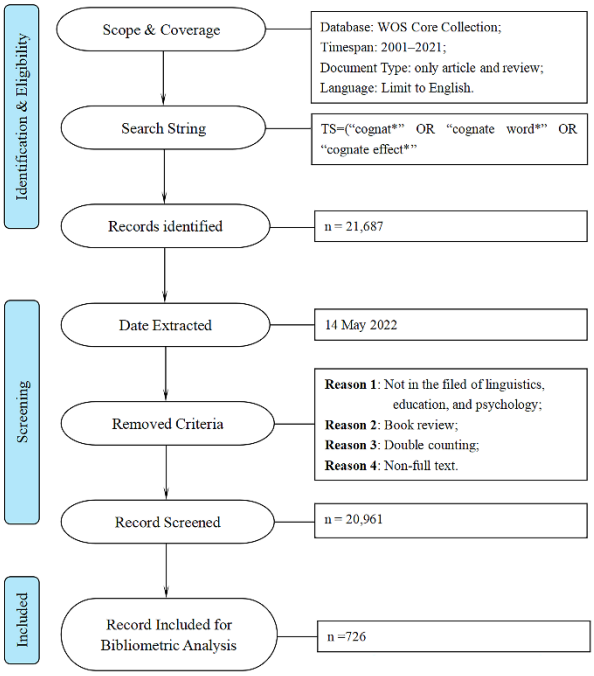

Figure 1. PRISMA Flow Diagram of Search Process

The following terms were added to Query in Advanced Search in WoS to collect the data set for analysis: TS="cognat*" OR "cognate word*" OR "cognate effect*". It is important to note that "*" is a wildcard in WoS that broadens the search of the retrieval terms (e.g., cognate*= cognate, cognates) and TS means that only articles that encompass these retrieval terms in their titles, abstracts or keywords are retrieved. The search records are exported as plain text, with full record and cited reference included [55]. Duplicate records from the retrieved dataset were eliminated by employing "remove duplicate (WoS)" function in CiteSpace. It is also noted that book reviews were excluded from the analysis. A total of 21,687 articles and reviews were obtained in 235 WoS categories. The present study, however, mainly focuses on study of cognates in the fields of linguistics, education, and psychology. Therefore, 726 research articles and reviews were extracted for the visualization. The procedure was illustrated in Figure 1. It is based on but not strictly aligned with recommended guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines [60].

3. Results

A set of 726 records was retrieved for analysis and Figure 2 illustrates the annual publication of literature on cognate studies from 2001 to 2021. The annual number of publications can be seen as an index for the research popularity and significance of a scientific field [61]. It is evident from Figure 2 that the number of publications shows a consistent annual growth from 2001 to 2021. The distribution of annual publications on cognates indicates a sustained and growing interest among scholars in this field.

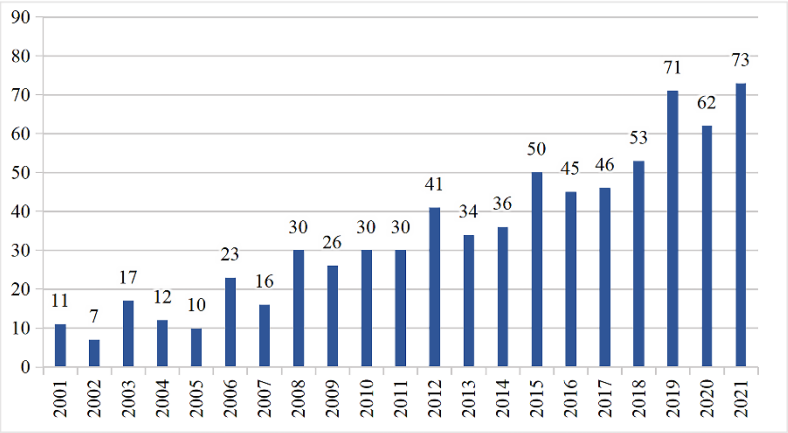

Figure 2. Annual Number of Published Articles (2001-2021)

3.1. Mapping and Analysis on Journals

The 726 retrieved articles and reviews on cognates were published in 243 journals, and the top 10 journals by publication volume is shown in Table 1. *Bilingualism: Language and Cognition* ranked the first in the number of published articles (61), followed by *Frontiers in Psychology* (24). The fact that studies on cognates have published in journals with these publication titles shows that the research of cognates is of interdisciplinary characteristics.

Table 1. Top 10 Journals by Publication Volume

Rank	The name of journals	Number	Percentage (%)
1	Bilingualism: Language and Cognition	61	8.40
2	Frontiers in Psychology	24	3.31
3	Indogermanische Forschungen	17	2.34
4	Oceanic Linguistics	17	2.34
5	Journal of Experimental Psychology: Learning, Memory, and Cognition	16	2.20
6	Language Learning	16	2.20
7	International Journal of Bilingualism	14	1.93
8	International Journal of American Linguistics	13	1.79
9	Linguistics	13	1.79
10	Brain and Language	11	1.52

3.2. Mapping and Analysis on Countries

The number of publications and citations is an important index in evaluating the influence of a country/region in the analyzed domain [55,62]. Based on the analysis of the authors' addresses listed in the retrieved data, it is found that the 726 publications in cognates originated from 54 countries and regions. Table 2 presents the top 10 countries/regions of cognate research. Among them, the USA ranked the first in the study of cognates, with the largest document collection (223) and the highest citation (5,887). Besides, European countries accounted for 60% in the top 10 countries/regions. Another important index for determining the influence is the citation per document [55]. Hence, it is noted that Australia, the USA, and Spain are the top three most influential countries, with 26.64, 26.4, and 26.4 citations per document respectively.

Table 2. The top 10 Countries/Regions in Cognate Research

Rank	Countries/ regions	Continent	Documents	Citations	Avg. pub. year	Avg. citations
1	USA	North America	223	5,887	2013.65	26.40
2	Netherlands	Europe	74	1,722	2013.14	23.27
3	Spain	Europe	60	1,584	2015.55	26.40
4	Canada	North America	57	1,489	2015.33	26.12

Table 2. (continued)

5	England	Europe	54	1,408	2014.83	26.07
6	Germany	Europe	45	547	2016.40	12.16
7	Belgium	Europe	40	927	2014.68	23.18
8	Australia	Oceania	39	1,039	2013.82	26.64
9	France	Europe	32	603	2015.53	18.84
10	China	Asia	22	486	2016.68	22.09

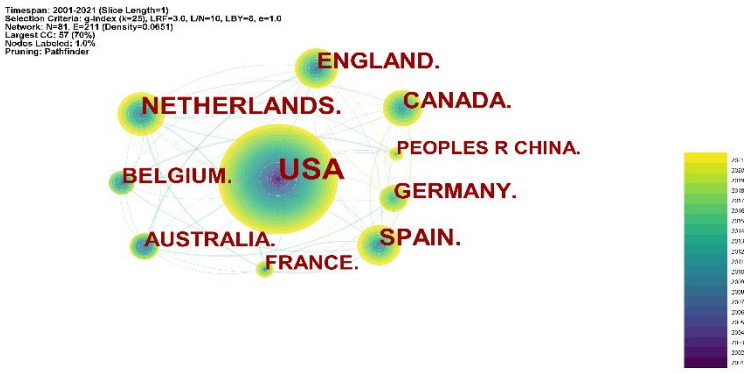

Figure 3. Collaboration Network of the Top 10 Countries/Regions

3.3. Mapping and Analysis on Research Disciplines

The disciplines (or categories) related to cognate study were analyzed by means of category analysis with CiteSpace. Figure 4 is the visualization of the distribution of disciplines (represented by the nodes) in this field. These nodes are formed by a group of cited references, and the bigger the node is, the larger the citation counts and occurrence frequency it has [55].

