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A comprehensive review of effects of linguistic distance in bilingual aphasia

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Abstract. This literature review synthesizes three seminal studies on cross-linguistic treatment effects in bilingual aphasia. The first study delves into the interplay between language proficiency and linguistic distance in treatment outcomes, revealing nuanced findings. The second study provides new insights into the role of language characteristics and typology in bilingual aphasia, shedding light on language processing and recovery patterns. The third study offers a meta-analytic perspective, emphasizing the impact of language similarity on linguistic competence in aphasic individuals. By integrating these studies, this review aims to present a comprehensive understanding of the complex relationship between linguistic factors and treatment efficacy in bilingual aphasia.

Keywords: Bilingual aphasia, recovery, linguistic distance

1. Introduction

This literature review synthesizes pivotal studies in bilingual aphasia, which is the damage to the language-processing brain areas of bilingual patients, primarily in the left cerebral hemisphere's perisylvian region, that impairs the ability to understand or convey language [1], focusing on the interplay of language proficiency, linguistic distance, and language typology on treatment outcomes. Bilingual aphasia can be identified using the Bilingual Aphasia Test (BAT) developed by Michel Paradis, which is a systematic assessment of all the languages known by an aphasic patient is an essential prerequisite for both clinical procedures and neurolinguistic research on multilingualism [2].

Bilingual aphasia presents unique challenges, requiring an understanding of the nuanced interactions between an individual's languages. The concept of linguistic distance, the structural differences between languages, is particularly crucial in understanding and treating bilingual aphasia. It influences how treatment in one language might transfer to another, considering their typological similarities or differences.

Moreover, language proficiency emerges as a significant factor, where higher proficiency often correlates with more effective recovery. This relationship underscores the importance of tailored therapeutic approaches. The synthesis of these studies aims to provide a comprehensive perspective on the complexities in bilingual aphasia treatment, emphasizing the need for considering both linguistic distance and proficiency in therapeutic strategies.

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2. Linguistic Distance in Treatments

Linguistic distance is gauged based on their typological features, which indicate the structural characteristics they share [2]. Proximate languages exhibit a common typology, implying that they possess similar fundamental linguistic traits and may have evolved from a common ancestor or have been significantly influenced by each other over time. This shared typology facilitates mutual comprehension and may contribute to a certain degree of linguistic affinity among speakers of proximate languages. The latter component is of specific interest as it allows us to measure the potential impact of linguistic divergence on the transferability of treatment effects across languages. The first study is framed around two key components: language proficiency and linguistic distance. Language proficiency is defined by DN, a bilingual aphasia patient's self-rated proficiency levels in his languages, with scores ranging from 4 to 9 on a 1–9 scale. Linguistic distance refers to the degree of difference or similarity between DN's languages.

The treatment employed in this study was delivered in Dutch, DN's first language, with an aim to improve spontaneous speech efficiency. The treatment involved a method known as Oral Reading for Language in Aphasia (ORLA), emphasizing oral reading of connected discourse and rhythm and pacing of speech.

The study found that the improvement in DN's Dutch language skills following treatment did, to an extent, generalize to his other highly proficient languages. However, this effect was minimal for the languages where DN had lower proficiency. The interplay between language proficiency and similarity is evident in the findings in two distinct manners. Progress in Dutch had a positive effect on all of DN's highly proficient languages. This particularly favored French, which is the least similar to Dutch, and had the greatest benefit. Conversely, German, which is the most similar, experienced the smallest benefit. Consequently, in terms of cross-linguistic generalization, comparable proficiency heightened the probability of improvement, while linguistic similarity reduced this likelihood. Regarding cross-linguistic interference, our data indicate that uneven proficiency levels may elevate the likelihood of interference in languages with linguistic similarities [3]. The results highlight the importance of proficiency in determining the level of cross-language generalization.

The study also found that greater cross-linguistic transfer occurred to linguistically dissimilar languages rather than similar ones. In this context, linguistically similar languages stem from the same linguistic family, as exemplified by Spanish and Catalan, which share a substantial portion of their vocabulary, grammar, and phonetic traits. These similarities are the result of their historical development from a common source.

On the other hand, linguistically dissimilar languages such as Chinese and English do not share a linguistic family [5]. They emerge from separate linguistic lineages, with distinct origins and evolutionary paths. As a result, their structures, vocabulary, and phonological patterns can be markedly different. For example, Chinese is characterized by its logographic writing system and tonal phonology, while English utilizes an alphabet-based script and a non-tonal phonological system.

