



The Relationship of Word-Finding Behaviors and Naming in Mild Cognitive Impairment and Dementia of Alzheimer's Type

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Received: July 5, 2024

Revised: August 29, 2024

Accepted: September 23, 2024

This work was supported by the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea (NRF-2021R111A3040309).

Objectives: Anomia, a fundamental language difficulty, presents in various forms of word-finding behaviors in individuals with Mild Cognitive Impairment (MCI) and Dementia of Alzheimer's Type (DAT). This study aims to compare the rates of word-finding behavior among these groups and determine the correlation between these rates and the results of naming tests. **Methods:** This study included 101 participants, consisting of forty-one healthy elderly adults, thirty individuals with MCI, and thirty individuals with DAT. Spontaneous speech data were collected using a picture description task. For the naming tests, we used the confrontation naming test (K-BNT) and the generative naming test (K-COWAT). **Results:** First, significant differences were observed in the rates of word-finding behavior among the three groups, especially in the global index, which indicates the overall rate of word-finding behaviors. Second, the correlation analysis results showed a significant negative correlation between the ratios of the global index, word reformulations, empty words, and performance on the confrontation naming test. Finally, there was a significant negative correlation between the ratios of the global index, word reformulations, repetitions, delays, insertions, and performance on the generative naming tests. **Conclusion:** These results suggest the necessity of developing a naming evaluation scale based on spontaneous speech to effectively assess anomia in individuals with MCI and DAT. The study found significant differences in the rates of word-finding behavior among healthy elderly adults, individuals with MCI, and individuals with DAT, and a correlation between the rates of word-finding behavior and naming tests.

Keywords: Mild cognitive impairment, Dementia of Alzheimer's type, Word-finding behaviors, Confrontation naming, Generative naming

Dementia of Alzheimer's type (DAT), accounting for the largest proportion of dementia cases, is characterized by significant difficulties in naming. This includes limited vocabulary use and difficulty with word retrieval, starting from the earliest stages of the disease (Bowles, Obler, & Albert, 1987). Amnesic mild cognitive impairment (aMCI), a known precursor to DAT, is also associated with naming difficulties caused by semantic language impairment (Appell, Kertesz, & Fisman, 1982). In previous studies, individuals with DAT and MCI were primarily assessed using tasks that mea-

sure word retrieval abilities, such as confrontational and generative naming. In previous studies, individuals with DAT and MCI were primarily assessed using tasks that measure word retrieval abilities, such as confrontational and generative naming. It is known that individuals with DAT exhibit problems in performance on confrontational naming tasks that are distinct from those caused by normal aging (Duker et al., 2012). They experience a loss of lexical information and specific semantic systems in the early stages of the disease, and more core semantic systems in

the later stages (LaBarge, Balota, Storandt, & Smith, 1992). In this regard, Williams, Mack, and Henderson (1989) reported that confrontation naming tests, such as the Boston naming test, correctly categorized 80% of individuals with DAT and 86% of healthy older adults. This suggests that poor performance on confrontation naming tasks is a fundamental language issue for DAT, even in the early stages of the disease. While most of the existing research on confrontation-naming performance in individuals with DAT is consistent, the research on confrontation-naming performance in those with MCI is controversial. The inconsistencies of findings on confrontation naming performance in individuals with MCI relate to variations in task difficulty and cognitive load, as well as the heterogeneity of the MCI population (Choi, Kim, Lee, & Kim, 2013).

Additionally, individuals with DAT and MCI exhibit significantly poorer performance on generative naming tasks than healthy older adults in the early stages of DAT and MCI (Albert, Moss, Tanzi, & Jones, 2001; Perry, Watson, & Hodges, 2000). The poor performance of individuals with MCI and DAT on generative naming tasks may be attributed to the task's inherent characteristics. The generative naming task requires participants to produce as many words as possible from a given category within a limited time, typically one minute. This task integrates various cognitive functions, including frontal executive functions and linguistic naming skills (Chertkow & Bub, 1990; Salmon, Heindel, & Lange, 1999). In contrast to confrontation naming, the generative naming task is a sensitive detector of subtle cognitive impairment in individuals with MCI (Adlam, Bozeat, Arnold, Watson, & Hodges, 2006). As such, confrontation and generative naming tasks are widely used to assess the naming ability of individuals with MCI and DAT. However, word-level naming tests have limitations as they do not accurately reflect the naming difficulties encountered in everyday conversation (German, 1991). These tests are influenced by factors such as familiarity with the target word and personal variables, including gender, age, and years of education (Connor, Spiro III, Opler, & Albert, 2004). Consequently, spontaneous speech-based naming assessments have been proposed as a more effective alternative that better reflect actual communication situations. The advantages of spontaneous speech-based naming assessments are as follows. First, they can identify