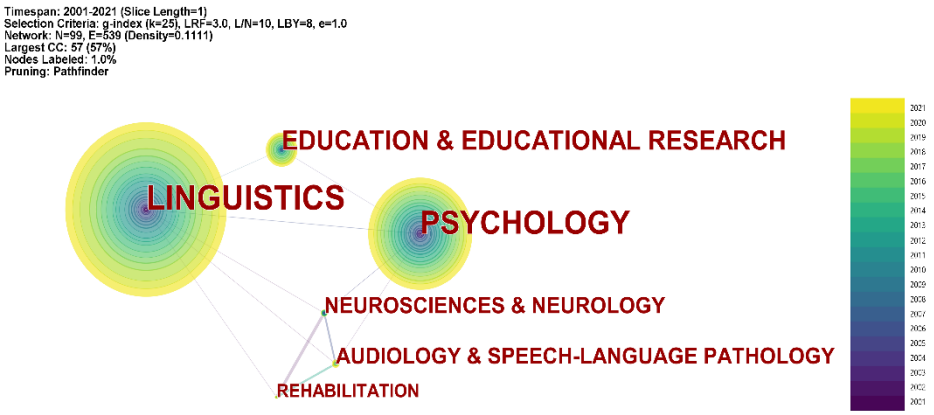

Figure 4. Disciplines incorporated in the research on cognates

The top three disciplines (or most cited categories) were linguistics [63,64], psychology [36,65], and education [66,67], with a citation counts of 475, 311, 118 respectively. Moreover, studies on cognates also attracted attention from researchers in audiology [12,68], neurosciences (or neurology) [69,70]. It is also noted that the lines between the node represent the co-citation links, confirming the interdisciplinary feature of cognate study. The yellow color of the citation rings, on the other hand, suggested that scholars had publications on cognate in recent years, especially in disciplines such as linguistics and psychology [27,71,72].

3.4. Mapping and Analysis on Critical References

Co-citation relationship is formed if two articles are cited together and direct citation links exist [55,73]. Figure 5 presents the co-citation network in the domain of cognates from 2001 to 2021. There are 497 nodes in this network, and the most cited articles in the knowledge domain of cognates can be identified in terms of its node size, representing the number of citations. The top 5 most cited articles in cognate studies are presented in Table 3.

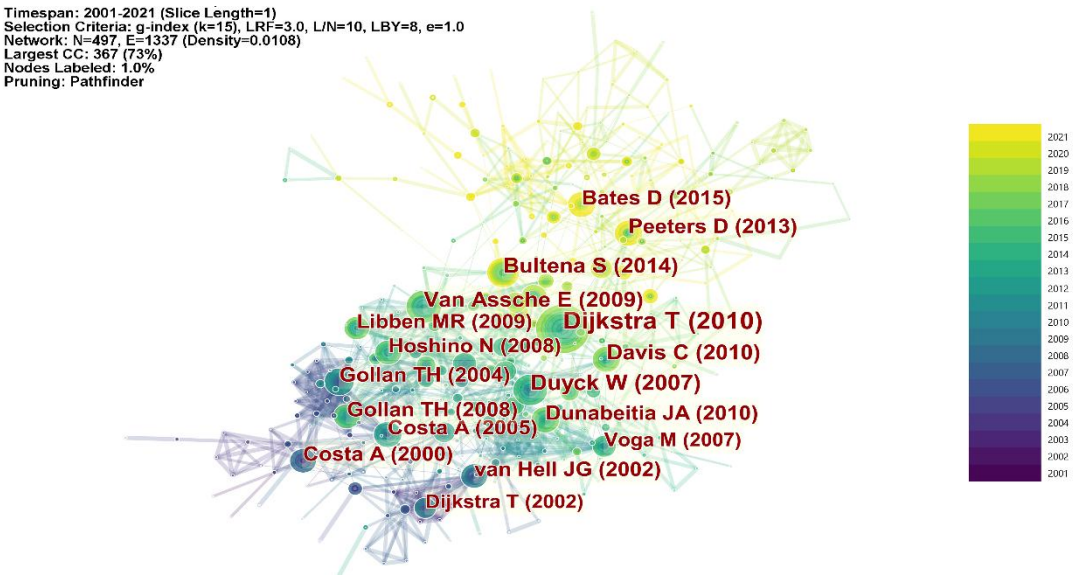

Figure 5. Key Articles in Cognates

Table 3. The Top Five Most Cited Articles in Cognates

Citation counts	Author(year)	Title	Journal
45	Dijkstra et al. (2010)	How cross-language similarity and task demands affect cognate recognition	Journal of Memory and Language
30	Duyck et al. (2007)	Visual word recognition by bilinguals in a sentence context: Evidence for nonselective lexical access	Journal of Experimental Psychology: Learning, Memory, and Cognition
29	Van Assche et al. (2009)	Does Bilingualism Change Native-Language Reading? Cognate Effects in a Sentence Context	Psychological Science
27	Bultena et al. (2014)	Cognate Effects in Sentence Context Depend on Word Class, L2 Proficiency, and Task	Quarterly Journal of Experimental Psychology
26	Davis et al. (2010)	Masked translation priming: Varying language experience and word type with Spanish-English bilinguals	Bilingualism: Language and Cognition

The article that has the highest cited frequency is published by Dijkstra and colleagues [74]. They found that a facilitation effect arose in English (L2) lexical decision, and that an inhibition effect was obtained in L1-L2 language decision task. In addition, no clear effect was found in progressive task, suggesting that cognate effects are task-dependent. The work of Duyck and colleagues [38] ranked the second. They examined language-independent lexical access by Dutch-English bilinguals with three experiments. The results of Experiment 1 and 2 showed that cognate facilitation effect existed in both isolated word recognition and sentence context in lexical decision task. Meanwhile, the results of eye-tracking of Experiment 3 confirmed the existence of the facilitation effect in natural reading task. The third paper reported backward influence of Dutch-English bilinguals' knowledge of English (L2) on their native language (Dutch) and found faster reading time for cognates when these bilinguals reading in their native language context [75]. Bultena and colleagues found that cognate facilitation effect was task dependent, and that nouns had larger cognate effects compared with verbs, and that bilinguals who were proficient in L2 (English) might reduce this facilitation effect [20]. Finally, the work of Davis and colleagues suggested that cognate priming effect has nothing to do with bilinguals' language experience, directions of masked translation, and word type [23]. In sum, these five articles examined the factors that influence the cognate effect and built the knowledge base of the research on cognates.

3.5. Co-citation Analysis: Interpretation of Clusters

In order to analyze the hotspots in the knowledge domain of cognates, the visualization methods are adopted to extract and generate the clusters in terms of the titles and abstracts of all collected literature [51,55]. Cluster is synthesized network of cited articles and identified by extracting noun phrases from the titles and abstracts [50]. By means of log-likelihood ratio (LLR) and latent semantic indexing (LSI) algorithms with CiteSpace, the 726 retrieved articles generated 125 clusters, with a modularity value of 0.781 and a mean silhouette value of 0.8762. LLR and LSI are tests that help determine the most representative labels for each cluster based on the analysis of the data [76]. A modularity Q value greater than 0.3 indicates that the co-citation clusters within a given field

have clearly defined and separated social structures, and silhouette value greater than 0.5 indicates that the clustering effects are reasonable, and the level of homogeneity within each cluster is relatively high [77].

