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Exploring Pragmatic Deficits in Broca's Aphasia Through Relevance Theory

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Abstract

This article delves into applying Sperber and Wilson's Relevance Theory (2006) as a framework for comprehending language deficits in individuals diagnosed with Broca's Aphasia. The theoretical foundation elucidates how communication difficulties characteristic of Broca's Aphasia can be understood through optimizing relevance in discourse. It explores the efficacy of Relevance Theory in explicating the challenges faced by individuals with Broca's Aphasia in expressing and processing linguistic information. Relevance Theory posits communication as a cognitive endeavor wherein speakers aim to maximize relevance, balancing cognitive effort and informational load. Methodologically, the study employs qualitative analysis of interactions between individuals with Broca's Aphasia and interviewers. Using a corpus of three transcripts of language assessments retrieved from the Aphasia Bank database (MacWhinney et al., 2000), the research employs a qualitative linguistic analysis. Applying this framework to Broca's Aphasia, characterized by expressive language impairments, offers insights into the pragmatic strategies employed by individuals to convey meaning. Findings underscore the benefits of employing Relevance Theory in elucidating language deficits, providing a better understanding of the pragmatic challenges faced by individuals with Broca's Aphasia. However, the application of this theory also reveals challenges, particularly in accounting for the diverse and context-specific nature of language impairments within this population. In conclusion, the study advocates for the development of a specialized framework tailored to the unique language challenges inherent in Broca's Aphasia.

Keywords: Broca's Aphasia, Relevance Theory, Pragmatics, Linguistic Analysis.

1. Introduction

Broca's Aphasia is a language disorder resulting from damage to Broca's area in the frontal lobe of the brain [1]. First identified by French neurologist Paul Broca in the 19th century, this condition has since been extensively studied, yet its underlying mechanisms and the best approaches for intervention remain subjects of ongoing research and debate [1]. Broca's Aphasia is characterized by expressive language impairments, including difficulty in producing grammatically complex sentences, limited vocabulary, and challenges with articulation, while comprehension abilities are relatively preserved [2].

Relevance Theory (henceforth RT) was developed by Sperber and Wilson and posits that communication is fundamentally an inferential process aimed at maximizing relevance [21,22]. According to this theory, individuals engage in cognitive processes to derive maximally relevant interpretations with minimal cognitive effort. The concept of explicatures and implicatures plays a crucial role, where explicatures are explicitly conveyed meanings, and implicatures are indirectly conveyed meanings that contribute to the relevance of an utterance. RT emphasizes individuals' inherent drive to maximize relevance in communication. This theory asserts that communication is an inferential process where speakers aim to strike a delicate balance between cognitive effort and cognitive effects [3].

In RT, the distinction between explicatures and implicatures plays a crucial role in understanding the layers of meaning conveyed in utterances. Explicatures refer to the explicitly communicated meanings in an utterance [4]. They constitute the surface-level, directly stated information intended by the speaker. For example, in the sentence "She locked the door", the explicature is the straightforward statement that the subject performed the action of locking the door. Conversely, implicatures encompass indirectly conveyed meanings that contribute to the relevance of an utterance [5]. These implicit meanings are inferred by the listener based on contextual cues and background knowledge, rather than being explicitly stated by the speaker.

Implicatures can range from strong to weak, with strong implicatures carrying more weight in interpretation and weak implicatures contributing to constructing relevant interpretations [6]. For instance, consider the statement "The car is parked outside". The explicature of this sentence is the literal description of the car's location. However, depending on the context, various implicatures could arise. If said in response to someone asking for a ride, the implicature may be that the car is available for transportation. Alternatively, if said during a discussion about safety, the implicature may be that the car is parked in a secure area. Accordingly, RT suggests that speakers strategically select and encode information to maximize relevance while minimizing cognitive effort for both themselves and their interlocutors.

By balancing the provision of explicatures and implicatures, speakers aim to convey meaning effectively and efficiently in communication contexts. This theoretical framework unveils the cognitive processes underlying language use and comprehension, and the way individuals navigate the complexities of linguistic interaction.

In light of this, Sperber and Wilson's RT has the potential to unveil the pragmatic challenges faced by individuals with Broca's Aphasia, suggesting that speakers aim to maximize relevance in communication. Despite language impairments, individuals with Broca's Aphasia, like all speakers, strive to convey messages that are both meaningful and contextually appropriate. RT emphasizes the role of implicatures – indirectly conveyed meanings that contribute to the relevance of an utterance – in guiding comprehension and interpretation. The theory's focus on maximizing relevance aligns with the pragmatic challenges encountered by individuals with Broca's Aphasia, particularly in the context of expressive language deficits.