Moreover, the influence of language distance on the overall linguistic competence of bilingual aphasic individuals is recognized [4]. For instance, a group of French-English bilinguals with aphasia were found to be more accurate at naming pictures representing cognates compared to noncognates, which is the review, was defined as the proportion of words with similar meanings and forms shared.

3. Typology

The relevance of morpho-syntactic structures and language typology to the processing of aphasia indicate that languages with more regular structures are easier for patients to handle, which supports the concept of linguistic distance, where languages with more shared syntax and morphology would be less challenging for aphasic patients [4]. The declarative/procedural model and the integrative model, both of which explore how bilingual individuals process syntax, suggest that the syntactic structures of the languages a bilingual individual speaks could influence the impairment patterns observed in aphasia. This lends credence to the role of linguistic distance in language processing. It is also demonstrated that the transfer of recovery effects from the language receiving treatment to the untreated language is

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contingent upon both the language's typology (its structural and feature characteristics) and the structural dissimilarity between them (for instance, Chinese-Spanish versus Spanish-Catalan). The latter aspect holds particular significance in the context of syntax processing, as many languages exhibit distinctions in syntax, even if they share orthographic similarities.

Language mixing and switching, common symptoms in bilingual aphasic patients, can be influenced by factors such as linguistic environment and individual language background, which are linked to the similarity or dissimilarity between languages [3]. Linguistic distance can contribute to the complexity of these symptoms, as the cognitive effort to switch between similar or dissimilar languages may differ.

4. Methods

The methodologies employed in the studies are varied and tailored to their specific research questions. The first study uses a case study design to closely examine the language recovery process in a bilingual aphasia patient named DN. This study is unique in its approach as it focuses on one individual undergoing treatment, providing a detailed and in-depth perspective. The treatment method used is Oral Reading for Language in Aphasia (ORLA), which is administered in DN's first language, Dutch. To assess language proficiency, the study utilizes self-rated proficiency scores. Additionally, it incorporates an analysis of typological features to evaluate the linguistic distance between DN's languages. This approach allows for a nuanced understanding of how language proficiency and linguistic distance impact language recovery in bilingual aphasia.

The second study diverges from the first by conducting a comprehensive literature review and meta-analysis. This approach aims to gather and synthesize existing research findings on linguistic distance and bilingual aphasia. By analyzing a broad range of studies, this second study provides a more generalized understanding of the field. The meta-analysis component allows for the identification of patterns and trends across different studies, contributing to a more robust understanding of how linguistic distance influences bilingual aphasia.

The third study adopts a comparative approach, focusing on French-English bilinguals with aphasia. This study specifically examines these individuals' performance in tasks involving cognates (words that are similar in both languages) and noncognates (words that are different across languages). This approach sheds light on how linguistic similarities and differences affect language processing in bilingual individuals with aphasia. By comparing performance on these two types of words, the study aims to uncover the role of linguistic similarity in language recovery.

5. Discussion

The synthesis of findings from these diverse studies offers a multi-faceted view of the complexities in bilingual aphasia. It becomes apparent that the interplay between language proficiency, linguistic distance, and language characteristics is intricate and varies from individual to individual. One of the key findings is that treatment effects tend to be more pronounced in languages where the patient has higher proficiency. This suggests that existing language skills play a significant role in recovery. However, an intriguing observation is that linguistic similarity does not consistently facilitate cross-language recovery, challenging the assumption that more closely related languages automatically lead to better recovery outcomes.

Another significant aspect highlighted by these studies is the importance of structural similarities and shared syntax between languages in the process of language processing and recovery. This finding emphasizes the need to consider the grammatical and syntactical aspects of languages when developing treatment plans for bilingual aphasia patients.

6. Conclusion

In conclusion, this comprehensive review of different methodological approaches provides a holistic perspective on the complex dynamics between linguistic factors and treatment outcomes in bilingual aphasia. By integrating the results from case studies, literature reviews, meta-analyses, and comparative studies, a more nuanced understanding of bilingual aphasia treatment is achieved. This synthesis

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highlights the unique challenges and opportunities in treating bilingual aphasic patients and suggests that future research, especially on the nuances of linguistic distance, holds great potential to enhance our understanding and improve therapeutic strategies for this population. The need for tailored approaches that consider individual linguistic profiles is underscored, advocating for more personalized treatment strategies in the field of aphasia therapy.

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