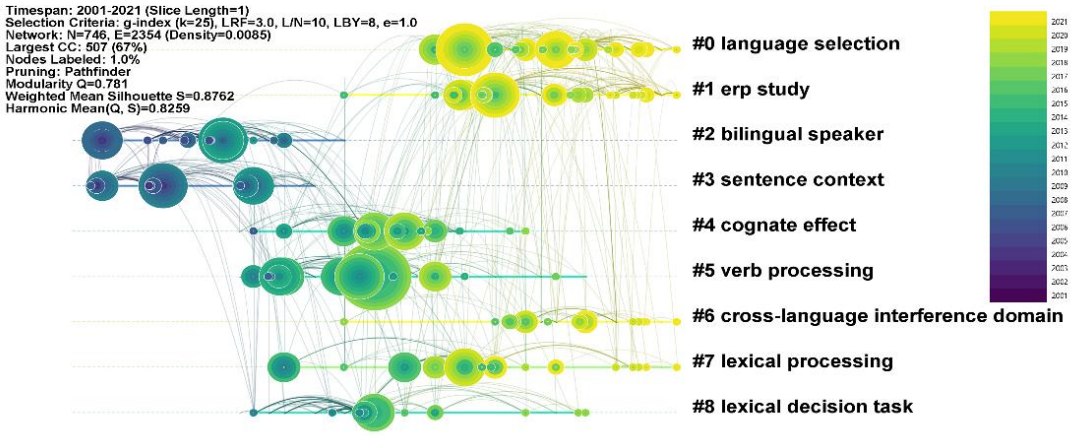

Figure 6. Timeline View of Cognate Research

Figure 6 illustrated the timeline view of the 9 main clusters in the research domain of cognates. The timeline visualizes the co-citation network, highlighting the evolution of research. In Figure 6, the color of the nodes from dark blue to yellow represents the evolution of topics over time [55], the colored curves depict co-citation links [51], and the vertical descending order is arranged in terms of the size of cluster [51]. Among these clusters, cluster #0 and cluster #1 have the emerging and appealing topics, which indicates the main focuses of cognate research at present.

The largest cluster contained 67 articles. It is labeled as language selection and has a silhouette value of 0.86. The five most cited articles are selected to analyze and the highest citer in this cluster was Duñabeitia and colleagues' [78]. The results of their study indicated that younger children were more sensitive to cognates than older ones, suggesting that cognate effect would diminish due to increased exposure to printed materials and mature language interference suppression mechanisms. Iniesta and colleagues found that late bilinguals' cognate selection would be affected more by cross-language phonological similarity and the unique task demand, and that variations in the role of phonological similarity and orthographic similarity in cognates selection could be modulated by these bilinguals' language background [37]. Sadat and colleagues found that Spanish-Catalan bilinguals' language switching costs in picture-naming task were primarily determined by the phonological similarity of cognates even though the frequency of cognates played a part in emergence of the bilingual switching cost [79]. Li and Gollan reported that cross-language phonological overlap might have influence on language selection at phonological and lexical levels [15]. In their follow-up study, Li and Gollan contended that default-language selection could be facilitated by cognates in switch and non-switch trials with or without sentence context [34].

The second cluster (#1), labeled as ERP study, has 64 articles and a silhouette value of 0.834. Related publications provided neural evidence on cognate processing. Peeters and colleagues found an N400 cognate facilitation effect in parietal regions and a late positivity (identified as P600 effect) for cognates. Frequency effect of cognates could account for the separable N400 effects with different duration and scalp distribution [26]. von Grebmer zu Wolfsthurn and colleagues disclosed that German low-proficient late learners of Spanish were less sensitive to cognate status but sensitive to syntactic violations (P600 effect). And cognate status did not modulate P600 effect, suggesting that inherent noun properties might not affect the neural mechanism of cognate processing [43]. von Grebmer zu Wolfsthurn and colleagues found a small but robust P300 effect on non-native cognate noun phrase (NP) production, offering implications for the conceptualization of non-native production mechanisms [80].

Cluster #2 is labeled as bilingual speaker and it included 52 articles and with a silhouette value of 0.945. The highly cited papers mainly focused on bilingual speakers' language switching performance. Costa and colleagues found that cognate status and age of L2 acquisition did not necessarily influence the control mechanism of highly proficient bilinguals in preventing interference from other languages, and these proficient bilinguals could resort to inhibitory control to perform the lexical selection [81]. Kroll and colleagues concluded that bilingual speakers' language-selective performance depended on factors such as the language background, task demand, and degree of activity of the non-target language [82]. Kroll and colleagues suggested that bilinguals would activate two languages in parallel and competition for selection also existed during speech production [65].

Cluster #3 is labeled as sentence context with silhouette value of 0.915. There are totally 46 papers in this cluster. Van Hell and de Groot revealed that sentences with a semantically high constraint restricted lexical access and modulated cross-language interactions in visual word recognition and translation [33]. Duyck and colleagues argued that cognate facilitation effects might be language independent and sentence context, together with other lexical variables, might influence bilinguals' cross-lingual lexical interactions in sentence embedded visual word recognition [38]. Schwartz and Kroll revealed that non-selectivity could be restricted by sentence context, and that less proficient bilinguals would resort to context to reduce competition in cross-language lexical interaction [83].

Cluster #4, labeled as cognate effect, contained 46 articles and has a silhouette value of 0.655. Bultena and colleagues found that cognate effect existed in Dutch-English bilinguals' responses to both verb and noun targets in lexical decision task while no effects of word ambiguity were observed in noun targets in the two experiments, suggesting that verb processing benefits more from cross-language overlap [12]. A reasonable explanation for this finding may be attributed to the complexity of verb representations. Verbs had smaller cognate effects, and that the cognate facilitation effect would reduce if native Dutch had higher proficiency in English and might rely on task demands [20]. Casaponsa and colleagues concluded that cognate effect could predict the reading comprehension achievement of low proficient bilinguals, and that cognitive and linguistic factors of cross-language lexical representations could lead to individual differences in task performance [84].