real-world naming problems (Schmitter-Edgecombe, Vesneski, & Jones, 2000). Second, they can be utilized to evaluate various word-finding behaviors (Heller & Dobbs, 1993). Third, they assess naming skills in naturalistic conditions and identify the strengths and weaknesses of overall communication abilities. These assessments provide information about language rules, language use skills, and various cognitive-linguistic aspects (Fleming & Harris, 2008; Ulatowska, North, & Macaluso-Haynes, 1981).

Spontaneous speech-based naming assessment methods primarily measure the production rate of various word-finding behaviors during spontaneous speech. Some studies have been conducted on this topic. In a survey of healthy older individuals, Schmitter-Edgecombe et al. (2000) used the test of word-finding in discourse (TWFD; German, 1991) picture description task to analyze the word-finding behaviors of young adults (ages 18-22 years), young-old adults (ages 58-74 years), and old-old adults (ages 75-93 years). The study focused on substitutions, word reformulations, repetitions, empty words, time fillers, inserts, and delays and found that both young and old-old adults exhibited more word-finding behaviors than young adults. Additionally, significant differences were observed in substitutions and word reformulations among the word-finding behaviors. Using similar analysis criteria, Choi (2020) examined the differences in word-finding behaviors among older adults based on age in a discourse production task. The study divided elderly participants into three groups: young-old, middle-old, and old-old. The results revealed a significant difference in the proportion of word-finding behaviors and repetitions, empty words, time fillers, inserts, and delays of these behaviors based on age. However, there is a lack of studies that have examined the output characteristics of word-finding behavior in individuals with MCI and DAT compared to investigations of the output characteristics of word-finding behavior in normal aging.

Furthermore, there is a lack of research examining the relationship between the rate at which individuals with MCI and DAT exhibit word-finding behavior in word-level naming tasks, such as confrontation and generative naming. Therefore, this study aimed to investigate differences in word-finding behavioral rates in spontaneous speech among healthy older adults, individuals with MCI, and individuals with DAT. Additionally, the study aimed to deter-

mine if there is a relationship between the rates of word-finding behavior and confrontation and generative naming performance within each group.

METHODS

Participants

The study included 101 participants: 41 healthy older individuals, 30 individuals with MCI, and 30 individuals with DAT. The criteria for each group were as follows: The healthy older adults (1) were aged 65 years or older, (2) had a Korean Mini-Mental State Examination (K-MMSE; Kang, 2006) score of -1.0 SD or more compared to the norm for their age and years of education, (3) did not have depression according to the short form geriatric depression scale (Cho et al., 1999), (4) did not experience neurological or psychiatric conditions that could affect cognitive functioning, and (5) were able to follow instructions and had the visual and auditory abilities required to perform the study tasks. Next, individuals with MCI were screened following the criteria outlined by Petersen et al. (2001) and diagnosed with amnesic MCI (aMCI) by a neurologist if they exhibited the following: (1) reported subjective memory impairment; (2) scored within the normal range on the Korean Mini-Mental State Examination (K-MMSE); (3) achieved a Barthel index (Mahoney, 1965) score of 20, indicating there were no issues with activities of daily living; and (4) on the Korean version of the Consortium to Establish a Registry for Alzheimer’s Disease Assessment Packet (CERAD-K; Lee et al., 2002) with memory impairment of -1.5 SD or less on at least one of the tasks of word list recall, word list recognition, and constructed recall; (5) achieved a total score of 0.5 on the clinical dementia rating (CDR; Morris, 1993); and (6) did not meet the diagnostic criteria for dementia. Finally, individuals with DAT were those diagnosed according to the diagnostic criteria outlined in the DSM-V (Diagnostic and statistical manual of mental disorders, 5th edition;

