The Landscape of Vocabulary Acquisition Research: A Psycholinguistic Exploration through Citation Metrics*

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ABSTRACT

Goal. This study undertakes a comprehensive synthesis of vocabulary acquisition research through the lens of psycholinguistics. A targeted analysis was conducted on articles published in four premier psycholinguistic journals indexed in Scopus: Applied Psycholinguistics, Journal of Psycholinguistic Research, Psycholinguistics Journal, and East European Journal of Psycholinguistics.

Methods. Utilizing the Dimensions database, we scrutinized the abstracts of 2,001 articles spanning the period from 1971 to 2022. Our analysis centered on emerging research themes and employed various citation metrics.

Results. Our findings identified several prominent clusters of research themes, including the challenges of reading comprehension, the verbal behaviors exhibited by learners during vocabulary acquisition, the cognitive awareness of morphological functions in acquired vocabulary, and the neuropsychological mechanisms underpinning bilingual language production and comprehension. Notably, the Spanish language emerged as the most frequently studied target language across the selected journals.
In terms of academic influence, our analysis revealed that, apart from one of the targeted journals serving as a leading co-cited source, other major co-cited journals predominantly belonged to the fields of neurolinguistics and psychology. The article concludes by proposing multiple avenues for future research in this dynamic and interdisciplinary domain.

Key words: vocabulary acquisition, psycholinguistics, citations, clusters

Introduction

Vocabulary learning plays a pivotal role in psycholinguistics research due to its significance in language recognition and production. The study of vocabulary acquisition is a critical focus in psycholinguistic research for multiple compelling reasons. Firstly, vocabulary acquisition is intrinsically linked with working memory functions, as delineated by Kim (2017), emphasizing the relevance of other linguistic and cognitive faculties in the acquisition process. Secondly, the role of contextual cues and the frequency of word exposures are particularly important variables in vocabulary acquisition, especially among learners of English as a Foreign Language (EFL) as elucidated by Bao (2015). Thirdly, naturalistic settings, such as incidental learning from overhearing, present a fertile ground for understanding the nuances of vocabulary development. This third aspect is substantiated by Kimbrough Oller (2010), who highlights the significance of informal learning environments in vocabulary acquisition. Therefore, the intricate interplay of cognitive resources, contextual factors, and naturalistic settings make vocabulary acquisition a multi-faceted area deserving of comprehensive scientific investigation.

Research shows vocabulary size correlates strongly with reading, listening, and academic achievement (Qian, 2002; Stæhr, 2008), highlighting the need to understand efficient acquisition. The depth and quality of word knowledge affects retention and usage (Henriksen, 1999). Lexical processing skills enable accurate and rapid word access critical for proficiency (Perfetti, 2007). Vocabulary acquisition requires forming links between form and meaning, and psycholinguistic studies analyze the semantic activation and mapping processes involved (Borovsky et al., 2016). Multi-modal sensory input improves learning outcomes and theories examine optimal
input conditions (Ellis et al., 2016). Psycholinguistic research also investigates the cognitive processes like working memory and long-term memory systems engaged during acquisition (Juffs & Harrington, 2011). Given the complexity of vocabulary learning and the individual differences affecting rate and ease of acquisition (Kaushanskaya, 2012), understanding the cognitive factors involved can optimize instruction. In summary, vocabulary acquisition is a vital focus in psycholinguistics given vocabulary’s importance for language proficiency and the intricate cognitive processes required for robust, lasting word knowledge. Therefore, vocabulary acquisition in psycholinguistics literature needs to be synthesized to understand the emerging themes generated during the period of almost five decades. The study attempts to address the following questions:

RQ 1. What are the trending research issues that vocabulary acquisition research in psycholinguistics domain has focused on during the timespan 1971–2022?

RQ 2. What are the co-cited documents and sources of publication that can be drawn from the literature of vocabulary acquisition in psycholinguistics?

Literature Review

Theoretical Framework

The acquisition of vocabulary in a second language (L2) is a subject of considerable interest in applied linguistics, and psycholinguistics offers valuable perspectives for understanding this complex process. Cognitive models such as Paivio’s Dual Coding Theory (1986) and Kroll and Stewart’s Revised Hierarchical Model (1994) provide foundational frameworks for exploring L2 vocabulary acquisition. Dual Coding Theory posits that words can be better retained when encoded through both verbal and non-verbal channels, suggesting that L2 vocabulary acquisition benefits from engaging both linguistic and imaginal representations. On the other hand, the Revised Hierarchical Model argues that L2 words initially establish connections to their first language (L1) equivalents but gradually link directly to a conceptual store as proficiency increases. This model elucidates the evolving role of L1 in L2 vocabulary learning.
Psycholinguistic factors further enrich our understanding of L2 vocabulary acquisition. Baddeley's model of working memory (2000) highlights the role of the phonological loop in language learning, and empirical studies have found a positive correlation between working memory capacity and L2 vocabulary acquisition (Atkins & Baddeley, 1998). Another psycholinguistic aspect to consider is lexical access, as described by Levelt’s model (1999). Lexical access in L2 learners is generally slower and less automatic, attributed to less robust lexical representations (Segalowitz, 2010).

Neurobiological correlates also offer insights into the mechanisms underlying L2 vocabulary acquisition. Research indicates that learning a second language is associated with structural changes in specific brain regions, such as the hippocampus and the left inferior parietal lobule (Stein et al., 2012). Neuroimaging studies have further shown that both L1 and L2 lexical items activate overlapping regions in the brain, suggesting a shared neural substrate for a bilingual lexicon (Abutalebi, 2008).

The integration of cognitive, psycholinguistic, and neurobiological perspectives not only enhances our understanding of L2 vocabulary acquisition but also has pedagogical implications. For example, educational strategies like spaced repetition and multimodal encoding can be informed by principles derived from cognitive psychology to improve vocabulary retention (Nation, 2001). In summary, the acquisition of L2 vocabulary is a multifaceted process influenced by a range of factors. This theoretical framework aims to provide a comprehensive, albeit not exhaustive, understanding of how L2 vocabulary is acquired, represented, and accessed in the human mind.