Other clusters, such as Cluster #5 (verb processing), Cluster #6 (cross-language interference domain), Cluster #7 (lexical processing), and Cluster #8 (lexical decision task) are also worthy to be mentioned. Cluster #5 and Cluster #7 mainly focused on lexical processing of cognates. Van Assche and colleagues explored verb processing by taking verb tense into account. The results of participants' performance in lexical decision task suggested that verb tense did not modulate verb cognate facilitation effect, and that the data of eye movement in Experiment 2 showed that verb facilitation effect was only found in later reading stage [40]. Starreveld and colleagues found that cognate effect, which was modulated by sentence context, occurred in two picture-naming experiments, suggesting the co-activation of two languages during word production [85]. Kootstra and colleagues argued that lexical repetition and presence of cognates would influence participants' tendency to switch and stronger lexical effects were found in Dutch-English bilinguals with a high proficiency in English [86]. Broersma and colleagues came to the conclusion that occurrence of cognates facilitated code-switching in speaking and that the facilitation would not occur if speakers did not produce cognates by analyzing the corpus of Welsh-English conversational speech [87]. The term label of Cluster #6 suggests that studies of cognates are in the research domain of cross-language interference. Different from the previous studies exploring participants' capacity to overcome L1 interference during L2 processing in same-script bilinguals, Prior and colleagues administered semantic similarity judgment task with false cognates and grammaticality judgement task to examine adult Arabic-Hebrew bilinguals' susceptibility to L1 interference. The results showed that L1 interference were significant both in the lexical and syntactic domains, and greater L2 proficiency of different-script bilinguals would reduce syntactic interference [88]. Cluster #8 is labeled as lexical decision task, which meant that this task was commonly used in the study of cognates. Non-cognate masked translation priming effects were tested using lexical decision tasks, and the results showed that asymmetric masked translation priming effects only existed in low proficient Greek-Spanish bilinguals [89]. In addition, masked translation priming effects were not modulated by intermediate L2 proficiency and emergence of symmetric effects required high level of L2 proficiency [90]. Lee and colleagues found that the effect L2-L1 non-cognate masked translation priming with a 150 ms stimulus onset asynchrony (SOA) was significant among low proficient Korean-English bilinguals in the lexical decision task [91].

In summary, topics represented in the clusters shows the research patterns and main forci of study efforts in the research domain of cognate processing. The interpretation of these clusters shows that recent studies mainly focus on the processing of cognates with the application of ERP technology.

3.6. Citation Burst

Citation burst is a computational technique employed to identify references that have garnered increased attention and to trace the evolution of study focus [51]. Adapted from Kleinberg's burst-detection algorithm [92], CiteSpace is used to identify the emergent research concepts of a certain field [77], thus revealing the ongoing research trends [56,93]. Table 4 displays the references on cognate word study in terms of the strength of their citation bursts. The year 2013 and 2021 respectively mark the beginning and end year of the burst within the time duration (2001-2021). Ten papers with the strongest citation bursts are selected to explore the research front in the knowledge domain of cognates.

The most emergent research concept is the role of cognates play in cross-language activation. The co-activation of representations in two languages contributes to the emergence of cognate effect [18]. Poarch and Van Hell performed five experiments to examine cross-language activation in children's speech production, and observed the existence of bidirectional and significant cognate facilitation effect, suggesting that evident co-activation of languages could be found in young L2 learners, bilinguals, and trilinguals. They also found that participants' varying levels of language proficiency allowed variance in cross-language activation [18]. Bultena and colleagues concluded that verbs had smaller cognate effects than nouns, and higher L2 proficiency reduced cognate facilitation, and that size of the effect might be different in particular task demand [20]. Kelley and Kohnert found that the 8- to 13-year-old Spanish-English bilinguals demonstrated a cognate advantage on processing expressive and receptive vocabulary in standardized vocabulary tests in spoken modality, and participants' age might lead to considerable within-group variation in cognate performance [14]. Van Assche and colleagues found that cognate facilitation effects yielded continuously because of the cross-lingual overlap between the two languages when Dutch-English bilinguals read both low and high constrained sentences in English, verifying the non-selective feature of the bilingual language system [30]. What is more, Comesaña and colleagues showed the role of stimuli list composition and found that cognate facilitation effects would vanish due to the reduction in cross-linguistic orthographic similarities when proficient and balanced native Catalan-speaking Spanish-language learners performed a lexical decision task [13].

Table 4. References with the Most Recent Citation Burst

References	Strength	Begin	End	Duration (2001-2021)
Poarch and Van Hell (2012)	4.59	2013	2021	
Bultena, Dijkstra, and Van Hell (2014)	5.71	2015	2021	
Peeters, Dijkstra, and Grainger (2013)	5.3	2015	2021	
Brenders, Van Hell, and Dijkstra (2011)	4.98	2015	2020	
Kelley and Kohnert (2012)	4.32	2015	2021	
Schepens, Dijkstra, and Grootjen (2012)	5.41	2017	2021	
Comesaña *et al*. (2015)	5.03	2017	2021	
Van Assche *et al*. (2011)	4.82	2017	2020	
Otwinowska and Szewczyk (2019)	4.29	2019	2021	
Dijkstra *et al*. (2018)	4.29	2019	2021	

The second category discusses the processing and representation of cognates. Peeters and colleagues provided empirical evidence on how identical cognates were processed by adult French-English bilinguals (mean age=22.3) in an English lexical decision task. Their study confirmed that identical cognates were processed faster and a larger cognate advantage existed in cognates with a low English frequency compared with those with a high English frequency. In addition, the electrophysiological data suggested that both cognate facilitation effect and frequency effect were found in the N400 time-window, and that P600 effect was also found in cognate processing. In light of the data collected, a two language-specific morphemic and phonological representation was proposed to account for cognate processing [26]. Brenders and colleagues found that cognates in an English lexical decision task were processed faster by fifth- and sixth-grade Dutch-English bilinguals but not in a Dutch lexical decision task, and that levels of language proficiency might influence participants' performance in resolving cognate ambiguity problems. Both the BIA+ model [2] and the RHM [95] would account for the processing of cognates [94].

The third direction in the research domain of cognate processing is to explore the selection, recognition, production, and acquisition of cognates. Schepens and colleagues offered the merits of applying the normalized Levenshtein distance function to the selection of cognates in six European languages, providing better stimulus materials for the study of cognates [96]. Dijkstra and colleagues integrated the basic assumptions of both BIA+ and RHM and built Multilink, a localist-connectionist computational model, to stimulate the recognition and production of cognates in varying tasks, providing a promising basis for word retrieval [4]. Otwinowska and Szewczyk discussed how the learnability of cognates, false cognates, and non-cognates was affected by cross-linguistic formal similarity, and proposed that the awareness of determining cross-linguistic overlap in meaning would modulate the acquisition of cognates [97].

In sum, the three research orientations identified from the citation burst offer noteworthy implications for future study on the effects, processing, representation, and acquisition of cognates.

4. Discussion

Generally, the annual numbers of articles published in the duration of data collection suggest a steady increase in the study of cognates and sustained interests from researchers over the past 20 years. The analysis of journals, along with the results of co-occurring category, shows that cognate study are of multidisciplinary characteristics, falling into the concerns of disciplines like linguistics, psychology, and education. Thus, both behavioral and neural evidence on cognates processing has been documented to uncover the language representation and processing mechanisms in multilingual individuals [24,26,28,80]. Three aspects of cognates, namely patterns of effect, influencing factors, and theory have been explored in the literature.

The timeline view of cognate research has revealed that "language selection", "effects" and "processing" are the three most popular topics within this filed. And they can be categorized under the broader themes of representation and processing of cognates. Cognates, due to their cross-linguistic similarity in meaning and form, have become ideal materials for studying bi/multilingual processing. Numerous studies on cognate processing have suggested that language processing in bilinguals is inherently language nonselective and languages known to a language user are co-activated [7,45]. Co-activation evokes cognate effect and the shared representation facilitates the recognition and comprehension of cognates in language-related tasks [19,21]. As illustrated in timeline visualization, the lexical decision task has been widely used in the study of language processing, which is a valuable tool in the investigation of cognate effect in lexical access.