American Psychiatric Association, 2013), confirmed by brain imaging, and they had a CDR total score of 0.5 or 1, indicating mild dementia. Descriptive statistics of gender ratio, age, years of education, and K-MMSE score of the three groups of healthy older adults, those with MCI, and those with DAT are presented in Table 1. First, a chi-square (χ^2) analysis was conducted to assess the gender ratio differences among the groups. The results indicated that the gender ratio differences were not statistically significant ($\chi^2 = .131, p > .05$). Next, we conducted a one-way analysis of variance (ANOVA) to determine the significance of the differences in age, years of education, and K-MMSE scores between groups. The results indicated that the differences in age ($F = 2.792, p > .05$) and years of education ($F = 2.490, p > .05$) were not statistically significant. However, the differences in mean K-MMSE scores between groups were significant ($F = 35.487, p < .001$). Post hoc analyses of the differences in K-MMSE scores revealed that the difference between the healthy older population and individuals with MCI groups was not significant. However, the difference between the healthy older and individuals with DAT groups and the groups of individuals with MCI and DAT was substantial.

Task

Spontaneous speech task

This study used a picture description task as a spontaneous speech task to assess word-finding behaviors. Picture description tasks have several advantages: they are simple to collect, easy to analyze, and reduce the memory burden on participants (Duong, Tardif, & Ska, 2003; Shewan, 1988). However, depending on the complexity of the pictures used and their content, differences in spontaneous production may occur, particularly between single- and multiple-picture tasks (Choi, 2015; Marini, Boewe, Caltagirone, & Carlomagno, 2005). Therefore, in this study, we used the “Boston Cookie-Theft picture” (Goodglass & Kaplan, 1983) for the single-picture task, and “The fight” (Nicholas & Brookshire,

Table 1. Mean (SD) of age, education level, and K-MMSE score by three groups

Group (N)	Male:Female	Age	Education level	K-MMSE
NC (41)	19:22	73.61 (5.09)	9.02 (4.50)	26.66 (1.64)
MCI (30)	15:15	71.27 (4.04)	9.10 (3.53)	26.10 (1.61)
DAT (30)	15:15	73.60 (4.21)	7.10 (3.80)	22.73 (2.77)

K-MMSE = korean mini-mental state examination (Kang, 2006); NC = Normal control; MCI = Mild cognitive impairment; DAT = Dementia of Alzheimer’s type.

1993) for the multiple-picture task, consistent with previous studies (Choi & Lee, 2017).

Word-finding behavior in spontaneous speech was analyzed on the analysis criteria of (Schmitter-Edgecombe et al., 2000). Word-finding behaviors were categorized into global index and specific word-finding behaviors. The specific word-finding behaviors analyzed were ① substitutions, ② word reformulations, ③ repetitions, ④ empty words, ⑤ time fillers, ⑥ insertions, and ⑦ delays. This is an analysis criterion presented in the TWFD (German, 1991), which is useful for sensitively detecting the word-finding behavior by individuals with naming difficulties (Choi, 2020; German & Glasnapp, 1990). We utilized the criteria Yoon, Kim, Kim, Chang, and Cha (2013) established to categorize the utterances necessary for analyzing spontaneous speech. We also employed the ratio method of word-finding behaviors per C-unit, as suggested by previous research (Choi, 2020). We followed the criteria outlined in Yi (2015) for clause analysis. Descriptions and examples of word-finding behaviors are presented in Appendix 1.

Naming tasks

We used the Korean version of the Boston naming test (K-BNT; Kim & Na, 1997) to assess confrontation naming ability. This test consists of 60 confrontation naming items in black and white line drawings and is recognized as the most used naming test for adults in Korea. Next, the Korean version of the controlled oral word association test (K-COWAT; Kang, Chin, Na, Lee, & Park, 2000) was used for assessing generative naming ability. This test requires subjects to produce words belonging to specific categories for one minute. The semantic categories of “animal” and “supermarket items,” and phonemic categories of Korean /k/, /o/, and /s/ phonemes, were used.

Procedures

All data collection procedures were conducted individually in a quiet place. First, each participant was briefly informed about the single-picture and multiple-picture description tasks. Participants were presented with an A4-sized picture and instructed to “look at this picture and describe it to me in detail.” No time limit was imposed for collecting spontaneous utterances, and all utterances were recorded and transcribed immediately. The K-BNT and K-

COWAT were administered according to a standardized manual.