**Vocabulary Acquisition**

The process of acquiring vocabulary is a crucial element in effectively conveying meaning. Moreover, it represents a foundational cornerstone for achieving expertise and proficiency in a language (Schmitt, 2008). Vocabulary acquisition refers to the process through which individuals learn words in a language other than their first language (Wu, 2012). It encompasses a complex process that delves into the complex cognitive mechanisms and linguistic subtleties by which people gather, retain, and use words along with their nuanced meanings within a specific language. As language learners engage with new
words, their cognitive processes go through a series of complex stages. These stages involve not just the initial exposure to the word's form and its corresponding definition, but also the assimilation of its various contextual nuances. Furthermore, vocabulary acquisition goes beyond mere word accumulation. This involves giving elaborate attention to a word, going beyond the immediate demands of a particular context of occurrence (Nation, 2012). This process requires an understanding of the subtle distinctions in connotations, shades of meaning, and idiomatic usage, all contributing to effective and nuanced communication.

**Factors Influencing Vocabulary Acquisition**

Several factors are relevant when considering vocabulary acquisition from this perspective. They include word recognition and processing, poor reading comprehension, verbal behavior, repetition, and morphological awareness.

**Poor Reader**

Poor reading comprehension can be linked to deficiencies in oral language, metalinguistic abilities, working memory, and higher-order cognitive skills (Li et al., 2021). Additionally, vocabulary knowledge significantly influences reading skills. When a learner lacks sufficient vocabulary, understanding the meanings of words encountered during reading becomes challenging. Individuals with limited reading abilities often face obstacles in developing a strong vocabulary. Previous research has examined various factors contributing to and resulting from poor reading comprehension. For instance, Hamra and Syatriana (2010) contend that inadequate vocabulary, limited learning support, and low reading motivation are key factors in poor reading comprehension among Indonesian secondary students.

Vocabulary deficiencies in less proficient readers exhibit a reciprocal relationship with their reading skills (Alyami & Mohsen, 2019). Typically, individuals with poor reading abilities tend to read less, and this reduced exposure to written text can hinder their vocabulary development (Cunningham & Stanovich, 1991). Furthermore, children with limited vocabularies often encounter difficulties in comprehending and retaining text (Beck, Perfetti, & McKeown, 1982). Consequently, this challenge can make it more difficult for them to assimilate new words encountered in text into their mental lexicon (Jenkins, Stein, & Wysocki, 1984).
Successful vocabulary acquisition often centers on encountering a diverse range of words in various contexts. Poor readers may either completely avoid reading or engage in it less frequently, thus limiting their exposure to new vocabulary. This reduced exposure to unfamiliar words hampers the expansion of their vocabulary. Additionally, poor readers may struggle with retaining the meanings of words they come across. They might quickly forget new words or incorrectly remember their definitions, making it challenging to incorporate these words into their everyday language.

**Verbal Behavior**

The principles of verbal behavior, as elucidated by Skinner (1957) play a central role in the process of vocabulary acquisition. Understanding these principles can serve as a valuable guide for educators, parents, and learners in nurturing effective vocabulary development. By engaging in meaningful conversations, immersing oneself in extensive reading, and employing positive reinforcement, we can effectively harness the potential of verbal behavior. This, in turn, enables us to unlock the vast realm of words, enriching our linguistic capabilities and ultimately enhancing our communication skills and cognitive growth. Several studies have substantiated the close connection between physical activity and cognitive prowess. These studies found that regular exercise can mitigate cognitive decline in the elderly (Colcombe et al., 2006; Hillman et al., 2008). Consequently, this translates into improved performance across various cognitive domains, encompassing reasoning, working memory, reaction time, and vocabulary skills when comparing physically active elderly individuals to their non-active counterparts of the same age (Yaffe et al., 2001).

Several studies compared physically active and passive situations (e.g., Winter et al., 2007). Their study aimed to ascertain whether engaging in physical activity before a vocabulary learning session could expedite the learning process among young, athletic men. Their findings concluded that a brief yet intensive training session preceding the learning session yielded the most favorable learning outcomes. Similarly, Schmidt-Kassow et al. (2010) conducted research to determine whether concurrent motor activity had any effect on verbal learning compared to learning in a physically passive environment. The study revealed a more
pronounced effect and enhanced performance in vocabulary assessments when participants engaged in physical activity during the initial encoding phase. This finding suggests that simultaneous physical activity during vocabulary learning effectively promotes the memorization of new vocabulary items.

In addition to the above, verbal behaviour is explored by using some software like eye-tracking programmes. Eye-tracking technology generates real-time data on the eye movements of language learners during specific tasks, and research studies have recognized it as an effective method for assessing the attention of second language learners (Kang et al., 2022). Eye-tracking not only provides researchers with insights into the elements that capture the attention of second language learners but also the duration for which they focus on specific words or phrases. Scholars have argued that the use of eye-tracking software can more accurately portray the natural reading behaviors of individuals (e.g., Choi, 2017; Pellicer-Sánchez & Siyanova-Chanturia, 2018).

**Nonword Repetition**

Nonword repetition is a vital cognitive task with significant importance in vocabulary acquisition and language skill development. It involves the ability to mimic unfamiliar or non-existent words, serving as an assessment of an individual's phonological memory and speech processing abilities. Nonword repetition, essentially comprising the request for a child to replicate novel phonological patterns, exhibits a strong connection to language development. This activity is particularly beneficial for children learning a new language or expanding their lexicon, as it enhances their ability to recognize and accurately pronounce new words (Nation & Hulme, 2011).

Several studies have highlighted a connection between nonword repetition and vocabulary acquisition. They indicate that children with poor nonword repetition skills tend to struggle with learning new words (Gathercole et al., 1997). Nonword repetition has also proven valuable for assessing and diagnosing language disorders in multilingual children (Boerma & Blom, 2017). Previous research has sparked debate regarding whether nonword repetition drives vocabulary growth (Baddeley, Gathercole, & Papagno, 1998) or if it is a consequence of it (Metsala, 1999). These two perspectives are not necessarily mutually exclusive. In fact, a third viewpoint suggests that nonword repetition
and vocabulary mutually influence each other during development (Rispens & Baker, 2012).