Cognate effect can be bidirectional [18] and the size of it is modulated by factors at word, task, and participant levels [7]. To wit, the degree of cross-similarity and frequency between cognates [26,74], the requirements of the specific language task [20], and individual factors such as AoA and level of proficiency in the languages involved can influences the size of the effect [10,94]. BIA+ model [2] and Muiltilink model [4] are theoretical models that provide explanation for cognate processing.

Although cognates have been extensively investigated, mixed results suggest that there are inconclusive consensus among researchers, and the following limitations should be noticed.

Firstly, the results of country analysis indicated that the majority of studies has primarily focused on cognate pairs of similar spelling systems [23,26,38,87], and investigations involving different-script languages are relatively limited [91]. This will bring into question the generalizability and of findings and models related to cognates since some studies suggests that writing can be a influencing factor [17].

Secondly, the cluster shows that bilingual speakers continue to be the primary focus of cognate studies, and the scope of participants remains relatively limited. Including participant of different language backgrounds (i.e., bilingual, trilingual, multilingual) and varying proficiency levels (high or low) is necessary for exploring the university or language-specific nature of cognate processing [18,98].

Thirdly, most previous research on cognates has primarily focused on adults, with limited studies specifically examining children's processing of cognates [18,78]. Therefore, there is limited knowledge regarding the impact of cross-language similarity on lexical acquisition in children and the developmental trajectory of cognate effects remains an area that requires further exploration [24].

Furthermore, most previous research on cognates has primarily focused on visual word recognition, with less on auditory modality [12]. The BIA+ model incorporates orthographic, phonological, and semantic information to simulate how bilingual individuals process words [2]. However, inhibitory effect founded in cognate processing suggests that the effect can be modality-dependent [99].

5. Conclusion

With the adoption of a bibliometric approach, this study has visually outlined the research domain of cognates. Cognates constitutes an important part in lexical processing. Although cognate effect has proved to be a robust experimental phenomenon, it is influenced by diverse variables. In future study, researchers should be more careful in choosing cognate pairs relevant to their specific research questions, especially in the assessment of cross-similarity of cognates. In addition to subjective rating with Likert scales, they can use Levenshtein Distance to assess the orthographic and phonological similarity between word pairs by taking into account of word frequency [13,96]. Different types of words (e.g., cognates, homographs, translation equivalents) can be included in the stimulus lists to disentangle cognate effect [29]. A longitudinal study on the developmental trajectory of cognate processing is necessary since it will offer valuable insights into how the recognition and processing of cognates evolve over time as individuals acquire and develop proficiency in multiple languages. Neural mechanisms underlying cognate word processing can be examined with the combination of ERPs and fMRI technique by considering participants' cognitive ability. Furthermore, Furthermore, it is important to utilize the findings of relevant experiments to guide the cultivation of awareness of cross-linguistic similarity, with the ultimate goal of facilitating cognate acquisition [97].

This study has its limitations. First, the data in this study is only retrieved in WoS and it may not cover the publications in this knowledge domain. The combination of other influential literature database, such as Scopus, might provide a more holistic picture of cognates studies. Second, although CiteSpace is proper enough to visualize the knowledge domain of research on cognate words, tools such as CiteSpace, VOSviewer and Bibliometrix could be employed in combination to serve the purpose of having a more objective bibliometric analysis.

Funding

This study was supported by the First-Class Disciplines Project of Beijing Foreign Studies University (2022SYLZD008).

References

[1] Jiang, N. (2015). Six decades of research on lexical representation and processing in bilinguals. In J Schwieter (Ed.), *The Cambridge Handbook of Bilingual Processing* (pp. 29-84). Cambridge: Cambridge University Press. doi:10.1017/CBO9781107447257.002

[2] Kroll, J. F., & Tokowicz, N. (2005). Models of Bilingual Representation and Processing: Looking Back and to the Future. In J. F. Kroll, & A. M. B. de Groot (Eds.), *Handbook of Bilingualism: Psycholinguistic Approaches* (pp. 531-553). New York: Oxford University Press.

[3] Dijkstra, T., & Van Heuven, W. J. B. (2002) The architecture of the bilingual word recognition system: From identification to decision. *Bilingualism: Language and Cognition*, 5(3): 175-197. doi: 10.1017/s1366728902003012

[4] Dijkstra, T., Wahl, A., Buytenhuijs, F., Van Halem, N., Al-Jibouri, Z., De Korte, M., & Rekké, S. (2019) Multilink: a computational model for bilingual word recognition and word translation. *Bilingualism: Language and Cognition*, 22(4): 657-679. doi:10.1017/S1366728918000287

[5] Ferré, P., Sánchez-Casas, R., Comesaña, M., & Demestre, J. (2017). Masked translation priming with cognates and noncognates: Is there an effect of words' concreteness? *Bilingualism: Language and Cognition*, 20(4): 770-782. doi:10.1017/s1366728916000262

[6] Francis, W. S. (2005). Bilingual semantic and conceptual representation. In J. F. Kroll, & A. M. B. de Groot (Eds.), *Handbook of bilingualism: Psycholinguistic approaches* (pp. 251-267). New York: Oxford University Press.

[7] Lijewska, A. (2020). Cognate Processing Effects in Bilingual Lexical Access. In R Heredia & A Cieślicka (Eds.), *Bilingual Lexical Ambiguity Resolution* (pp. 71-95). Cambridge: Cambridge University Press. doi:10.1017/9781316535967.005

[8] Szubko-Sitarek, W. (2015). Multilingual lexical recognition in the mental lexicon of third language users. Heidelberg, Germany: Springer.

