Original Paper

A Multimodal Study on Language Impairments in Chinese-Speaking Alzheimer's Disease Patients from the Perspective of Relevance Theory

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Abstract

With the intensification of global population aging, Alzheimer's disease (AD) has emerged as a significant public health issue among the elderly populations, with language impairment being one of its primary manifestations. This study, grounded in Relevance Theory, selects situated discourse from five elderly individuals in the early stages of AD featured in the reality show "Forget Me Not Cafe" as corpus material. Utilizing a multimodal corpus research method, it analyzes the manifestations of language impairment in these patients, aiming to comprehensively unveil their specific characteristics at both verbal and non-verbal levels. The findings reveal that affected elderly individuals exhibit five verbal manifestations, including redundant repetition, the use of filler words, naming difficulty, aborted phrases, and vague references. Meanwhile, they also employ non-verbal means such as gestures and laughter to make multimodal compensatory adjustments in communication. Furthermore, this study highlights the differences in the manifestations of language impairment between Chinese and English-speaking AD patients. English-speaking patients are more prone to issues like pronoun misuse, tense and voice errors, whereas Chinese-speaking patients predominantly exhibit tone confusion. This research not only holds significant importance for the academic development of gerontolinguistics but also possesses practical clinical application value and notable social benefits.

Keywords

Chinese-speaking Alzheimer's disease patients, language impairment, multimodal corpus research method, Relevance Theory

1. Introduction

Alzheimer's Disease (AD), also known as senile dementia, is a stealthily-onset and progressively-developing neurodegenerative disorder. Its clinical manifestations primarily include memory impairment, cognitive dysfunction and aphasia. Language impairment, one of the key manifestations of AD, refers to the difficulties patients encounter when using the language symbol system to express thoughts and emotions (Gu & Huang, 2020). This impairment encompasses multiple dimensions, including lexical, grammatical, and pragmatic aspects.

As the global population ages at an accelerated pace, AD has emerged as a significant public health issue. Language impairment in AD patients not only disrupts daily communication but also exerts profound impacts on their quality of life, mental well-being, and social relationships. Notably, while memory decline is a prominent feature of the disease, medical research has found that the deterioration of language functions in AD patients may even precede the decline in memory functions (Min et al., 2011; Guo, 2014; Guo & Chen, 2017). This underscores the unique disciplinary advantages and pioneering significance of studying language impairment in AD patients from a linguistic perspective, offering positive implications for early prevention and screening of the condition.

Therefore, this study focuses on the manifestations of language impairment in Chinese-speaking AD patients from a multimodal perspective, with Relevance Theory serving as its theoretical foundation. This research not only holds significant importance for the academic development of gerontolinguistics but also possesses practical clinical application value and notable social benefits, contributing to the familial prediction, clinical screening, and rehabilitation training of the disease.

2. Literature Review

2.1 Previous Studies on Language Impairments in AD Patients

Research on the speech phenomena of AD patients has been primarily conducted from two main aspects. Firstly, by describing and categorizing language impairment phenomena from a linguistic perspective. For instance, Dijkstra et al. (2004) classified speech manifestations into two categories: discourse building and discourse impairing, and found that elderly patients with the disease exhibit more pronounced and severe discourse impairing features compared to healthy elderly groups. Another example is the specialized study conducted by domestic scholar Liu (2014) on word-finding difficulties in patients with senile dementia. Secondly, by utilizing interdisciplinary knowledge from neurology, psychology, cognition, and other related fields to elucidate these phenomena. For example, Almor et al. (2009) investigated the common mechanisms underlying verb and noun naming deficits in AD patients.

Although language impairment in AD patients has garnered widespread attention, there are still some shortcomings in existing research. Firstly, most studies mainly focuses on unimodal analysis (purely linguistic aspects) (Lai, 2014; Fraser et al., 2016; Huang & Yang, 2022), lacking a comprehensive examination of multimodal data. Multimodal research can capture non-verbal features employed by patients during communication, such as gestures and facial expressions, thereby more comprehensively

unveiling the complexity and diversity of language impairment in AD patients. Secondly, current research predominantly centers on Indo-European languages like English (Shuttleworth & Huber, 1988; Pekkala et al., 2013; Liu, 2019), while research targeting language impairment in Chinese-speaking AD patients remains relatively scarce. As a tonal language, Chinese exhibits marked differences from English and other languages in terms of phonology, vocabulary, and grammatical structure, which may lead to unique manifestations of language impairment in Chinese AD patients. Therefore, dedicated research in this area is warranted. In addition, the majority of current studies explore the issue merely through traditional pragmatic theories, such as Speech Act Theory in conversation analysis. However, few studies have employed relatively newer theories, like Relevance Theory, to elucidate the language impairment characteristics of this patient population. By approaching the issue from the perspective of Relevance Theory, this research can unveil the unique patterns of verbal ostension and information inference in language communication among AD patients from a cognitive standpoint, thereby providing a more theoretically robust explanation for the underlying mechanisms of their language impairment.