Nonword repetition is a more intricate task than it may initially seem. Several factors come into play, influencing one's performance in nonword repetition. These factors encompass a variety of stimulus properties, including how closely the nonwords resemble real words (Gathercole et al., 1991), the rhythmic and melodic aspects of speech (prosodic structure) (Archibald, Gathercole & Joanisse, 2009), the likelihood of specific phoneme sequences within the nonword (phonotactic probability) (Munson et al., 2005), an individual’s proficiency in controlling speech movements (speech motor skills) (Sasisekaran, Smith & Sadagopan, 2010), and articulatory factors such as complexity and sound blending (coarticulation) (Vance, Stackhouse & Wells, 2005).

**Morphological Awareness and Vocabulary Acquisition**

Vocabulary acquisition involves more than just rote memorization of words; it also entails comprehending the underlying structure and connections between them. Morphological awareness plays a crucial role in this process by aiding in the deciphering of unfamiliar words and the identification of words that are related. One skill highly relevant to vocabulary acquisition is morphological awareness, as highlighted in various studies (Anglin, 1993; McBride-Chang et al., 2008; McBride-Chang et al., 2005; Stahl & Nagy, 2006). Morphological awareness refers to the ability to recognize the morphemic structure of words and the capacity to analyze and manipulate that structure (Carlisle, 1995). It can be defined as “the skill to think about and manipulate morphemes and word formation rules within a language” (Kuo & Anderson, 2006: 161). Morphemes are the smallest meaningful units in a language that can be combined to create new words, often allowing us to deduce the meaning of complex words based on the meanings of their constituent morphemes (Sparks & Deacon, 2015).

Researchers propose that children possessing a strong grasp of morphological awareness can easily derive the meanings of unfamiliar complex words encountered in spoken or written language by identifying their connections to more common terms (Kieffer & Lesaux, 2012). The idea that morphological awareness plays a pivotal role in vocabulary development was initially suggested by Carlisle (2007). She posited that
morphemes could function as reusable building blocks that facilitate children's acquisition of new, morphologically complex words. This concept aligns with findings from studies demonstrating that children can deduce word meanings by analyzing the morphological elements of words. Multiple studies, conducted with monolingual speakers of diverse languages, have consistently shown a robust link between morphological awareness and vocabulary proficiency (Carlisle, 2000; McBride-Chang et al., 2005; Nagy, Berninger & Abbott, 2006).

Morphological processes can be broadly classified into two well-defined categories: implicit and explicit. Implicit morphological processes hinge on the power of language immersion. In this context, children are immersed in a linguistic environment where they are continually exposed to spoken and written language. Through this immersive experience, they intuitively and organically absorb morphological patterns embedded within the language, all without the need for formal or explicit rule-learning mechanisms. This process is akin to how young language learners absorb language naturally, gradually developing an innate understanding of word formation and structure. In contrast, explicit morphological processes are often referred to as morphological awareness skills. These skills equip children with the conscious ability to scrutinize and manipulate the intricate morphological architecture of complex words. Through explicit morphological awareness, children can dissect and understand the constituent morphemes that make up words, allowing them to navigate and comprehend the complexities of language with a more analytical and structured approach (Ardanouy et al., 2023; Deacon & Kirby, 2004).

The study of morphological awareness is guided by various frameworks, and one such framework is the Morphological Pathways Framework proposed by Levesque et al. (2021). According to this framework, morphological awareness is a multidimensional component of the linguistic system, sharing common elements with phonological and syntactic awareness. This model suggests that morphological awareness skills influence literacy skills through multiple pathways operating at different levels. For example, morphological awareness is connected to word identification processes through its ability to facilitate the simultaneous activation of semantic, phonological, and syntactic representations (Giazitzidou et al., 2023). In line with Levesque et al.’s (2021) Morphological Pathways Framework, it's
proposed that morphological awareness can impact word identification processes both directly and indirectly. The processing of words morphologically involves interactive elements of various linguistic dimensions, including semantics and syntax (Carlisle, 2003; Kuo & Anderson, 2006). These processes, in turn, trigger the activation of phonological, semantic, and syntactic lexical representations. Phonology serves as the foundation for the initial recognition of morphemes (Deacon & Kirby, 2004).

**Methodology**

**Data Source**

In order to elicit comprehensive data about vocabulary acquisition research from psycholinguistics, we utilized Dimensions database. Dimensions is a reliable database that indexes millions of articles for thousands of peer-reviewed journals. We opted to use Dimensions because it is broader than other databases such as Web of Science and Scopus (Herzog et al., 2020). Dimensions is an integrated research database that collates data on grants, academic publications, citations, clinical trials, patents, and policy documents. It provides a holistic view of the research life cycle, allowing for comprehensive scholarly assessment and impact tracking across disciplines (Herzog et al., 2020). Data from Dimensions could be downloaded in the form of CSV which is compatible with bibliometric analysis software such as CiteSpace and VOWSviewer, which are used by the current study.

**Target Journals and Key Terms**

We targeted four journals that solely publish research that deals psycholinguistics issues. We employed the term “psycholinguistic” in the source titles icon of the Dimensions and yielded seven journals which are:

1. Applied Psycholinguistics (ISSN: 0142-7164 (print), 1469-1817 (online), published by Cambridge University Press.
3. Psycholinguistics (ISSN: 2309-1797 (print), 2415-3397 (online), published by Hryhorii Skovoroda University in Pereiaslav.
(4) East European Journal of Psycholinguistics (ISSN: 2312-3265 (print), 2313-2116 (online), published by Lesya Ukrainka Eastern European National University.

We employed the term “vocabulary” AND “psycholinguistic” in the search engine of the Dimensions and confined the search to cover only article type that published in English for the timespan 1971–2022. The results yielded the following results 201 articles that deals with vocabulary acquisition from psycholinguistics perspectives (Details are provided in the Results section).

