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SPEECH ERRORS AS REFLECTIONS OF COGNITIVE MECHANISMS IN LANGUAGE PRODUCTION: PSYCHOLINGUISTIC STUDIES

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Abstrak *This research examines speech errors as reflections of the cognitive mechanisms involved in language production. By synthesizing findings from psycholinguistic literature, it explores how errors such as substitutions, omissions, and reversals provide insights into processes like lexical access, phonological encoding, and executive control. Through the analysis of various studies, this paper highlights how speech errors reveal both the limitations and efficiencies of the human language system. The findings demonstrate that speech errors are not merely incidental but serve as critical evidence of the brain's language processing dynamics. Furthermore, the study emphasizes the significant implications of understanding speech errors for advancing psycholinguistics, improving speech therapy practices, and enhancing language learning methodologies.*

Keywords: *Speech Errors, Cognitive Mechanisms, Language Production, Psycholinguistics, Executive Control, Lexical Access*

Abstrak Penelitian ini meneliti kesalahan bicara sebagai refleksi mekanisme kognitif yang terlibat dalam produksi bahasa. Dengan mensintesis temuan dari literatur psikolinguistik, penelitian ini mengeksplorasi bagaimana kesalahan seperti substitusi, penghilangan, dan pembalikan memberikan wawasan ke dalam proses seperti akses leksikal, pengodean fonologis, dan kontrol eksekutif. Melalui analisis berbagai penelitian, makalah ini menyoroti bagaimana kesalahan bicara mengungkap keterbatasan dan efisiensi sistem bahasa manusia. Temuan tersebut menunjukkan bahwa kesalahan bicara tidak hanya bersifat insidental tetapi berfungsi sebagai bukti penting dari dinamika pemrosesan bahasa otak. Lebih jauh, penelitian ini menekankan implikasi signifikan dari pemahaman kesalahan bicara untuk memajukan psikolinguistik, meningkatkan praktik terapi bicara, dan meningkatkan metodologi pembelajaran bahasa.

Kata Kunci: *Kesalahan Bicara, Mekanisme Kognitif, Produksi Bahasa, Psikolinguistik, Kontrol Eksekutif, Akses Leksikal*

INTRODUCTION

Language production is a multifaceted cognitive process involving the interplay of multiple systems. The act of producing speech necessitates the integration of conceptualization, lexical retrieval, phonological encoding, and motor articulation. Despite the apparent fluency in spoken communication, speech errors remain a pervasive phenomenon that provide profound insights into cognitive processes. These errors, encompassing mispronunciations, malapropisms, and slips of the tongue, are not random occurrences but rather reflect the systematic ways in which the brain processes, retrieves, and organizes linguistic information.

The analysis of speech errors has been a focal point of psycholinguistic research, contributing to a deeper understanding of language production mechanisms. These errors serve as a lens to explore the interaction between critical cognitive processes, such as lexical access, phonological encoding, and executive control. Empirical evidence

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suggests that speech errors emerge at various stages of language production, highlighting the interconnected and dynamic nature of these processes, which are occasionally subject to interference or breakdown.

B. Research Problem

Although considerable research has explored the classification and typology of speech errors, fewer studies have examined how these errors reveal the cognitive mechanisms underlying language production. Foundational theories by scholars such as Freud and Levelt have provided important insights into speech errors, yet the exact function of executive control in detecting and correcting these errors remains unresolved. Additionally, there is a limited understanding of how speech errors may reflect broader cognitive processes, including attention and working memory, and how these processes interact to sustain fluency in speech.

How do speech errors reflect the cognitive mechanisms involved in language production, and what role does executive control play in their detection and correction?

C. Research Objective

The primary objective of this research is to examine how speech errors provide insights into the cognitive mechanisms underlying language production, with a specific focus on executive control, lexical access, and phonological encoding. By synthesizing findings from existing psycholinguistic studies, this paper seeks to elucidate the relationship between speech errors and cognitive processes, contributing to a deeper understanding of how the brain identifies and rectifies errors in real-time language production.

PREVIOUS WORK

A. Speech Errors and Cognitive Mechanisms

The study of speech errors has played a pivotal role in psycholinguistics. Sigmund Freud's theory, particularly his concept of the "Freudian slip," posits that speech errors reveal unconscious desires and psychological influences. However, contemporary psycholinguistic theories present a more mechanistic perspective, focusing on the cognitive stages involved in language production.

Levelt's (1989) influential model of language production suggests that it unfolds in stages: conceptualization, formulation, and articulation. According to this model, errors commonly arise during the formulation stage when a speaker retrieves words from memory, but competition between similar lexical items leads to misfires. In terms of cognitive mechanisms, Meyer (1996) proposes that speech errors result from the interaction between lexical access and phonological encoding.