In light of this, this study employs Relevance Theory as the theoretical framework, selecting situated discourse data from five elderly individuals in the early stages of AD featured in the first season of the reality show "Forget Me Not Cafe" as the corpus. Utilizing a multimodal corpus research method, this study conducts an analysis of their language impairment manifestations, aiming to comprehensively uncover their specific characteristics at both verbal and non-verbal levels. Specifically, this research primarily investigates the following three research questions:

1) What are the verbal manifestations of language impairment in Chinese-speaking AD patients?

2) What non-verbal manifestations do Chinese-speaking AD patients employ to make multimodal compensatory adjustments for their language impairment?

3) What differences exist in the manifestations of language impairment between AD patients in China and those in English-speaking countries?

2.2 Theoretical Foundation

This study employs Relevance Theory as the theoretical framework, it was formally proposed by Dan Sperber and Deirdre Wilson in their 1986 work *Relevance: Communication and Cognition*. This theory aims to elucidate how humans effectively transmit and comprehend information in natural language communication, marking a "cognitive turn" in pragmatics. According to Sperber and Wilson (1986), communication is an ostensive-inferential process that involves both informative intention and communicative intention. From the speaker's perspective, communication is an ostensive process where the speaker conveys their informative and communicative intentions to the hearer through verbal acts. From the hearer's perspective, however, communication constitutes an inferential process, in which the hearer deduces the speaker's genuine intentions based on the speaker's ostensive acts and their own cognitive environment. Simultaneously, the hearer seeks optimal relevance when interpreting utterances, which refers to achieving the maximum contextual effects with the least processing effort within a given cognitive environment.

In the early stages of domestic research on Relevance Theory, scholars' research endeavors were largely concentrated on the linguistic sign modality. As research progressed, scholars gradually came to realize that ostensive acts are not confined solely to linguistic expressions and that achieving optimal relevance in meaning does not necessarily rely on the most straightforward linguistic symbols. Instead, in daily communication, language, tone, gestures, and other elements can all serve as effective means to ostensively convey informative intentions. For AD patients, due to impaired language abilities, they sometimes struggle to articulate their communicative intentions clearly and fluently. When confronted with language barriers, to ensure smooth communication, they often resort to non-verbal means such as gestures as multimodal compensatory strategies, striving to ostensively convey their communicative information. Consequently, this study, grounded in Relevance Theory, will probe into the impact of language impairment on communication among AD patients and explore how they utilize non-verbal information to make compensatory adjustments to their linguistic expressions, thereby achieving optimal relevance in communication.

3. Methodology

This study employs a multimodal corpus research method, aiming to comprehensively unveil the specific characteristics of language impairment in AD patients at both verbal and non-verbal levels.

The corpus for this study is derived from the first season of the domestic documentary-style reality show "Forget Me Not Cafe". It is a public-interest program centered around raising awareness of cognitive impairments, with the main premise being the operation of a restaurant. The show features five elderly individuals in the early stages of AD as its protagonists: Grandpa Daqiao, Grandpa Xiaomin, Grandma Gongzhu, Grandma Pugongying and Grandma Zhuzhu. The situated discourse of these five elderly participants in the program naturally reflects the language use patterns and manifestations of language impairment in patients' daily lives.

The data collection process commenced with downloading the complete first season of "Forget Me Not Cafe" from the Tencent Video platform. Subsequently, all situated discourse segments involving the five elderly participants were extracted from the program. Ultimately, a "Multimodal Corpus of Language Impairment Manifestations in Chinese-Speaking AD Patients" was constructed, with each characteristic of language impairment manually annotated and the relevant content transcribed according to the transcription system proposed by Gail Jefferson (2015). This corpus comprises over 650 minutes of naturally occurring conversational data collected within the restaurant setting.

During the data analysis phase, this study primarily adopts a qualitative research approach guided by Relevance Theory to interpret the specific characteristics of language impairment in these AD patients. It provides illustrative examples of these manifestations as well as the multimodal compensatory adjustment strategies they employed.