**Software**

We used CiteSpace (6.2 R4) Advanced (Chen, 2006) to analyze the emerging themes of the research articles that investigated vocabulary acquisition from psycholinguistics domains during 50 years. We also used VOWSviewer (Van Eck & Waltman, 2010) to visualize authors’ keywords used in research to identify the most important research areas covered in vocabulary acquisition in psycholinguistics literature. These tools provide a comprehensive methodological framework for conducting a robust scientometric study on vocabulary acquisition in psycholinguistic research, enabling the identification of research gaps, influential works, and future directions.

**Data Analysis**

To provide a robust scientometric analysis of the academic landscape, the study employed an integrated approach using three specialized software tools: CiteSpace for document co-citation analysis and VOSviewer for source co-citation analysis. Each tool was selected for its unique capabilities in representing different aspects of scholarly communication and research trends. CiteSpace was indispensable in capturing both temporal and structural metrics within the academic network under investigation. Temporal metrics were key in identifying dynamic trends and shifts in scholarly attention. One such metric was burstness, which identifies periods when specific articles or concepts experienced a sudden increase in citation rates, thereby revealing their immediate relevance and impact on the academic community. Another temporal metric used was the sigma value, a quantitative measure that gauges the novelty or originality of a work within scientific literature. By including sigma values, the study aimed to shed light on
the transformative works that have potentially reshaped the field, as indicated by (Mohsen & Alangari, 2023).

In addition to temporal metrics, CiteSpace also generated valuable structural metrics that provided a snapshot of the interconnectivity and organizational architecture of the research network. The Modularity Q value was utilized to evaluate the clarity and definition of clusters within the network. A higher Modularity Q suggests that the network can be cleanly divided into distinct research communities, with each community representing a focused area of inquiry (Chen & Song, 2019).

Silhouette scores were another structural metric used to measure the internal cohesion and similarity within these clusters. A high silhouette score indicates greater uniformity among the works in a given cluster, offering insights into the thematic coherence of the research community (Solmi et al., 2022). This allowed the study to make rigorous assessments regarding the homogeneity and thematic unity of the various research clusters. Furthermore, the study employed the concept of betweenness centrality to understand the role and influence of specific nodes in the network. This metric quantifies how often a node serves as a bridge between other nodes in the network, highlighting its role in facilitating scholarly communication between different research clusters (Brandes, 2001).

On the other hand, VOSviewer was utilized for its strengths in source co-citation analysis. By mapping out how often sources were cited together, this tool illuminated collaborative patterns and academic alliances, helping to identify leading journals or authors in the field.

Together, these software tools and metrics coalesced to form a comprehensive, multi-faceted analysis, allowing for a nuanced understanding of the research landscape. Each tool contributed unique dimensions to the study, which, when synthesized, offered a deep, holistic view of the academic progression in the field.

**Results**

**1 - Publication Metrics**

Table 1 presents the number of articles published by the four target journals that solely published psycholinguistic research.
Table 1
The Number of Articles Published by the Target Journals

<table>
<thead>
<tr>
<th>Source title</th>
<th>Frequency</th>
<th>Citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Psycholinguistics</td>
<td>1157</td>
<td>42851</td>
</tr>
<tr>
<td>Journal of Psycholinguistic Research</td>
<td>733</td>
<td>13292</td>
</tr>
<tr>
<td>East European Journal of Psycholinguistics</td>
<td>57</td>
<td>31</td>
</tr>
<tr>
<td>PSYCHOLINGUISTICS</td>
<td>54</td>
<td>48</td>
</tr>
</tbody>
</table>

Figure 1 presents the percentage frequency of articles published in the four target journals.

Figure 1
Percentage Frequency of Articles Published in the Four Target Journals

1 – Clusters
In this study, we utilized CiteSpace to conduct a Document Co-citation Analysis (DCA) spanning from 1971 to 2022. From an initial corpus of 2001 article abstracts, the analysis identified 895 nodes and 4,814 links, coalescing into 48 distinct clusters. The calculated Modularity Q value of 0.714 and an average silhouette value of 0.891 indicate significant clustering and high internal coherence within these clusters, respectively. For clearer visualization and focused analysis, only the largest 10 clusters were displayed. These clusters represent
the most active and significant areas in vocabulary acquisition in psycholinguistics research over the past 52 years. We have chosen the top 10 major clusters for our analysis to cover the most significant themes identified by our study. Figure 2 identifies these clusters with their nodes that highlighted the most influential papers while Table 2 summarizes the largest clusters with their metrics.

**Figure 2**

*Clusters with their Nodes that Highlighted the Most Influential Papers*

**Table 2**

*Clusters Information*

<table>
<thead>
<tr>
<th>Cluster ID</th>
<th>Size</th>
<th>Silhouette</th>
<th>Label (LLR)</th>
<th>Average Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>201</td>
<td>0.851</td>
<td>poor reader</td>
<td>1983</td>
</tr>
<tr>
<td>1</td>
<td>193</td>
<td>0.909</td>
<td>verbal behavior</td>
<td>1980</td>
</tr>
<tr>
<td>2</td>
<td>190</td>
<td>0.837</td>
<td>nonword repetition</td>
<td>1997</td>
</tr>
<tr>
<td>3</td>
<td>183</td>
<td>0.76</td>
<td>morphological awareness</td>
<td>2004</td>
</tr>
<tr>
<td>4</td>
<td>182</td>
<td>0.854</td>
<td>word reading</td>
<td>2002</td>
</tr>
<tr>
<td>5</td>
<td>98</td>
<td>0.863</td>
<td>Latino children</td>
<td>1998</td>
</tr>
<tr>
<td>6</td>
<td>86</td>
<td>0.929</td>
<td>bilingual speaker</td>
<td>1980</td>
</tr>
<tr>
<td>7</td>
<td>83</td>
<td>0.986</td>
<td>response bias effect</td>
<td>1963</td>
</tr>
<tr>
<td>8</td>
<td>78</td>
<td>0.886</td>
<td>Spanish vocabulary development</td>
<td>1995</td>
</tr>
<tr>
<td>9</td>
<td>51</td>
<td>0.973</td>
<td>gender processing</td>
<td>1990</td>
</tr>
</tbody>
</table>
a. Co-Cited References

Co-citation refers to a citation of two related articles in a subsequent paper, indicating a thematic relationship between these papers (Small, 1973). Identifying such themes would help us identify the most trending research papers and the most influential studies in a field of study. Table 3 identifies the most co-cited references.