[9] Lauro, J., & Schwartz, A. I. (2017). Bilingual non-selective lexical access in sentence contexts: A meta-analytic review. Journal of Memory and Language, 92: 217-233. doi:10.1016/j.jml.2016.06.010
[10] Sudarshan, A., & Baum, S. (2019). Bilingual lexical access: A dynamic operation modulated by word-status and individual differences in inhibitory control. *Bilingualism: Language and Cognition*, 22(3): 537-554. doi:10.1017/S1366728918000111
[11] Arana, S., Oliveira, H., Fernandes, A., Soares, A., & Comesaña, M. (2022). The cognate facilitation effect depends on the presence of identical cognates. *Bilingualism: Language and Cognition*, 25(4): 660-678. doi:10.1017/S1366728922000062
[12] Bultena, S., Dijkstra, T., & Van Hell, J. G. (2013). Cognate and word class ambiguity effects in noun and verb processing. *Language and Cognitive Processes*, 28(9): 1350-1377. doi:10.1080/ 01690965.2012.718353
[13] Comesaña, M., Ferré, P., Romero, J., Guasch, M., Soares, A. P., García-Chico, T. (2015). Facilitative effect of cognate words vanishes when reducing the orthographic overlap: The role of stimuli list composition. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 41(3): 614-635. doi:10.1037/xlm0000065
[14] Kelley, A., & Kohnert, K. (2012). Is There a Cognate Advantage for Typically Developing Spanish-Speaking English-Language Learners? *Language Speech and Hearing Services in Schools*, 43(2): 191-204. doi:10.1044/0161-1461(2011/10-0022)
[15] Li, C., & Gollan, T. H. (2018). Cognates facilitate switches and then confusion: Contrasting effects of cascade versus feedback on language selection. *Journal of Experimental Psychology Learning*, 44(6): 974-991. doi: 10.1037/xlm0000497
[16] Nakayama, M., Verdonschot, R. G., Sears, C. R., & Lupker, S. J. (2014). The masked cognate translation priming effect for different-script bilinguals is modulated by the phonological similarity of cognate words: Further support for the phonological account. *Journal of Cognitive Psychology*, 26(7): 714–724. doi:10.1080/20445911.2014.953167
[17] Zhang, J., Wu, C., Zhou, T., & Meng, Y. (2019). Cognate facilitation priming effect is modulated by writing system: Evidence from Chinese-English bilinguals. *International Journal of Bilingualism*, 23(2): 553-566.. doi:10.1177/1367006917749062
[18] Poarch, G. J., & Van Hell, J. G. (2012). Cross-language activation in children's speech production: Evidence from second language learners, bilinguals, and trilinguals. *Journal of Experimental Child Psychology*, 111(3): 419-438. doi:10.1016/j.jecp.2011.09.008
[19] Andras F., Rivera, M., Bajo, T., Dussias, P. E., & Paolieri, D. (2022). Cognate facilitation effect during auditory comprehension of a second language: A visual world eye-tracking study. *International Journal of Bilingualism*, 26(4): 405-425. doi: 10.1177/ 13670069211033359
[20] Bultena, S, Dijkstra T, & Van Hell, J. G. (2014). Cognate Effects in Sentence Context Depend on Word Class, L2 Proficiency, and Task. *Quarterly Journal of Experimental Psychology*, 67(6): 1214-1241. doi:10.1080/17470218.2013.853090
[21] Poort, E. D., & Rodd, J. M. (2017). The cognate facilitation effect in bilingual lexical decision is influenced by stimulus list composition. *Acta psychologica*, 180: 52-63. doi: 10.1016/j.actpsy.2017.08.008
[22] Rosselli, M., Ardila, A., Jurado, M. B., & Salvatierra, J. L. (2014). Cognate facilitation effect in balanced and non-balanced Spanish–English bilinguals using the Boston Naming Test. *International Journal of Bilingualism*, 18(6): 649-662. doi: 10.1177/ 1367006912466313
[23] Davis, C., Sánchez-Casas, R., García-Albea, J. E., Guasch, M., Molero, M., & Ferré, P. (2010). Masked translation priming: Varying language experience and word type with Spanish-English bilinguals. *Bilingualism: Language and Cognition*, 13(2): 137-155. doi:10. 1017/S1366728909990393
[24] Bosma, E., & Nota, N. (2020). Cognate facilitation in Frisian–Dutch bilingual children's sentence reading: An eye-tracking study. *Journal of Experimental Child Psychology*, 189, 104699. doi:10.1016/j.jecp.2019.104699
[25] Cop, U., Dirix, N., Van Assche, E., Drieghe, D., & Duyck, W. (2017). Reading a book in one or two languages? An eye movement study of cognate facilitation in L1 and L2 reading. *Bilingualism: Language and Cognition*, 20(4): 747-769. doi:10.1017/S1366728916000213
[26] Peeters, D., Dijkstra, T., & Grainger, J. (2013). The representation and processing of identical cognates by late bilinguals: RT and ERP effects. *Journal of Memory and Language*, 68(4): 315-332. doi:10.1016/j.jml.2012.12.003
[27] Xiong, K. X., Verdonschot, R. G., & Tamaoka, K. (2020). The time course of brain activity in reading identical cognates: An ERP study of Chinese-Japanese bilinguals. *Journal of Neurolinguistics*, 55: 100911. doi:10.1016/j.jneuroling.2020.100911
[28] Hsieh, M.-C., Jeong, H., Sugiura, M., & Kawashima, R. (2021). Neural Evidence of Language Membership Control in Bilingual Word Recognition: An fMRI Study of Cognate Processing in Chinese-Japanese Bilinguals. *Frontiers in Psychology*, 12: 643211. doi: 10.3389/ fpsyg. 2021.643211
[29] Dijkstra, T., Peeters, D., Hieselaar, W., & Van Geffen, A. (2022). Orthographic and semantic priming effects in neighbour cognates: Experiments and simulations. *Bilingualism: Language and Cognition*, 26(2): 371-383. doi:10.1017/S1366728922000591
[30] Van Assche, E., Drieghe, D., Duyck, W., Welvaert, M., & Hartsuiker, R. J. (2011). The influence of semantic constraints on bilingual word recognition during sentence reading. *Journal of Memory and Language*, 64(1): 88-107. doi:10.1016/j.jml.2010.08.006
[31] Colomé, À., & Miozzo, M. (2010). Which words are activated during bilingual word production? *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 36(1): 96-109. doi: 10.1037/a0017677
[32] Lijewska, A., & Chmiel, A. (2015). Cognate facilitation in sentence context - translation production by interpreting trainees and non-interpreting trilinguals. *International Journal of Multilingualism*, 12(3): 358-375. doi: 10.1080/14790718.2014.959961
[33] Van Hell, J. G., & De Groot, A. M. B. (2008). Sentence context modulates visual word recognition and translation in bilinguals. *Acta Psychologica*, 128(3): 431-451. doi:10.1016/j.actpsy. 2008.03.010
[34] Li, C., & Gollan, T. H. (2021). What cognates reveal about default language selection in bilingual sentence production. *Journal of Memory and Language*, 118: 104214. doi: 10.1016/j.jml. 2020.104214
[35] Dijkstra, T., Van Hell, J. G., & Brenders, P. (2015). Sentence context effects in bilingual word recognition: Cognate status, sentence language, and semantic constraint. *Bilingualism: Language and Cognition*, 18: 597-613. doi: 10.1017/S1366728914000388
[36] Van Hell, J. G., & Dijkstra, T. (2002). Foreign language knowledge can influence native language performance in exclusively native contexts. *Psychonomic Bulletin and Review*, 9(4): 780-789. doi: 10.3758/BF03196335
[37] Iniesta, A., Rossi, E., Bajo, M. T., & Paolieri, D. (2021). The Influence of Cross-Linguistic Similarity and Language Background on Writing to Dictation. *Frontiers in Psychology*, 12: 679956. doi: 10.3389/fpsyg.2021.679956
[38] Duyck, W., Van Assche, E., Drieghe, D., & Hartsuiker, R. J. (2007). Visual word recognition by bilinguals in a sentence context: Evidence for nonselective lexical access. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 33(4): 663-679. doi: 10.1037/0278-7393.33.4.663

[39] Libben, M. R., & Titone, D. A. (2009). Bilingual lexical access in context: Evidence from eye movements during reading. *Journal of Experimental Psychology: Learning, Memory, and Cognitio*n, 35(2): 381-390. doi: 10.1037/a0014875

[40] Van Assche, E., Duyck, W., & Brysbaert, M. (2013) .Verb processing by bilinguals in sentence context. *Studies in Second Language Acquisition*, 35(2): 237-259. doi:10.1017/s0272263 112000873

[41] Vanlangendonck, F., Peeters, D., Rueschemeyer, S., & Dijkstra, T. (2020). Mixing the stimulus list in bilingual lexical decision turns cognate facilitation effects into mirrored inhibition effects. *Bilingualism: Language and Cognition*, 23(4), 836-844. doi:10.1017/S1366728919000531

[42] Zhu, Y., & Mok, P. P. K. (2020). Visual recognition of cognates and interlingual homographs in two non-native languages: Evidence from Asian adult trilinguals. *Linguistic Approaches to Bilingualism*, 10(4): 441-470. doi: 10.1075/lab.17049.zhu