Lexical access refers to retrieving words from memory, while phonological encoding involves converting these words into speech sounds. Errors in either process can lead to slips of the tongue, such as word substitutions or mispronunciations. Garrett's (1975) model further emphasizes the role of executive control processes, such as attention and monitoring, in speech production. Executive control is responsible for detecting and

correcting errors, a function that can occur either consciously or automatically, depending on the context of the speech act.

B. Theories on Speech Errors

- Freudian Slip
  Freud's early work on speech errors proposed that they might reflect unconscious desires, repressed thoughts, or hidden psychological content. Although this theory has largely been supplanted by more cognitive frameworks, it continues to offer a perspective on how the mind may process and express subconscious material through speech.
- The Conceptualization-Formulation-Articulation Model (Levelt, 1989)
  Levelt's model posits that speech errors predominantly occur during the formulation phase, when speakers select the words they wish to use. Errors at this stage can provide insights into the processes of lexical access (retrieving words from memory) and phonological encoding (transforming words into speech sounds).
- Monitoring and Control (Garrett, 1975)
  Garrett's theory emphasizes the critical role of executive control mechanisms in detecting and correcting speech errors. These mechanisms enable speakers to monitor their speech in real time and make corrections as needed, ensuring the effectiveness of communication and maintaining fluency in language production.

C. Cognitive Mechanisms: Lexical Access and Executive Control

Research by Meyer (1996) and Laver (2000) has shown that speech errors often arise from failures in lexical access, which involves selecting and retrieving the correct words from the mental lexicon. Errors such as malapropisms (using a word that sounds similar but is incorrect) or perseverations (repeating a previous word) indicate that lexical access is not always flawless and can be disrupted by competing lexical items.

Executive control mechanisms, in contrast, govern the brain's ability to direct attention and suppress irrelevant information. These processes are essential during the monitoring phase of speech production. When a speaker makes an error, the executive control system must identify the mistake and either correct it or suppress it in real time. Studies by Shattuck-Hufnagel (1979) and Meyer & Bock (1992) suggest that the detection and correction of errors occur through the dynamic interaction between attentional control and working memory.

RESEARCH METHOD

A. Research Design

This study adopts a qualitative research design, utilizing a library research methodology. It involves reviewing a range of existing psycholinguistic studies, experimental results, and theoretical papers related to speech errors. Using a survey research approach, the paper integrates findings from various studies to develop a thorough understanding of the cognitive mechanisms involved in speech production.

B. Research Subjects

The subjects of this study consist of the written works of scholars from the fields of psycholinguistics, cognitive psychology, and neuroscience. These include theoretical papers, experimental research, and reviews on the cognitive processes related to speech errors. Key researchers whose work is central to this study include Levelt, Garrett, Meyer, and Shattuck-Hufnagel.

C. Research Object

The focus of this study is the conceptual understanding of the cognitive mechanisms that underlie speech errors. This encompasses the roles of lexical access, phonological encoding, and executive control in the detection and correction of errors.

DATA ANALYSIS

A. Lexical Access and Speech Errors

Research indicates that speech errors frequently arise when there is competition between similar lexical items. For instance, Meyer (1996) found that substitutions commonly occur between words that are semantically or phonologically related (Laganaro, 2019). This suggests that lexical retrieval is a competitive process, with errors more likely when multiple lexical items are activated at once. Meyer further explains that when words with similar meanings and sounds are activated simultaneously during speech production, interference can occur (He et al., 2021). This interference results in incorrect word choices, leading to errors such as substitutions (Al-Sobhi, 2019).

Dell (1986) supports these findings, showing that speech errors can emerge at multiple levels, including phonemic, morphemic, and lexical levels (Dell et al., 2021). Dell developed an interactive activation-spreading model, which explains that when a word or sound is activated, its activation spreads to related items, including both phonologically and semantically similar words (Chen et al., 2021). As a result, when a person tries to pronounce a word, other closely related words may become activated and compete for pronunciation.

The interaction between lexical items during speech production can lead to errors, especially when cognitive control is insufficient to resolve the competition. Levelt (1999), in his theory of speech production, suggests that lexical retrieval involves several stages, including conceptualization, formulation, and articulation (Pulvermüller, 2023). During the formulation stage, selecting the appropriate word from the mental lexicon must be done quickly and efficiently (Castro et al., 2020). If the right word cannot be retrieved, or if executive control fails to resolve the competition between activated words, speech errors will occur.