Table 3
Highly Co-cited References

<table>
<thead>
<tr>
<th>References</th>
<th>Citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anonymous (1973). A First Language</td>
<td>74</td>
</tr>
<tr>
<td>Gathercole, S.E. et al. (1989). Journal of Memory and Language, 28(2), 200–213</td>
<td>45</td>
</tr>
</tbody>
</table>

b. Co-cited Sources of Publication

We set 100 citations as a threshold to find out the co-cited sources of publication that published vocabulary acquisition research from psycholinguistics perspectives. We found four clusters where sources of publication were categorized and presented in colors in figure 3. Table 4 presents the top 20 highly co-cited sources of publication with the number of citations for each journal.

Table 4
The Most Highly Co-cited Sources of Publication

<table>
<thead>
<tr>
<th>No.</th>
<th>Source</th>
<th>Citations</th>
<th>Total Link Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Acta Psychologica</td>
<td>105</td>
<td>4045</td>
</tr>
<tr>
<td>2</td>
<td>Advances in Psychology</td>
<td>104</td>
<td>3208</td>
</tr>
<tr>
<td>3</td>
<td>American Journal of Speech-Language Pathology</td>
<td>145</td>
<td>5122</td>
</tr>
<tr>
<td>4</td>
<td>American Psychologist</td>
<td>110</td>
<td>2263</td>
</tr>
<tr>
<td>5</td>
<td>Annals of Dyslexia</td>
<td>258</td>
<td>9334</td>
</tr>
</tbody>
</table>
 Timeline Review

CieSpace visualizes how clusters of vocabulary acquisition research in psycholinguistics domain was investigated overtime. It also
Figure 4
How Clusters Appeared During the 52 years of Psycholinguistic Research that Investigated Vocabulary Acquisition
present the most influential papers which record surge of citations and burstness. Figure 4 depicts how clusters appeared during the 52 years of psycholinguistic research that investigated vocabulary acquisition.

Results from Figure 4 indicate that citation in cluster #0 started earlier around 1950 and ended in the beginning of the first millennium of this century 1930 while the cluster #1 started before 1950 and continued to 2017. Cluster 2 started in 1973 and ended in 2018. Other details could be found in Figure 3. Figure 5 presents the top ten articles that record highest burstness.

**Figure 5**
*Top Ten Articles with High Burstness*

![Figure 5](image)

Results from Figure 5 indicate that Bates’ (2015) article recorded the highest burstness, including its influence on the research community of psycholinguistics for the period 2019–2022 while the historical article that authored by anonymous contributors in 1973 recorded the second rank for the period 1977–1994. The third article was Bar et al. (2013) obtained the third rank.

**Citation Counts**

In the bibliometric study at hand, the citation counts reveal an interesting hierarchy within the clusters. The most cited paper is by Anonymous (1973), with 66 citations, which is situated in Cluster #1. This suggests that this particular work serves as a seminal cornerstone within its respective cluster. Following this, Bates D. (2015) in Cluster #3 holds the second-highest citation count of 57, indicating its significant influence in shaping discourse within that cluster. Third in line is Bradley L's work from 1983, located in Cluster #0, with 45 citations, highlighting its continued relevance over a span of decades. It's followed by Barr D.J. (2013) in Cluster #3, which has garnered 43 citations, emphasizing the contemporaneous importance of this work. The fifth and sixth positions are occupied by Berko J. (1958) and Carlisle J.F.
(2000) in Cluster #4 with 38 and 37 citations respectively. These works maintain their influence, suggesting the stability and ongoing relevance of the research topics within this cluster. Next, Baayen R.H. (2008) in Cluster #4 has obtained 36 citations, underscoring the continuous importance of this more modern work within the same cluster. Following closely is GATHERCOLE SE's work from 2006, located in Cluster #2, with 35 citations, suggesting its pivotal role in shaping that cluster's focal areas. In ninth place is Ziegler J.C.'s work (2005) in Cluster #4, with 34 citations, further strengthening the idea that Cluster #4 contains highly-cited and therefore presumably impactful research. Finally, the tenth spot is held by Wagner R.K. (1987) in Cluster #0, with 33 citations, offering additional insights into the cluster’s research gravity.

Table 6
Citations Count of the Most Highly Cited Articles

<table>
<thead>
<tr>
<th>Citation Counts</th>
<th>References</th>
<th>DOI</th>
<th>Cluster ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>66</td>
<td>Anonymou, 1973, A FIRST LANGUAGE, V0, P0</td>
<td>10.4159/harvard.9780674732469</td>
<td>1</td>
</tr>
<tr>
<td>57</td>
<td>Bates D., 2015, JOURNAL OF STATISTICAL SOFTWARE, V67, P0</td>
<td>10.18637/jss.v067.i01</td>
<td>3</td>
</tr>
<tr>
<td>45</td>
<td>Bradley L., 1983, NATURE, V301, P419</td>
<td>10.1038/301419a0</td>
<td>0</td>
</tr>
<tr>
<td>38</td>
<td>Berko J., 1958, WORD, V14, P150</td>
<td>10.1080/00437956.1958.11659661</td>
<td>4</td>
</tr>
<tr>
<td>37</td>
<td>Carlisle J.F., 2000, READING AND WRITING, V12, P169</td>
<td>10.1023/a:1008131926604</td>
<td>4</td>
</tr>
<tr>
<td>35</td>
<td>Gathercole S.E., 2006, APPLIED PSYCHOLINGUISTICS, V27, P513</td>
<td>10.1017/s0142716406060383</td>
<td>2</td>
</tr>
<tr>
<td>34</td>
<td>Ziegler J.C., 2005, PSYCHOLOGICAL BULLETIN, V131, P3</td>
<td>10.1037/0033-2909.131.1.3</td>
<td>4</td>
</tr>
</tbody>
</table>
**Degree**

The analysis of node degrees in the network presents another layer of understanding of how central or peripheral each work is within their respective clusters. Node degree, an indicator of the number of connections a node has in a network, signifies the centrality and thus potential influence of a paper within its cluster. The paper by Bradley L. (1983) in Cluster #0 has the highest degree, standing at 169. This implies it serves as a pivotal nexus, interconnected with a significant number of other works, and possibly shaping the overall research trajectory within this cluster. Anonymous (1973) in Cluster #1 follows closely with a degree of 158, echoing its significance not only in terms of citation counts but also as a central node within its cluster.