Accordingly, focusing on strong implicatures holds potential promise in addressing the communicative difficulties associated with Broca's Aphasia. RT suggests that the indeterminacy and fuzziness inherent in strong implicatures accommodate the pragmatic challenges faced by individuals with expressive language impairments [7]. This approach focuses on RT's emphasis on meta-representational abilities, aligning with the cognitive challenges experienced by individuals with Broca's Aphasia [8]. Furthermore, RT underscores the significance of context in communication, highlighting its role in shaping interpretations and guiding pragmatic inferences. Accordingly, this study explores RT, outlines its key principles, and investigates its potential applicability in the context of Broca's aphasia, by delving into the pragmatic aspects of language production, utilizing transcripts from language assessments as recorded in the Aphasia Bank database a project that seeks to advance Aphasia research [9]. Focusing on RT, the current piece of research aims to uncover specific pragmatic challenges faced by individuals with Broca's Aphasia.

2. Methods

To analyze the linguistic deficit present in Broca's Aphasia, this study employs a qualitative linguistic analysis. The corpus consists of transcripts obtained from language assessments conducted as part of the Aphasia Bank database [9]. The selection criteria included individuals with confirmed diagnoses of Broca's Aphasia and availability of language assessment transcripts for analysis. Three participants were included in the study, chosen to represent a range of severity and linguistic profiles within the Broca's Aphasia population.

The language assessments used in this study were retrieved from the Aphasia Bank database. These assessments consisted of standardized tasks administered by trained interviewers to evaluate various aspects of language production and comprehension [10]. The specific tasks included in the analysis are:

1. Stroke and Recovery: Participants were asked to discuss their experiences related to their stroke, including its onset, symptoms, and recovery process.
2. Important Event: Participants were prompted to share an important life event or memory, allowing for spontaneous narrative production.
3. Picture Descriptions: Participants were presented with pictures depicting common objects or scenes and asked to describe them in detail.
4. Cinderella Story: Participants were tasked with recounting a familiar story, such as Cinderella, to assess narrative abilities.
5. Peanut Butter and Jelly Sandwich: Participants were instructed to explain the process of making a peanut butter and jelly sandwich, evaluating their ability to produce sequential and procedural language.

The transcripts of the language assessments were analyzed using qualitative linguistic methods, guided by the principles of RT. The analysis process involved several steps:

1. Transcript Selection: Three transcripts were selected from the Aphasia Bank database, ensuring a diverse representation of linguistic abilities and challenges within the Broca's Aphasia population.
2. Transcription: The selected transcripts were transcribed verbatim, capturing all speech utterances, hesitations, and non-verbal cues.
3. Annotation: Each transcript was annotated to identify segments corresponding to the specific tasks outlined above (Stroke and Recovery, Important Event, Picture Descriptions, Cinderella Story, Peanut Butter and Jelly Sandwich).
4. Linguistic Analysis: A qualitative linguistic analysis was conducted on the annotated segments, focusing on linguistic features, syntactic structures, and discourse strategies employed by participants. The analysis aimed to identify patterns and deviations from typical language use, shedding light on the pragmatic challenges faced by individuals with Broca's Aphasia.
5. Application of Relevance Theory: The analysis was conducted within the theoretical framework of Relevance Theory, which posits that communication is an inferential process aimed at maximizing relevance.

The principles of RT were used to interpret the participants' communicative strategies and pragmatic challenges in light of their cognitive and linguistic impairments. Ultimately, the linguistic analysis focused on identifying key themes and patterns within the transcripts, particularly related to the participants' abilities to convey meaning, produce grammatically correct sentences, and maintain coherence in discourse. Participant confidentiality was maintained throughout the study, with all identifying information removed from the transcripts prior to analysis.

3. Results

The language assessment is based on the Western Aphasia Battery-Revised test following Aphasia Bank's protocol [11]. The transcripts contain the dialogue between the interviewer (INV) and the participant (PAR) revolving around the participant's experiences, specifically related to a stroke and various topics. The following are the analyses of the different

parts of the conversation through RT:

3.1. Stroke and Recovery

The participants' responses about the stroke provide minimal details, marked by disrupted and fragmented speech, (e.g. "Aphasia.. no.. Turkey to China") emphasizing the impact of the stroke rather than specific events. This brevity aligns with agrammatism and telegraphic speech, the hallmark of the illness, where speakers aim to balance cognitive effort and information conveyed [12]. Additionally, the participant's struggle to recall details indicates potential challenges in metarepresentational abilities. The patient's exhibit a grammatical speech, characterized by short, telegraphic utterances that prioritize conveying essential information while minimizing linguistic complexity. In the context of the stroke narrative, participants tend to focus on conveying the overarching impact of the stroke rather than providing detailed accounts of specific events or experiences. This preference for brevity may stem from the cognitive effort required to construct grammatically complex sentences and retrieve specific lexical items, which are often compromised in Broca's Aphasia. Moreover, the observed difficulty in recalling details suggests potential impairments in metarepresentational abilities, which involve the cognitive processes underlying the representation and manipulation of mental states.