4. Manifestations of Language Impairment in Chinese-Speaking AD Patients

By using multimodal corpus research method, this study conducted an in-depth analysis of language impairments exhibited by five elderly individuals in the early stages of AD at both verbal and non-verbal levels.

4.1 Verbal Level Manifestations of Language Impairment in Chinese-Speaking AD Patients

At the verbal level, the affected elderly primarily display five verbal manifestations, including redundant repetition, the use of filler words, naming difficulty, aborted phrases, and vague references.

4.1.1 Redundant Repetition

Redundant repetition refers to the recurrence of one or more adjacent words or phrases (Shadden, 1998) and is the most prevalent type of language impairment observed in AD patients. These repetitions disrupt the coherence and fluency of discourse, as shown in Example 1 below:

Example 1:

Grandpa Xiaomin: 欢迎光临，请请里里里里边坐。(Episode 1, 17:11)

This statement was made by Grandpa Xiaomin during a greeting interaction. In this utterance, the word "请" and "里" is redundantly reiterated multiple times. Unlike intentional repetitions used for emphasis in healthy communication, these repetitions reflect involuntary, uncontrolled linguistic behaviors characteristic of AD-related language dysfunction. This disrupts sentence coherence and fluency, creating a stuttering, disjointed rhythm that severely impedes effective information transfer. Listeners may struggle to rapidly decode his informative intention, highlighting the communicative difficulty caused by this language disorder.

4.1.2 The Use of Filler Words

Filler words in spoken language generally arise due to the spontaneity and immediacy of oral expression. Common filler words in Chinese include forms such as "呃", "这个", "那个" (Liu, 2015). They typically contain no substantive informational content and lack significant communicative value, serving as redundant elements embedded within discourse, as illustrated in Example 2:

Example 2:

Grandma Gongzhu: 呃(.)我们是(2)特殊人群，呃我们患有那个(.)，就是，呃(2)呃叫，呃叫，叫(6)，我我想想嗷(3)，呃(.)，呃，认知(.)，认知障碍，呃，记忆障碍。(Episode 1, 40:19)

In Example 2, Grandma Gongzhu was explaining to the guests the unique characteristics of their restaurant's service staff. However, due to the impact of AD, she temporarily struggled to recall the terms "认知障碍" and "记忆障碍". Consequently, she unconsciously used plenty of filler words such as "呃", "那个", and "就是", along with extended pauses, resulting in lengthy and convoluted speech. Listeners had to expend more processing effort to filter out these meaningless filler words in order to comprehend Grandma Gongzhu's informative intention, thereby significantly reducing the efficiency of communication.

4.1.3 Naming Difficulty

Naming difficulty is one of the common language impairments observed in AD patients. Due to impaired memory, particularly short-term and semantic memory, these patients often struggle to recall the names of things or fail to associate the visual image of an object with its corresponding word, as illustrated in Example 3:

Example 3:

Grandma Zhuzhu: 那鸡蛋红烧肉，是我们餐厅那个(.)，那个呃什么啦(3)，有名((laughter))，那是我们特点。(Episode 2, 55:59)

In Example 3, when Grandma Zhuzhu was describing "鸡蛋红烧肉", she actually intended to convey that this dish was the "招牌菜" of their restaurant. However, due to naming difficulty, she was unable to directly say the accurate term "招牌菜". The fillers, pauses, and laughter in her statement indicated her struggle to recall the appropriate vocabulary to describe the dish's status. Eventually, she came up with the semantically related words "有名" and "特点" to explain it, making her utmost effort to ostensively convey the communicative information. Nevertheless, this still posed a certain degree of difficulty for listeners in making inferences.

4.1.4 Aborted Phrases

Aborted phrases refer to incomplete expressions that were not revised within two succeeding sentences (Tomoeda et al., 1996). AD patients often fail to fully express what they have in mind, that is, the content they actually articulate is often less than what they intended, and they may not even be aware of this issue, as illustrated in Example 4:

Example 4:

Grandpa Daqiao: 我是17年下半年医生就跟我讲，她说你有轻度的这个::。(Episode 1, 4:58)

In Example 4, Grandpa Daqiao was recounting his experience of being informed about his illness. The complete sentence he initially intended to express was, "我是17年下半年医生就跟我讲，她说你有轻度的认知障碍。" However, during his actual narration, possibly due to a temporary lapse in memory, he used the filler word "这个" to buy himself some thinking time. Nevertheless, he did not supplement or correct his statement afterward, directly omitting the crucial information about "认知障碍", resulting in an incomplete sentence. This phenomenon requires listeners to make additional inferences about the omitted parts of the speech, thereby reducing the efficiency of verbal communication.