In Cluster #2, three works by Gathercole S.E. from the years 1992, 1990, and 1989, respectively, exhibit high degrees (158, 157, and 147). This suggests that Gathercole's contributions are central to the discourse within this cluster and likely serve as foundational or standard references for other works. Wagner R.K. (1987) in Cluster #0 holds a degree of 149, reinforcing its significant influence and its role as a central node similar to Bradley L's work within the same cluster. Carlisle J.F. (2000) in Cluster #4 has a degree of 120, indicating its central role within this cluster. Likewise, Ziegler J.C. (2005) also in Cluster #4 shows a high degree of centrality with 116. Metsala J.L. (1999) in Cluster #8 has a degree of 118, making it an important work within this cluster. Lastly, another work by Gathercole SE from 2006 in Cluster #2 stands at a degree of 112, reaffirming Gathercole’s influential status within this particular research community.

**Table 7**

*Degree Metrics of the Highly Co-cited Articles*

<table>
<thead>
<tr>
<th>Degree</th>
<th>References</th>
<th>DOI</th>
<th>Cluster ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>169</td>
<td>Bradley L., 1983, NATURE, V301, P419</td>
<td>10.1038/301419a0</td>
<td>0</td>
</tr>
<tr>
<td>158</td>
<td>Anonymous, 1973, A FIRST LANGUAGE, V0, P0</td>
<td>10.4159/harvard.9780674732469</td>
<td>1</td>
</tr>
<tr>
<td>158</td>
<td>Gathercole S.E., 1992, DEVELOPMENTAL PSYCHOLOGY, V28, P887</td>
<td>10.1037/0012-1649.28.5.887</td>
<td>2</td>
</tr>
</tbody>
</table>

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### Centrality

Centrality metrics offer a nuanced understanding of the influence of a particular paper within a network of academic literature. It serves to measure how pivotal a node is within its broader research cluster. A higher centrality score often indicates that a particular work has a more pronounced role in connecting disparate parts of the research network. The work by Anonymous (1973) in Cluster #1 stands out with an unusually high centrality of 0.44, suggesting that it serves as a principal bridge among other works in its cluster and possibly even beyond. It potentially links diverse areas of study, thereby playing a critical role in the cohesion and integration of the broader research landscape.

Bradley L. (1983) in Cluster #0 comes next with a centrality score of 0.13, reinforcing its already established pivotal role in terms of both citation counts and degree. This indicates that while Bradley L’s work is central, it does not possess the same level of network influence as the Anonymous paper. Daneman M. (1980) in Cluster #2 has a centrality of 0.10, marking it as an influential piece within this specific area of study, although its centrality is notably lower than the top two works. Wagner R.K. (1987), Baayen R.H. (2008), and Berko J. (1958), all within Clusters #0 and #4, have identical centrality values of 0.07.

<table>
<thead>
<tr>
<th>Page</th>
<th>Reference</th>
<th>Journal</th>
<th>Volume</th>
<th>Issue</th>
<th>Year</th>
<th>Title</th>
<th>DOI</th>
<th>Centrality</th>
</tr>
</thead>
<tbody>
<tr>
<td>147</td>
<td>Gathercole S.E., 1989, JOURNAL OF MEMORY AND LANGUAGE, V28, P200</td>
<td>10.1016/0749-596x(89)90044-2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>120</td>
<td>Carlisle J.F., 2000, READING AND WRITING, V12, P169</td>
<td>10.1023/a:1008131926604</td>
<td>4</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>118</td>
<td>Metsala J.L., 1999, JOURNAL OF EDUCATIONAL PSYCHOLOGY, V91, P3</td>
<td>10.1037/0022-0663.91.1.3</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>116</td>
<td>Ziegler J.C., 2005, PSYCHOLOGICAL BULLETIN, V131, P3</td>
<td>10.1037/0033-2909.131.1.3</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>112</td>
<td>Gathercole S.E., 2006, APPLIED PSYCHOLINGUISTICS, V27, P513</td>
<td>10.1017/s0142716406060383</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
This implies that while they are significant, they are relatively equal in terms of their roles as central hubs within their respective clusters.

The works by Gathercole S.E. from the years 1990, 1992, and 1989 in Cluster #2 have centrality scores ranging from 0.05 to 0.06, affirming their roles as important but less pivotal compared to higher-ranking works. Lastly, Carlisle J.F. (2000) in Cluster #4 holds a centrality of 0.05, similar to the works by Gathercole SE, indicating its importance but lesser influence in connecting the network of research.

Understanding the centrality scores allows us to better discern the 'connective tissue' within a research network, identifying those works that not only are influential but also serve to integrate diverse strands of academic discourse. In summary, the centrality metric adds an additional layer of interpretation to the structural and relational aspects of scientific contributions within their respective domains.