3.2. Important Event

When prompted to share an important life event, the participants under study struggle to articulate a specific story. This could be attributed to the difficulty in accessing relevant information or organizing it coherently, which aligns with the expressive language challenges associated with Broca's Aphasia. The task of recounting an important life event requires participants to retrieve and organize episodic memories, construct a coherent narrative, and convey their personal experiences effectively. However, the patients encounter significant difficulties in these aspects due to expressive language deficits, including word retrieval difficulties, syntactic impairments, and impaired discourse coherence. The observed reliance on non-verbal cues such as clapping or raising hand gestures may reflect compensatory strategies employed by individuals with Broca's Aphasia to supplement their verbal communication. This reliance on non-verbal communication highlights the pragmatic challenges faced by individuals with Broca's Aphasia in navigating social interactions and conveying their intended meanings.

3.3. Picture Descriptions (Window, Umbrella, Cat)

The participants' descriptions of the pictures exhibit a mix of verbal and non-verbal elements. There is an effort to convey a story, but the linguistic challenges result in fragmented and incomplete narratives. RT predicts that individuals with communication disorders may employ compensatory strategies, such as gestures and expressions, to enhance the communicative impact. In the task of describing pictures depicting everyday objects and scenes, individuals with Broca's Aphasia demonstrate a combination of verbal and non-verbal communication strategies to convey meaning. Despite linguistic challenges, participants exhibit an effort to construct narratives around the visual stimuli, reflecting their underlying intention to

communicate effectively. However, linguistic impairments such as word-finding difficulties, syntactic deficits, and discourse fragmentation manifest in the fragmented and incomplete nature of the narratives. Participants struggle to maintain coherence and cohesion within their descriptions, resulting in disjointed speech characterized by hesitations, repetitions, and omissions.

3.4. Cinderella Story

The participants attempt to recount the Cinderella story, facing notable challenges in syntax, word retrieval, and coherence. The narrative is fragmented, with frequent hesitations and repetitions (e.g. "uh well..Cinderella was a poor child in uh... in.. uh"). In the task of retelling a familiar narrative such as the Cinderella story, individuals with Broca's Aphasia encounter significant challenges in syntactic organization, lexical retrieval, and discourse coherence. These difficulties are evident in the fragmented and disjointed nature of the narratives produced, characterized by hesitations, repetitions, and syntactic errors. The observed hesitations and repetitions may reflect attempts to overcome word-finding difficulties and formulate coherent utterances, highlighting the underlying effort and cognitive load associated with language production in Broca's Aphasia. Despite these challenges, participants demonstrate a persistent effort to convey the storyline of the Cinderella narrative, reflecting their motivation to engage in communicative tasks despite linguistic limitations. The observed difficulties in narrative coherence underscore the pragmatic challenges faced by individuals with Broca's Aphasia in constructing and conveying complex discourse.

3.5. Peanut Butter and Jelly Sandwich

The task involving the explanation of making a peanut butter and jelly sandwich elicits a concise and straightforward response. The participants showed understanding of the concept but the speech was marked with minimal responses such as "yes" and "uhu", and excessive fillers and hesitations, hindering the clarity of the intended messages and considered as violations of relevance. When tasked with explaining a procedural activity such as making a peanut butter and jelly sandwich, individuals with Broca's Aphasia demonstrate a basic understanding of the task requirements and exhibit a concise, albeit fragmented, verbal response. However, the linguistic output is characterized by minimal verbal elaboration, excessive fillers, and hesitations, impairing the clarity and coherence of the message. Despite the participants' ability to comprehend the task and generate a verbal response, linguistic deficits such as word-finding difficulties, syntactic impairments, and reduced verbal fluency hinder the production of detailed and coherent discourse. The observed violations of relevance, including excessive fillers and hesitations, reflect the underlying challenges in optimizing communication efficiency and minimizing cognitive effort in individuals with Broca's Aphasia.

4. Analysis

The application of RT to individuals with Broca's Aphasia unveils a spectrum of linguistic behaviors and pragmatic strategies aimed at navigating the complexities of communication. The analysis of these phenomena, drawing upon existing literature

and theoretical frameworks in aphasiology and cognitive science shows that individuals with Broca's Aphasia exhibit pragmatic strategies aimed at optimizing communication effectiveness despite expressive language impairments [13]. These strategies encompass linguistic simplification, reliance on non-verbal cues, and explicit expressions of attitudes toward attributed thoughts. For instance, during discussions about personal experiences such as strokes, individuals with Broca's Aphasia often provide minimal details, emphasizing the impact rather than specific events [14]. This conciseness aligns with agrammatism and telegraphic speech, characteristic of Broca's Aphasia, where individuals strive to balance cognitive effort and conveyed information [15].