[43] von Grebmer zu Wolfsthurn, S., Robles, L. P., & Schiller, N. O. (2021a). Cross-linguistic interference in late language learners: An ERP study. *Brain and Language*, 221(6): 104993. doi:10.1016/j.bandl.2021.104993

[44] White, E. J., Titone, D., Genesee, F., Steinhauer, K. (2017). Phonological processing in late second language learners: The effects of proficiency and task. *Bilingualism: Language and Cognition*, 20(1): 162-183. doi:10.1017/S1366728915000620

[45] Lauro, J., & Schwartz, A. I. (2018). Cognate effects on anaphor processing. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 44(9): 1-17. doi: 10.1037/xlm 0000601

[46] Squires, L. R., Ohlfest, S. J., Santoro, K. E., & Roberts, J. L. (2020). Factors Influencing Cognate Performance for Young Multilingual Children's Vocabulary: A Research Synthesis. *American Journal of Speech-Language Pathology*, 29(4): 2170-2188. doi: 10.1044/2020_AJSLP-19-00167

[47] Sinatra, R., Deville, P., Szell, M., Wang, D., & Baraabási, A. (2015). A century of physics. *Nature Physics*, 11, 791–796. doi: 10.1038/nphys3494

[48] Shafique, M. (2013). Thinking inside the box? Intellectual structure of the knowledge base of innovation research (1988–2008). *Strategic Management Journal*, 34(1): 62-93. doi: 10.1002/smj.2002

[49] Cui, Y., Mou, J., & Liu, Y. (2018). Knowledge mapping of social commerce research: a visual analysis using CiteSpace. *Electronic Commerce Research*, 18: 837-868. doi:10.1007/s10660-018-9288-9

[50] Fu, Y., Wang, H., Guo, H., & Bermúdez-Margaretto, B., & Domínguez Martínez, A. (2020). What, Where, When and How of Visual Word Recognition: A Bibliometrics Review. *Language and Speech*, 002383092097471. doi:10.1177/0023830920974710

[51] Chen, C. M. (2017). Science mapping: A systematic review of the literature. *Journal of Data and Information Science*, 2(2): 1-40. doi: 10.1515/jdis-2017-0006

[52] Yu, H. Y., Zhi, Z. Z., Zhang, C. X., & Yang, H. Z. (2017). Research on literature involving zirconia-based on Pubmed database: a bibliometric analysis. *Current Science*, 112: 1134-1137. doi: 10.18520/cs/v112/i06/1134-1137

[53] Yang, W. C., Wang, S. F., Chen, C., Leung, H. H., Zeng, Q., & Su, X. (2022). Knowledge Mapping of Enterprise Network Research in China: A Visual Analysis Using CiteSpace. *Frontiers in Psychology*, 13: 898538. doi: 10.3389/fpsyg.2022.898538

[54] Jiang, J. X., & Fan, L. (2022). Visualizing the Knowledge Domain of Language Experience: A Bibliometric Analysis. *SAGE Open*, 1-17. doi:10.1177/21582440211067252

[55] Li, J., & Liu, J. H. (2020). Science Mapping of Tunnel Fires: A Scientometric Analysis-Based Study. *Fire Technology*, 56: 2111-2135. doi: 10.1007/s10694-020-00969-z

[56] Wang, H. L., Yan, X. L., & Guo, H. N. (2018). Visualizing the knowledge domain of embodied language cognition: A bibliometric review. *Digital Scholarship in the Humanities*, 34(1): 21-31. doi:10.1093/llc/fqy010

[57] Chen, C. M. (2006). CiteSpace II: detecting and visualizing emerging trends and transient patterns in scientific literature. *Journal of the American Society for Information Science and Technology*, 57(3): 359-77. doi:10.1002/asi.20317

[58] Singh, V. K., Sigh, P., Karmakar, M., Leta, J., & Mayr, P. (2021) The journal coverage of web of science, Scopus and dimensions: a comparative analysis. *Scientometrics*, 126: 5113-5142. doi: 10.1007/s11192-021-03948-5

[59] Danvila-del-Valle, I., Este´vez-Mendoza, C., & Lara, F. J. (2019). Human resources training: a bibliometric analysis. *Journal of Business Research*, 101: 627-636. doi: 10.1016/j.jbusres. 2019.02.026

[60] Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T. J., Loder, E. W., Mayo-Wilson, E., McDonald, S., McGuinness, L. A., Stewart, L. A., Thomas, J., Tricco, A. C., Welch, V. A., Whiting, P., & Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *Systematic Reviews*, 10(89): 1-11. doi: 10.1136/bmj.n71

[61] Van Nunen, K., Li, J., Reniers, G., & Ponnet, K. (2018). Bibliometric analysis of safety culture research. *Safety science*, 188: 248-258. doi: 10.1016/j.ssci.2017.08.011

[62] Dzikowski, P. (2018). A bibliometric analysis of born global firms. *Journal of Business Research*, 85: 281-294. doi: 10.1016/j.jbusres.2017.12.054

[63] Costa, A., Santesteban, M., & Caño, A. (2005). On the facilitatory effects of cognate words in bilingual speech production. *Brain and Language*, 94(1): 94-103. doi:10.1016/j.bandl. 2004.12.002

[64] Gollan, T. H., Fennema-Notestine, C., Montoya, R. I., & Jernigan, T. L. (2007). The bilingual effect on Boston Naming Test performance. *Journal of the International Neuropsychological Society*, 13(2): 197-208. doi:10.1017/S1355617707070038

[65] Kroll, J. F., Bobb, S. C., Misra. M., & Guo, T. M. (2008). Language selection in bilingual speech: Evidence for inhibitory processes. *Acta Psychologica*, 128(3): 416-430. doi:10.1016/j.actpsy. 2008.02.001

[66] Carlo, M. S., August, D., Mclaughlin, B., Snow, C. E., Dressler, C., Lippman, D. N., Lively, T. J., & White, C. E. (2004). Closing the gap: Addressing the vocabulary needs of English- language learners in bilingual and mainstream classrooms. *Reading Research Quarterly*, 39(2): 188-215. doi: 10.1598/rrq.39.2.3

[67] Sampayo-Vargas, S., Cope, C. J., He, Z., & Byrne, G. J. (2013). The effectiveness of adaptive difficulty adjustments on students' motivation and learning in an educational computer game. *Computers and Education*, 69: 452-462. doi:10.1016/j.compedu.2013.07.004

[68] Whiteside, S. P., & Marshall, J. (2001). Developmental Trends in Voice Onset Time: Some Evidence for Sex Differences. *Phonetica*, 58(3): 196-210. doi:10.1159/000056199

[69] Goral, M., Levy, E. S., Obler, L. K., Cohen, E. (2006). Cross-language lexical connections in the mental lexicon: Evidence from a case of trilingual aphasia. *Brain and Language*, 98(2): 235-247. doi:10.1016/j.bandl.2006.05.004

[70] Gräber, S., Hertrich, I., Daum, I., Spieker, S., & Ackermann, H. (2002). Speech perception deficits in Parkinson's disease: underestimation of time intervals compromises identification of durational phonetic contrasts. *Brain and Language*, 82(1): 65-74. doi:10. 1016/s0093- 934x(02)00002-0