Further research by Vigliocco and Hartsuiker (2002) expanded our understanding of speech errors by showing how lexical and syntactic components interact (Gauvin & Hartsuiker, 2020). Their findings indicate that substitution errors often involve words that are not only phonologically or semantically similar but also share the same syntactic function within the sentence. This suggests that lexical retrieval is influenced by both

sentence structure and contextual usage. When the syntactic context favors the activation of competing words, the likelihood of speech errors increases (Hardy et al., 2020).

A key study by Goldberg and Ferreira (2022) demonstrated that word frequency also influences speech errors (Goldberg & Ferreira, 2022). More frequently used words have higher baseline activation levels, making them more easily selected during speech production. However, this also means that less common words can be substituted with more common ones in certain contexts, resulting in substitution errors (Bryant et al., 2023).

Research by Torres-Prioris (2019) emphasizes the critical role of executive control in minimizing speech errors. The study found that individuals with executive control deficits, such as those with certain neurological disorders, are more prone to making speech errors (Torres-Prioris et al., 2019). This highlights that, aside from lexical competition, the ability to monitor and correct speech production is vital for reducing errors. Executive control helps suppress the activation of unwanted words, ensuring the correct word is selected and spoken (Shen & Janse, 2020).

In conclusion, the evidence suggests that speech errors result from a complex and competitive lexical retrieval process. The simultaneous activation of multiple lexical items, the interaction with syntactic structure, word frequency, and cognitive control all contribute to the occurrence of speech errors (Hsu et al., 2021). Understanding these mechanisms offers a deeper insight into language production and how various factors influence the fluency of speech.

B. Phonological Encoding and Speech Errors

Phonological encoding errors occur when a speaker selects a word but mispronounces it. Laver (2000) found that mispronunciations, such as saying "relax" instead of "cashew," are more frequent during fast speech. This highlights the complexity of transforming mental word representations into spoken form and the potential for errors in this process. According to Laver, these phonological errors arise due to the multiple stages involved in phonological encoding, including selecting the correct phonemes and sequencing them properly (Ramoo et al., 2024).

Garrett's (1980) studies show that phonological errors tend to happen at the sub-lexical level, where individual phonemes are selected and arranged into words (Nour Abu Guba et al., 2023). Garrett suggested that this process involves a complex network of phonological nodes, which can inadvertently activate incorrect phonemes, leading to errors in the word sequence.

Fromkin's (1971) research categorized phonological errors into several types, such as phoneme substitution, metathesis (swapping phoneme positions), and elision (omitting phonemes) (Merabet & LAGRAA, 2023). Fromkin's findings suggest that phoneme substitutions often occur when two phonemes share similar articulatory features, like the place or manner of articulation. For example, substituting /p/ with /b/ or /t/ with /d/.

Shattuck-Hufnagel's (1979) research supports the idea that phonological errors may result from interference caused by similar phonological structures in the mental lexicon

(Alderete et al., 2019). Shattuck-Hufnagel developed a model where speech errors can be predicted based on the phonological activation patterns of words frequently used together in a given context.

Phonological errors are also more common in fast speech contexts, where time to access and organize phonemes is limited. Research by Butterworth (1989) shows that speech rate directly affects the frequency of phonological errors. When speakers attempt to speak quickly, the phonological encoding process has to be completed in less time, increasing the likelihood of errors (Kilbourn-Ceron et al., 2020).

Levelt's (1989) speech production theory also provides insight into phonological errors. He proposed that speech production involves several stages, including lexical selection and articulation (Roelofs & Ferreira, 2019). During the phonological stage, the selected word is converted into a pronounceable form. Levelt suggests that errors at this stage often occur because the mental representation cannot be synchronized with the required articulatory movements.

Neuropsychological research further demonstrates that damage to specific brain areas can impact phonological encoding. Caplan (1992) found that damage to Broca's area can result in difficulties with phonological encoding, causing errors such as phoneme substitutions or distortions (Denes et al., 2020). This indicates that phonological encoding relies not only on cognitive processes but also on the integrity of specific brain structures.

Phonological errors are also influenced by emotional distress and fatigue. Research by Moser (1995) indicates that individuals under emotional stress or experiencing fatigue tend to make more phonological errors. This is likely due to a decrease in cognitive capacity to process information efficiently under such conditions (Behrens et al., 2023).

In conclusion, errors in phonological encoding reflect the intricate and susceptible nature of converting mental representations into spoken form. By understanding the factors that influence phonological encoding, we can gain a deeper insight into the process of speech production and the reasons certain errors are more likely under specific conditions. Further research is needed to explore how neurobiology, psychology, and environmental factors affect phonological encoding and speech production in general.