Table 8
Centrality Burstness of the Highly Co-cited Articles

<table>
<thead>
<tr>
<th>Centrality</th>
<th>References</th>
<th>DOI</th>
<th>Cluster ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.44</td>
<td>Anonymou, 1973, A FIRST LANGUAGE, V0, P0</td>
<td>10.4159/harvard.9780674732469</td>
<td>1</td>
</tr>
<tr>
<td>0.13</td>
<td>Bradley L., 1983, NATURE, V301, P419</td>
<td>10.1038/301419a0</td>
<td>0</td>
</tr>
<tr>
<td>0.10</td>
<td>Daneman M., 1980, JOURNAL OF MEMORY AND LANGUAGE, V19, P450</td>
<td>10.1016/s0022-5371(80)90312-6</td>
<td>2</td>
</tr>
<tr>
<td>0.07</td>
<td>Wagner R.K., 1987, PSYCHOLOGICAL BULLETIN, V101, P192</td>
<td>10.1037/0033-2909.101.2.192</td>
<td>0</td>
</tr>
<tr>
<td>0.07</td>
<td>Berko J., 1958, WORD, V14, P150</td>
<td>10.1080/00437956.1958.11659661</td>
<td>4</td>
</tr>
<tr>
<td>0.06</td>
<td>Gathercole SE, 1990, JOURNAL OF MEMORY AND LANGUAGE, V29, P336</td>
<td>10.1016/0749-596x(90)90004-j</td>
<td>2</td>
</tr>
<tr>
<td>0.05</td>
<td>Gathercole S.E., 1992, DEVELOPMENTAL PSYCHOLOGY, V28, P887</td>
<td>10.1037/0012-1649.28.5.887</td>
<td>2</td>
</tr>
</tbody>
</table>
The sigma metric encapsulates a blend of citation metrics and structure, offering a composite view of an article’s importance and innovative impact. A sigma value of 1.00 for all the top-ranked items across different clusters suggests an equivalence in their scientific originality and overall influence in the respective domains.

Starting with the item by Anonymous (1973) in Cluster #1, its sigma value of 1.00 corroborates its high centrality and citation count, reinforcing its status as a seminal work in its domain. The same level of influence and originality is evident for Bradley L (1983) in Cluster #0, Daneman M. (1980) in Cluster #2, and Wagner R.K. (1987) in Cluster #0, further substantiating their critical roles within their respective research clusters. Baayen R.H. (2008) and Berko J. (1958) in Cluster #4, each with a sigma value of 1.00, underscore the transformative impact these works have had on their specific fields of inquiry. In Cluster #2, the contributions by Gathercole S.E. from 1989, 1990, and 1992 also achieve a sigma value of 1.00, reflecting their innovative impact on this area of study. Carlisle J.F.’s work from 2000 in Cluster #4 is another notable contribution with a sigma value of 1.00, indicating it as a work of significant scientific originality.

### Table 9
**Sigma of the Highly Co-cited Articles**

<table>
<thead>
<tr>
<th>Sigma</th>
<th>References</th>
<th>DOI</th>
<th>Cluster ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td>Anonymous, 1973, A FIRST LANGUAGE, V0, P0</td>
<td>10.4159/harvard.9780674732469</td>
<td>1</td>
</tr>
<tr>
<td>1.00</td>
<td>Bradley L., 1983, NATURE, V301, P419</td>
<td>10.1038/301419a0</td>
<td>0</td>
</tr>
<tr>
<td>1.00</td>
<td>Daneman M., 1980, JOURNAL OF MEMORY AND LANGUAGE, V19, P450</td>
<td>10.1016/s0022-5371(80)90312-6</td>
<td>2</td>
</tr>
</tbody>
</table>


### Discussion

This scientometric analysis aims to combine research on vocabulary acquisition from a psycholinguistics perspective through the lens of quantitative metrics to discern prevalent research topics and their temporal evolution. The results designate “poor reader” as the first predominant cluster, suggesting that a significant portion of the research in this field has been focused on understanding the vocabulary acquisition challenges faced by individuals classified as “poor readers”. The focal point of these investigations centers on identifying the specific cognitive processes and linguistic factors that contribute to vocabulary difficulties in this group. This observation is congruent with some studies that acknowledged importance of addressing reading difficulties and their impact on vocabulary development. The results also designate “verbal behavior” as the second predominant cluster, suggesting that another substantial area of research revolves around the analysis of verbal behavior in the context of vocabulary acquisition. The focal point of these investigations centers on exploring how verbal interactions, such as conversations and dialogues, influence vocabulary development. This observation is congruent with the notion that language exposure and usage play a pivotal role in acquiring a rich vocabulary. The results
further designate “nonword repetition” as the third predominant cluster, indicating a notable focus on the phenomenon of nonword repetition in the context of vocabulary acquisition. The focal point of these investigations centers on understanding the relationship between an individual's ability to repeat unfamiliar or nonsensical words and their overall vocabulary development. This observation is congruent with the idea that nonword repetition tasks can serve as valuable indicators of a person’s phonological memory and language processing skills. The fourth cluster is morphological awareness, suggesting that researchers have also been keen on investigating the role of morphological awareness in vocabulary acquisition. This suggests that there is interest in exploring how an individual’s ability to recognize and understand the structure of words, including prefixes and suffixes, contributes to the development of a robust vocabulary. Morphological awareness is recognized as a crucial component of language proficiency, and its inclusion in this analysis aligns with the comprehensive examination of factors influencing vocabulary acquisition.

The field of vocabulary acquisition research within the domain of psycholinguistics has experienced notable transformations and change over time. Analyzing the temporal aspects of this research reveals intriguing patterns and shifts in focus. Firstly, the examination of the temporal evolution of research topics shows that the study of “poor reader” as a subject of interest began as far back as 1950 and persisted until the beginning of the first millennium of this century, specifically around 1930. This extended period of research suggests that understanding the challenges faced by individuals classified as “poor readers” has been a longstanding concern in the field. It demonstrates a commitment to addressing the complex issue of vocabulary acquisition difficulties in this specific group over several decades. Secondly, the investigation into “verbal behavior” commenced prior to 1950 and continued until 2017. This long duration of research activity highlights the enduring significance of exploring how language interactions and verbal communication impact vocabulary development. The fact that research in this area extended into the 21st century indicates an ongoing interest in the role of verbal behavior in shaping vocabulary acquisition processes. Thirdly, the topic of “nonword repetition” emerged in 1973 and remained an active area of research until 2018. This timeline suggests that researchers recognized the value of nonword repetition tasks as
a means to delve into phonological memory and language processing skills concerning vocabulary development. The relatively recent conclusion of research in this area may indicate a shift towards exploring other aspects of vocabulary acquisition. In addition, “morphological awareness” research had its origins in 1935 and continued until 2020. This extended period of investigation into morphological awareness underscores its enduring importance in understanding vocabulary acquisition. The study of how individuals recognize and grasp the structure of words, including prefixes and suffixes, remained a relevant and evolving topic throughout the latter half of the 20th century and into the 21st century. The temporal analysis of vocabulary acquisition research in psycholinguistics reveals a dynamic landscape with different topics. This evolution reflects the field’s adaptability and responsiveness to changing perspectives, methodologies, and societal needs over time.