[71] Antúnez, M., Mancini, S., Hernández-Cabrera, J. A., Hoversten, L. J., Barber, H. A., & Carreiras, M. (2021). Cross-linguistic semantic preview benefit in Basque-Spanish bilingual readers: Evidence from fixation-related potentials. *Brain and Language*, 214: 104905. doi: 10.1016/j.bandl.2020.104905

[72] Hameau, S., Biedermann, B., & Nickels, L. (2021). Lexical activation in late bilinguals: effects of phonological neighbourhood on spoken word production. *Language, Cognition and Neuroscience*, 36(4): 517-534. doi:10.1080/23273798.2020.1863438

[73] Small, H. (1973). Co-citation in the scientific literature: A new measure of the relationship between two documents. *Journal of the American Society for Information Science*, 24(4): 265-269. doi: 10.1002/asi.4630240406

[74] Dijkstra, T., Miwa, K.., Brummelhuis, B., Sappelli, M., & Baayen, H. (2010). How cross-language similarity and task demands affect cognate recognition. *Journal of Memory and Language*, 62(3): 284-301. doi:10.1016/j.jml.2009.12.003

[75] Van Assche, E., Duyck, W., Hartsuiker, R. J., & Diependaele, K. (2009). Does bilingualism change native-language reading? Cognate effects in a sentence context. *Psychological Science*, 20(8): 923-927. doi: 10.1111/j.1467-9280.2009.02389.x

[76] Chen, C. M., Hu, Z., Liu, S., Tseng, H. (2012). Emerging trends in regenerative medicine: A scientometric analysis in CiteSpace. *Expert Opinion on Biological Therapy*, 12: 593–608. doi: 10.1517/14712598.2012.674507

[77] Chen, C. M. (2016). CiteSpace: A practical guide for mapping scientific literature. New York: Nova Science.

[78] Duñabeitia, J. A., Ivaz, L., & Casaponsa, A. (2016). Developmental changes associated with cross-language similarity in bilingual children. *Journal of Cognitive Psychology*, 28(1): 16-31. doi: 10.1080/20445911.2015.1086773

[79] Sadat, J., Martin, C. D., Magnuson, J. S., Alario, F., & Costa, A. (2015). Breaking Down the Bilingual Cost in Speech Production. *Cognitive Science*, 40: 1911-1940. doi: 10.1111/cogs. 12315

[80] von Grebmer zu Wolfsthurn, S., Robles, L. P., Schiller, N. O. (2021b). Noun-phrase production as a window to language selection: An ERP study. *Neuropsychologia*, 162(6): 108055. doi:10. 1016/j.neuropsychologia.2021.108055

[81] Costa, A., Santesteban, M., & Ivanova, I. (2006). How do highly proficient bilinguals control their lexicalization process? Inhibitory and language-specific selection mechanisms are both functional. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 32(5): 1057-1074. doi:10.1037/0278-7393.32.5.1057

[82] Kroll, J. F., Bobb, S. C., & Wodniecka, Z. (2006). Language selectivity is the exception, not the rule: Arguments against a fixed locus of language selection in bilingual speech. *Bilingualism: Language and Cognition*, 9(2): 119-135. doi:10.1017/s1366728906002483

[83] Schwartz, A. I., & Kroll, J. F. (2006). Bilingual lexical activation in sentence context. *Journal of Memory and Language*, 55(2): 197-212. doi:10.1016/j.jml.2006.03.004

[84] Casaponsa, A., Antón, E., Pérez, A., Duñabeitia, J. A. (2015). Foreign language comprehension achievement: insights from the cognate facilitation effect. *Frontiers in Psychology*, 6: 588. doi: 10.3389/fpsyg.2015.00588

[85] Starreveld, P. A., De Groot, A. M. B., Rossmark, B. M. M., & Van Hell, J. G. (2014). Parallel language activation during word processing in bilinguals: Evidence from word production in sentence context. *Bilingualism: Language and Cognition*, 17(2): 258-276. doi:10.1017/s1366 728913000308

[86] Kootstra, G. J., Van Hell, J. G., & Dijkstra, T. (2012). Priming of code-switches in sentences: The role of lexical repetition, cognates, and language proficiency. *Bilingualism: Language and Cognition*, 15(4): 797-819. doi:10.1017/s136672891100068x

[87] Broersma, M., Carter, D., Donnelly, K., & Konopka, A. (2019). Triggered codeswitching: Lexical processing and conversational dynamics. *Bilingualism: Language and Cognition*, 23(2): 1-14. doi:10.1017/s1366728919000014

[88] Prior, A., Degani, T., Awawdy, S., Yassin, R., & Korem, N. (2017). Is susceptibility to cross-language interference domain specific? *Cognition*, 165: 10-25. doi:10.1016/j.cognition. 2017.04.006

[89] Dimitropoulou, M., Duñabeitia, J. A., & Carreiras, M. (2010) Masked translation priming effects with low proficient bilinguals. *Memory and Cognition*, 39(2): 260-275. doi:10.3758/s13421-010-0004-9

[90] Dimitropoulou, M., Duñabeitia, J. A., & Carreiras, M. (2011). Two Words, One Meaning: Evidence of Automatic Co-Activation of Translation Equivalents. *Frontiers in Psychology*, 2: 1-12. doi:10.3389/fpsyg.2011.00188

[91] Lee, Y., Jang, E., & Choi, W. (2018). L2-L1 Translation Priming Effects in a Lexical Decision Task: Evidence From Low Proficient Korean-English Bilinguals. *Frontiers in Psychology*, 9: 267. doi:10.3389/fpsyg.2018.00267

[92] Kleinberg, J. (2002). *Bursty and hierarchical structure in streams*. Proceedings of the 8th ACM SIGKDD Conference on Knowledge Discovery and Data Mining. Edmonton, Alberta, Canada: ACM Press.

[93] Guo, H. (2017). Measurement of Emerging Research Field Identification: Theory, Indicators and Examples. Beijing: Science Press.

[94] Brenders, P., Van Hell, J. G., & Dijkstra, T. (2011). Word recognition in child second language learners: Evidence from cognates and false friends. *Journal of Experimental Child Psychology*, 109(4): 385-396. doi:10.1016/j.jecp.2011.03.012

[95] Kroll J. F., & Stewart, E. (1994). Category interference in translation and picture naming: Evidence for asymmetric connections between bilingual memory representations. *Journal of Memory and Language*, 33: 149-174. doi: 10.1006/jmla.1994.1008

[96] Schepens, J., Dijkstra, T., & Grootjen, F. (2012). Distributions of cognates in Europe as based on Levenshtein distance. *Bilingualism: Language and Cognition*, 15(1): 157-166. doi:10.1017/ S1366728910000623

[97] Otwinowska, A., & Szewczyk, J. M. (2019). The more similar the better? Factors in learning cognates, false cognates and non-cognate words. *International Journal of Bilingual Education and Bilingualism*, 22(8): 974-991. doi: 10.1080/13670050.2017.1325834

[98] Lemhöfer, K., & Dijkstra, T. (2004). Recognizing cognates and interlingual homographs: Effects of code similarity in language-specific and generalized lexical decision. Memory & Cognition, 32(4), 533–550. doi:10.3758/bf03195845

[99] Cornut, C., Mahé, G., & Casalis, S. (2022). L2 word recognition in French–English late bilinguals: Does modality matter? *Bilingualism: Language and Cognition*, 25(1): 121-136. doi:10.1017/S1366728921000511