C. Executive Control and Error Correction

Garrett (1975) and Shattuck-Hufnagel (1979) propose that executive control mechanisms play a vital role in overseeing and correcting speech errors. These mechanisms enable the speaker to identify and correct errors during speech production, ensuring fluency and accuracy in communication. Executive control involves several high-level cognitive functions, such as attention, working memory, and decision-making (Satterfield & Killgore, 2019). This suggests that speech errors are not random but are closely linked to higher cognitive functions like attention and working memory.

Research by Levelt (1989) supports this idea, stating that executive control in speech production includes monitoring planned utterances before they are spoken (Gauvin & Hartsuiker, 2020). According to Levelt's monitoring model, before a word or phrase is spoken, its mental representation is compared to the desired target to check for

congruence. If any discrepancies are found, the executive control system corrects the error before it is spoken aloud.

Nozari, Dell, and Schwartz (2011) demonstrated that effective executive control is crucial for reducing both the frequency and severity of speech errors, particularly in individuals with aphasia. Their research found that deficits in executive control, as seen in certain neurological disorders, make individuals more prone to speech errors and hinder their ability to correct them (Simic et al., 2019). This suggests that executive control is essential not only for error detection but also for the implementation of effective correction strategies.

Executive control is key in monitoring speech production and making real-time corrections, reflecting the brain's constant regulation of language production. Hartsuiker and Kolk (2001) showed that the executive control system in speech production operates similarly to the control system in other cognitive tasks. Their model demonstrated that speech errors could be monitored and corrected through the same control mechanisms used for general cognitive monitoring. The study also indicated that disruptions in executive control, such as divided attention or overloaded working memory, could lead to speech errors (Kattner, 2021).

Oomen and Postma (2001) highlighted the importance of executive control in detecting and correcting spontaneously occurring speech errors. Using a dual-task method, they showed that increasing cognitive load significantly impaired the ability to detect and correct errors, suggesting that available executive control capacity is crucial for effective speech error monitoring and correction (Baker et al., 2021).

Neuropsychological studies also support the role of executive control in speech production. Research by Stuss and Benson (1986) showed that damage to the frontal lobes, which are responsible for executive control, leads to more frequent speech errors and a diminished ability to correct them. This indicates that the integrity of the frontal lobes is essential for effective executive control in speech production (Hertrich et al., 2021).

Dell and Reich (1981) developed an interactive activation-spreading model to explain how executive control influences speech production. According to this model, during speech production, words and phonemes are activated in an interactive network, and executive control helps direct this activation, ensuring the correct elements are selected and spoken. When executive control is impaired, incorrect activation may occur, resulting in speech errors.

Botvinick, Braver, Barch, Carter, and Cohen (2001) found that executive control in speech production also involves monitoring conflicts that arise during language processing. They discovered that brain regions like the anterior cingulate cortex (ACC) play a crucial role in detecting these conflicts and initiating corrective actions. The ACC helps direct attention and cognitive resources to correct speech errors (De la Fuente Garcia et al., 2020).

Overall, executive control is a fundamental component of successful language production. Understanding how executive control functions to monitor and correct speech

errors offers valuable insights into how the brain organizes and manages this complex process. Further research is needed to explore the influence of various factors, including neurological and environmental conditions, on the role of executive control in speech production.

RESULTS AND DISCUSSION

The review of existing research shows that speech errors are not simply mistakes but provide insight into the cognitive mechanisms behind language production. These errors offer a glimpse into the mental processes of lexical access, phonological encoding, and executive control, which together manage the intricate task of producing fluent speech.

A. Lexical Access and Its Role in Speech Errors

As highlighted in numerous studies, lexical access—the process of retrieving words from the mental lexicon—is a vital stage in language production. Disruptions in lexical access can lead to errors such as word substitutions or tip-of-the-tongue (TOT) states. Meyer (1996) demonstrated that lexical errors are more likely when the brain retrieves words that are either semantically or phonologically similar, causing semantic substitution errors (e.g., saying "dog" instead of "cat") or phonological errors (e.g., saying "televise" instead of "television"). This suggests that the brain relies on both semantic and phonological connections during lexical retrieval, and when these connections become too strong, they can interfere with one another, resulting in errors.

In Garrett's (1975) model of speech production, he pointed out that lexical selection and phonological encoding are not always perfectly aligned. For example, in cases of perseveration—where a speaker repeats a word that was previously used—it indicates that lexical retrieval may not be fully completed before another word is activated. This overlap between words within the mental lexicon can lead to errors in speech production.