4.1.5 Vague References

Vague reference refers to the use of non-specific terms such as "thing" or "stuff" to refer to objects or concepts (Nicholas et al., 1985). AD can cause memory impairment in patients, leading to the gradual fading or forgetting of many concrete words in their mental lexicon. Consequently, when referring to an object, they tend to opt for more abstract categorical concepts rather than their specific names, in an effort to conserve cognitive effort and time, as illustrated in Example 5:

Example 5:

Grandma Pugongying: 哎您这个也是没有东西的吧。(Episode 9, 39:43)

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In Example 5, Grandma Pugongying inquired of a guest whether his glasses had lenses. However, both "glasses" and "lenses" are relatively specific terms. Due to memory impairment, Grandma might have struggled to accurately recall the exact names of these items. As a result, she opted to use the pronoun "这个" to refer to the "glasses" and the vague term "东西" to refer to the "lenses", aiming to reduce the cognitive effort required to think of the specific names and maintain overall fluency in her speech. Nevertheless, this vague referencing approach posed difficulties for the listener in comprehension, necessitating greater processing effort to infer Grandma's informative intention.

4.2 Non-Verbal Level Manifestations of Language Impairment in Chinese-Speaking AD Patients

At the non-verbal level, the five elderly patients employ non-verbal means such as gestures and laughter to make multimodal compensatory adjustments in their communication. Additionally, they exhibited a relatively high number of non-verbal behavioral characteristics, suggesting that these non-verbal cues play a significant supplementary role in the expression of AD patients.

4.2.1 Gestures

Gesture is a form of non-verbal communication that convey information, express emotions, or aid in verbal exchanges through hand movements. For AD patients, gestures play a crucial role in the expression of illocutionary force, serving as a compensatory adjustment by the brain's mechanisms to language impairments such as naming difficulty. Without these bodily movements, it would be challenging for listeners to accurately comprehend the speaker's speech acts, and effective perlocutionary acts would be unattainable (Huang et al., 2021), as illustrated in Example 6 (Figure 1):

Example 6:

Guest: 这是它的什么位置啊？

Grandma Zhuzhu: 哦脚子((Imitating the shape of a claw with her hands))，那个那个鹅，那个那个什么，那个脚子吧。

Guest: 爪子。

Grandma Zhuzhu: 对对，爪子嘛。(Episode 7, 18:10)

Figure 1. Grandma Zhuzhu Uses Gestures to Compensate for Language Impairment

In Example 6, a guest asked Grandma Zhuzhu which part of the goose was used in the dish. Due to naming difficulty, Grandma Zhuzhu was unable to accurately recall the name of that specific part. She first attempted to describe it verbally but used the inaccurate term "脚子". Subsequently, she compensated for her language impairment by using her hands to imitate the shape of a "claw", as shown in Figure 1. This effectively made up for the inadequacy in her verbal expression, explicitly conveying the communicative information to the listener as much as possible, helping to reduce the listener's inferential effort and enabling the guest to understand her intention. This multimodal ostensive act also facilitated the listener in successfully inferring Grandma Zhuzhu's informative intention, thereby achieving optimal relevance.

4.2.2 Laughter

Laughter is often used by elderly individuals with AD as a means to express difficulties in comprehension and constructing discourse, serving as a typical compensatory behavior to overcome language impairment (Lindholm, 2008). When elderly patients encounter difficulties in verbal expression, they may resort to laughter to mask or alleviate the embarrassment and discomfort arising from their inability to articulate clearly, as illustrated in Example 7 (Figure 2):

Example 7:

Grandma Zhuzhu: 这个是海人爱，就是(1)，什么呢我忘记了((laughter))。(Episode 5, 1:7:20)

Figure 2. Grandma Zhuzhu Uses Laughter to Alleviate the Embarrassment Caused by Language Impairment

In Example 7, Grandma Zhuzhu was reciting the dish name to the guests, but due to memory impairment caused by AD, she forgot the dish name that the chef had just told her. Consequently, she used laughter as an interpersonal compensatory strategy, as shown in Figure 2, to alleviate the embarrassment caused by her inability to recall the dish name. Meanwhile, it also served as a signal to listeners, seeking assistance to facilitate the communication (Huang & Che, 2023). The guests should infer Grandma Zhuzhu's intention from the laughter to ensure the smooth progression of the interaction.