An analysis of linguistic tasks such as picture descriptions and narrative retellings highlights the challenges individuals with Broca's Aphasia face in constructing coherent narratives. These difficulties arise from deficits in syntax, word retrieval, and coherence, which are hallmarks of agrammatism and impaired working memory [16]. Participants often exhibit fragmented speech marked by hesitations, repetitions, and syntactic errors, hindering the fluidity and coherence of their narratives [17]. This analysis underscores the intricate interplay between linguistic structures and cognitive processes in language production.

Additionally, in response to expressive language impairments, individuals with Broca's Aphasia frequently resort to compensatory strategies such as gestures, expressions, and non-verbal cues to augment verbal output and convey meaning more comprehensively [18]. These compensatory strategies serve as adjuncts to linguistic output, facilitating communication effectiveness despite linguistic challenges. During linguistic tasks involving picture descriptions, participants demonstrate a mix of verbal and non-verbal elements, utilizing gestures and expressions to complement verbal output and convey intended messages [19].

While individuals with Broca's Aphasia endeavor to maximize relevance in communication, instances of violations of relevance are evident in their linguistic behaviors. These violations manifest as excessive fillers, hesitations, and minimal responses, impeding the clarity and coherence of intended messages [20]. Tasks such as explaining procedural sequences or recounting narratives often elicit responses marked by syntactic fragmentation and lexical retrieval difficulties, indicative of violations of relevance and pragmatic impairments.

5. Discussion

The study contextualizes its findings within the broader landscape of aphasiology and linguistic theory. It reflects on the implications of using RT as a lens to understand pragmatic deficits, emphasizing the theoretical advancements and the practical insights gained. The discussion also critically assesses the limitations of the study, acknowledging the constraints of solely linguistic analysis. RT's principles open avenues for experimental investigations into language processing in Broca's Aphasia. Researchers could design experiments to test the comprehension of implicatures, pragmatic inferences, and the

recognition of implicit meanings in individuals with Broca's Aphasia. By manipulating contextual information and the effort and effect factors, these studies could shed light on how individuals with Broca's Aphasia navigate the challenges of relevance optimization.

The study's findings underscore the relevance of Relevance Theory in elucidating language deficits associated with Broca's Aphasia. The theory provides a conceptual foundation for understanding how individuals with expressive language impairments navigate their communicative challenges. The strategic optimization of relevance, evidenced through linguistic simplification and non-verbal compensatory strategies, offers valuable insights for clinicians and researchers. However, the study also illuminates the need for a specialized framework tailored to the unique language challenges inherent in Broca's Aphasia. The limitations of a generic theoretical approach point towards the necessity of a nuanced model that considers individual differences and contextual factors. Such a tailored framework would enhance the precision of assessments, interventions, and therapeutic strategies, ultimately improving communication outcomes for individuals with Broca's Aphasia.

It's crucial to acknowledge the heterogeneity within Broca's aphasia. Individuals may present with varying degrees of impairment, and therapeutic strategies need to be tailored to individual needs. While RT provides valuable insights, a comprehensive approach to treating Broca's aphasia should involve collaboration with professionals from various disciplines, including neurology, speech pathology, and psychology. Furthermore, the study explores potential avenues for future research, addressing the need for more extensive corpora, including diverse linguistic contexts, and refining the application of RT to accommodate the unique linguistic challenges faced by individuals with Broca's Aphasia. The discussion concludes by highlighting the study's contribution to advancing our understanding of linguistic deficits in Broca's Aphasia and the potential for informed therapeutic interventions based on pragmatic principles.

6. Conclusion

In conclusion, this research provides a linguistic analysis of individuals with Broca's Aphasia, employing RT to uncover pragmatic deficits in their language production. Through qualitative analysis of language assessment transcripts, the study reveals how individuals with Broca's Aphasia navigate expressive language impairments and optimize relevance in communication. The findings underscore the importance of considering both cognitive and linguistic factors in understanding language deficits associated with Broca's Aphasia. While RT offers a framework for interpreting the communicative behaviors of individuals with Broca's Aphasia, the study also highlights the need for a condition-specific model to fully capture the diverse nature of these deficits. Additionally, the study emphasizes the importance of personalized therapeutic interventions to fit individual linguistic profiles, informed by a deeper understanding of the pragmatic strategies employed by individuals with Broca's Aphasia. Further research is needed to

explore the applicability of RT in other linguistic contexts and to refine its application to accommodate the unique challenges faced by individuals with Broca's Aphasia. By continuing to investigate the cognitive and linguistic processes underlying language deficits in Broca's Aphasia, clinicians and linguists can develop more effective strategies to improve communication outcomes and enhance the quality of life for individuals living with this condition.

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