The top four references that were frequently co-cited include Anonymous (1973), Bates et al. (2015), Bradley et al. (1983), and Wagner et al. (1987). These studies covered various subject areas. For example, Wagner et al. (1987) examined research that had previously developed independently, focusing on phonological processing. This study explored questions about the nature of phonological abilities and their role in the acquisition of reading skills. It provided evidence supporting the idea that phonological awareness plays a causative role in learning to read and suggested similar causal roles for phonological recoding in lexical access and phonetic recoding in working memory. Anonymous (1973) conducted an extensive longitudinal study on preschool children's language development, emphasizing its significance for self-awareness and comprehension of the world. They examined three children's linguistic progress, covering semantics and grammar, and their findings are linked to recent research in psychology and linguistics, particularly in non-English language acquisition. Roger Brown’s work is a comprehensive analysis of early grammatical constructions and their meanings, representing a significant contribution to the field.

It's worth noting that journals specialized in psycholinguistics, cognition, and development played a significant role in the co-citation of references. Journals with a strong impact on this research field primarily focused on cognition and vocabulary development. However, it is important to acknowledge that there are other publication venues that have also made substantial contributions in this area. For instance,

Conclusion

Through the application of scientometric techniques, this analysis has yielded valuable insights into the landscape of psycholinguistic research related to vocabulary acquisition. By utilizing quantitative measures, we have illuminated prominent research themes and their evolution over time. Our examination has identified four primary research clusters: “poor reader”, “verbal behavior”, “nonword repetition”, and “morphological awareness”. This temporal analysis uncovers a dynamic and continually evolving terrain within the realm of vocabulary acquisition research in psycholinguistics. It underscores the field’s adaptability and its capacity to respond to changing perspectives, methodologies, and societal demands. Furthermore, we have observed the significant influence exerted by specialized journals in psycholinguistics, cognition, and development on the co-citation of prominent references. These journals primarily emphasize cognition and vocabulary development, highlighting their substantial role in this research domain. Nonetheless, it remains vital to acknowledge the contributions of other publication outlets, including “Applied Psycholinguistics”, “Cognition”, “Child Development”, “Bilingualism Language and Cognition”, “Brain and Language”, “Behavior Research Methods”, and “Cognitive Psychology” all of which have also made noteworthy contributions to this field.

Indeed, this scientometric study has inherent limitations that present opportunities for future research. Firstly, the current analysis may not encompass all relevant terminologies, indicating the need for expansion in upcoming studies to attain a more comprehensive understanding of the subject. Secondly, this research is confined to a scientometric perspective and does not delve into other bibliometric aspects such as collaboration metrics, geographical or institutional productivity, and word co-occurrence analyses. It is highly advisable for future investigations to explore these additional bibliometric dimensions to gain a more
comprehensive and nuanced insight into the field. Another limitation is the study’s focus on journals that exclusively publish articles in the field of psycholinguistics. This approach inevitably excludes articles from broader applied linguistics journals, which often publish research targeting vocabulary acquisition within the psycholinguistic domain. Therefore, future studies are strongly encouraged to identify appropriate and comprehensive keywords to facilitate the retrieval of relevant articles from these multidisciplinary journals.

ADHERENCE TO ETHICAL STANDARDS

Ethic declarations. The study was conducted in compliance with domestic (Ethical code, 2009) and international ethical standards (American Psychological Association, 2002). The study was approved by the Scientific Ethics Committee of the Najran University, Saudi Arabia.

Funding. This work was supported and funded by Imam Muhammad Ibn Saud Islamic University (IMSIU) (Grant number IMSIU: RG23131).

Conflicts of Interest. The author declares no conflict of interest.

Author contributions. Mohammed Ali Mohsen: Conceptualization, Methodology, Writing-original draft preparation, Supervision, Formal analysis and investigation, Writing-review and editing; Hassan Saleh Mahdi: Writing-original draft preparation, Preparation of tables, figures, diagrams, Writing-review and editing; Manar Almanea: reproducibility of results, Writing-review and editing, Funding acquisition.

Consent for Publication. All authors commented on previous versions of the manuscript. All authors have read and approved the final version of the manuscript.

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References


© Mohsen, M., Mahdi, H.S., & Almanea, M.


**ANOTACIЯ**


**Методи.** Використовуючи базу даних Dimensions, ми ретельно проаналізували реферати 2 001 статті, що охоплюють період з 1971 по 2022 рік. Наш аналіз зосереджувався на нових темах досліджень і використовував різні метрики цитування.

**Результати.** Отримані результати дозволили виокремити кілька важливих кластерів дослідницьких тем, серед яких проблеми розуміння читання, вербальна поведінка учнів під час засвоєння лексики, когнітивне усвідомлення морфологічних функцій у засвоєній лексиці та нейропсихологічні механізми, що лежать в основі двомовного мовлення та розуміння мови. Примітно, що іспанська мова виявилася найбільш часто досліджуваною цільовою мовою у вибраних журналах. За точки зору академічного впливу, наш аналіз показав, що, окрім одного з цільових журналів, який є провідним джерелом цитування, інші основні журналі, що цитуються, переважно належать до галузей нейролінгвістики та психології. Стаття завершується пропозицією кількох напрямків для майбутніх досліджень у цій динамічній та міждисциплінарній галузі.

**Ключові слова:** засвоєння лексики, психолінгвістика, цитування, кластери.