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4.3 Differences in Language Impairment Manifestations between Chinese and English-Speaking AD Patients

English and Chinese, as two distinct language systems, each possess unique structural characteristics. English is an inflectional language, where its grammatical structure is conveyed through morphological changes. For instance, the singular and plural forms of nouns, as well as the tenses and voices of verbs, are all indicated by changes in word endings. Additionally, English emphasizes the use of pronouns to distinguish between the speaker, the listener, and other relevant entities through different personal pronouns. On the other hand, Chinese is an isolating language that does not rely on morphological changes to express grammatical meanings but achieves this through word order, function words, and tones. In Chinese, tones not only differentiate syllables but also have a decisive impact on word meanings. The same combination of syllables can convey entirely different meanings depending on the tone used. It is precisely due to these differing linguistic features of English and Chinese that AD has a notably distinct impact on the language processing abilities of patients speaking these languages, leading to varied manifestations of language impairment.

For English-speaking AD patients, pronoun misuse along with tense and voice errors are relatively common language impairment manifestations. In terms of pronoun usage, English-speaking patients may sometimes confuse personal pronouns, such as mistakenly saying "she" or "it" instead of "I". These errors reflect a gradual blurring of the patients' sense of self and personality. Moreover, in English, tenses and voices rely on morphological changes. For instance, the past tense is typically indicated by adding the "-ed" suffix, while the passive voice is conveyed through specific verb forms. However, English-speaking AD patients often omit these morphological changes or add unnecessary ones, leading to errors in sentence tenses and voices. For example, a patient might say, "I go to park yesterday", where "go" should be in the past tense "went" to indicate that the action occurred in the past. These phenomena, on the one hand, suggest a gradual decline in the patients' syntactic abilities, and on the other hand, indicate a growing confusion in their concepts of time and space.

A unique language impairment manifestation observed in Chinese-speaking AD patients is tone confusion. As a tonal language, Chinese relies heavily on tones to distinguish word meanings. However, under the influence of AD, patients may experience semantic reversals due to tone errors. For instance, a patient might mispronounce "妈 (mā, meaning mother)" as "马 (mǎ, meaning horse)" or say "买 (mǎi, meaning to buy)" as "卖 (mài, meaning to sell)". This tone confusion not only affects the patients' oral expression but may also lead to difficulties in understanding others' speech.

These characteristics of language impairment reflect the distinct impacts of AD on the language processing abilities of Chinese and English-speaking patients. Comparing these differences can aid in a more accurate assessment of language impairment in AD patients across different languages, and facilitate the provision of more effective and targeted language rehabilitation training for them.

5. Conclusion

This study, grounded in Relevance Theory, selected situated discourse from five elderly individuals in the early stages of AD featured in the first season of the reality show "Forget Me Not Cafe" as its corpus. Utilizing a multimodal corpus research method, it delved deeply into the manifestations of language impairment in Chinese-speaking AD patients. The study found that the affected elderly exhibited five characteristic features at the verbal level, including redundant repetition, the use of filler words, naming difficulty, aborted phrases, and vague references. Meanwhile, patients also tended to employ non-verbal means such as gestures and laughter for multimodal compensatory adjustments in communication. Additionally, this study revealed differences in the manifestations of language impairment between Chinese and English-speaking AD patients. English-speaking patients were more prone to issues such as pronoun misuse, tense and voice errors, whereas Chinese-speaking patients predominantly exhibited tone confusion. This research not only theoretically advances the construction and refinement of gerontolinguistics by enriching the disciplinary knowledge system through the study of discourse from special elderly groups but also practically provides linguistic evidence for the early diagnosis and intervention of AD.

However, this study also has certain limitations. The primary drawback lies in the singularity of the corpus source, which relies solely on the patients' performances in the reality show without directly collecting and systematically analyzing corpus from AD patients in real-life settings. This limitation may, to some extent, affect the generality and accuracy of the research findings, as the contextual settings and patient performances in the reality show could be influenced by various factors, such as the show's production needs and the patients' emotional states. Therefore, future research could directly collect corpus from AD patients in real-life scenarios, including their daily conversations and self-narrated experiences, to more comprehensively and authentically reflect the manifestations of their language impairment. This, in turn, would provide more scientific and effective support for family prediction, clinical screening, and rehabilitation training related to the disease.

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