Therefore, lexical access plays a key role in speech errors, with the word retrieval process often being subject to competition among multiple candidates. The brain's failure to resolve this competition effectively often leads to errors, reflecting the inherent complexity of lexical access.

B. Phonological Encoding and the Emergence of Phonetic Errors

Phonological encoding—the process of converting lexical items into their corresponding sounds—represents another crucial stage where speech errors can arise. As Laver (2000) points out, mispronunciations, such as saying "blushing" instead of "bushing," occur when there is a breakdown in the coordination between a word's mental representation and its phonetic output. These errors are more likely when speakers are under time constraints or distracted, underscoring the importance of phonological encoding for smooth speech production.

Phonological errors can also be a result of difficulties in articulating complex phonological sequences, particularly when speakers are fatigued or distracted. For instance, Shattuck-Hufnagel & Klatt (1979) noted that phonological errors frequently occur during rapid speech, where the articulation of one sound can affect neighboring sounds, leading to anticipation errors (e.g., saying "tap" instead of "pat") or perseveration errors (e.g., "readd" instead of "read"). These errors indicate that the brain constantly coordinates motor processes with cognitive representations of speech sounds, and when this coordination fails under certain conditions, it can lead to slips of the tongue.

C. Executive Control and the Detection and Correction of Errors

While lexical access and phonological encoding focus on retrieving and producing linguistic units, executive control mechanisms are essential for overseeing these processes and identifying errors as they occur. Garrett (1975) emphasized the role of executive control in error correction, suggesting that the monitoring system functions as a feedback loop that continuously checks the accuracy of language production. When an error is detected, the executive control system enables the speaker to correct it, either by rearticulating the word or substituting it with a more appropriate one.

Shattuck-Hufnagel (1979) further emphasized the importance of working memory and attention in speech monitoring. Errors are more likely when there is insufficient attention or when working memory becomes overloaded. In fast-paced or cognitively demanding situations, the brain may lack the resources to fully monitor speech production, leading to an increase in errors. This was supported by neurocognitive studies, which linked damage to the prefrontal cortex—an area involved in executive control—to difficulties in monitoring and correcting speech errors (e.g., Kern et al., 2009).

Executive control not only facilitates error correction but also involves error suppression. The cognitive system often suppresses minor errors to prevent them from interrupting the flow of communication, a process that usually occurs unconsciously. This suppression mechanism helps maintain the appearance of fluent speech, even in the presence of occasional mistakes.

D. Implications for Psycholinguistic Theory and Practice

The findings highlight that speech errors offer valuable insights into the interaction between cognitive mechanisms involved in language production. The roles of lexical access, phonological encoding, and executive control suggest that language production is not a linear process, but a dynamic interaction between various cognitive systems. This challenges existing models of language production that treat these processes as isolated or sequential, and has significant implications for psycholinguistic theory.

Additionally, understanding the role of speech errors in cognitive processing has practical applications in language teaching and speech therapy. For example, language educators can use the knowledge of lexical errors to create more effective vocabulary

learning strategies that account for the cognitive demands of word retrieval. Similarly, speech therapists can apply insights into error correction to assist individuals with speech disorders in developing better self-monitoring abilities, especially for those dealing with speech fluency issues or aphasia.

CONCLUSION

This paper has demonstrated that speech errors are not merely mistakes in language production but serve as an insight into the cognitive mechanisms underlying lexical access, phonological encoding, and executive control. By reviewing existing psycholinguistic studies, we have observed that errors are an inherent result of the complex nature of language production, reflecting the dynamic interaction of various cognitive processes. Errors in lexical access, phonological encoding, and executive control are closely connected in the speech production process. These errors offer a valuable perspective for researchers to investigate the cognitive foundations of language use and provide practical implications for both education and therapy.

SUGGESTION

While this study has provided an in-depth analysis of speech errors as reflections of cognitive mechanisms, several directions for future research remain. One key area is examining individual differences in error types and their cognitive correlates. For instance, future studies could explore whether certain individuals are more susceptible to specific speech errors and whether these differences are linked to variations in cognitive abilities like working memory or attention control.

Another promising avenue is the investigation of contextual factors in speech errors. Much of the existing research has focused on controlled, laboratory-based speech tasks. However, real-world speech is more variable, and factors such as stress, cognitive load, and distraction may significantly impact the frequency and nature of errors. Exploring how these contextual factors influence speech production could offer additional insights into the role of cognitive mechanisms in everyday language use.

Lastly, future research should examine the neurocognitive basis of speech errors. Advances in neuroimaging techniques, like fMRI and EEG, could enable researchers to track the brain regions involved in error detection and correction, providing a clearer understanding of the neural processes that underpin language production.

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