The rate of word-finding behaviors was calculated by dividing the frequency of each specific word-finding behavior (substitutions, word reformulations, repetitions, empty words, time fillers, insertions, and delays) by the total number of syllables, then multiplying by 100. The global index was obtained by dividing the frequency of all word-finding behaviors by the total number of syllables and multiplying by 100. Interjudge reliability was used to assess the reliability of the word-finding behavior. A second rater randomly selected 20% of the analyzed utterances to assess consistency. The rate of interjudge agreement was 95.36%.

Statistical Analyses

Statistical analyses were conducted using the SPSS version 22.0 program (IBM Corp., Armonk, NY, USA). A one-way ANOVA assessed the difference in the global index of word-finding behavior and the ratio of specific word-finding behavior among the groups of healthy older adults, those with MCI, and those with DAT. If significant group differences were found, post hoc analysis was performed using the Scheffe method. The correlation between the rate of word-finding behaviors output and K-BNT and K-COWAT scores was assessed using Pearson’s correlation analysis. Finally, to investigate the effect of word-level naming test performance on the global index, defined as the total rate of word-finding behaviors, a stepwise multiple regression analysis was conducted.

RESULTS

Differences in the Proportion of Word-Finding Behaviors by the Three Groups

The average global index of word-finding behavior for the healthy older population, individuals with MCI, and individuals with DAT groups is shown in Figure 1. Table 2 presents the descriptive statistics of the output rates for each group’s word-finding behavior. The results show that empty words were the most frequent errors in all groups. This was followed by insertions in the groups of healthy older adults and individuals with MCI, as well as repetitions in the group of individuals with DAT. Substitutions were nearly absent in all three groups. Next, we conducted a one-way ANOVA to determine if the groups had significant dif-

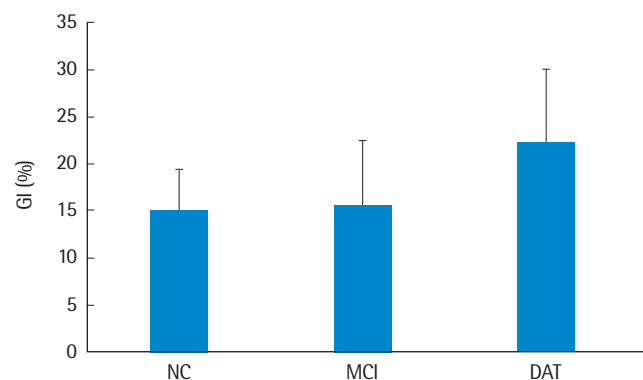


Figure 1. Mean of ratios of global index by three groups. NC=Normal control; MCI=Mild cognitive impairment; DAT=Dementia of Alzheimer's type.

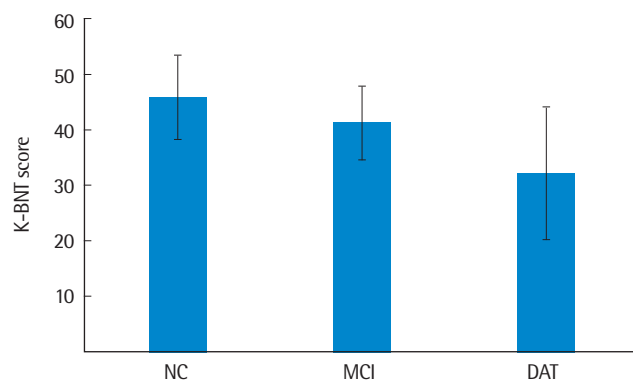


Figure 2. Mean of scores of K-BNT by three groups. NC=Normal control; MCI=Mild cognitive impairment; DAT=Dementia of Alzheimer's type; K-BNT=Korean version-Boston naming test (Kim & Na, 1997).

Table 2. Mean (SD) of ratios of word-finding behaviors by three groups

Ratio of word-finding behavior (%)	NC (N=41)	MCI (N=30)	DAT (N=30)
Substitutions	.03 (.15)	.12 (.30)	.00 (.24)
Word reformulations	2.75 (1.37)	2.11 (1.40)	3.15 (1.86)
Repetitions	2.19 (1.74)	2.49 (2.33)	3.87 (2.97)
Empty words	4.91 (3.74)	5.81 (3.70)	7.27 (3.78)
Time fillers	3.09 (2.67)	3.11 (2.52)	3.71 (2.98)
Insertions	1.52 (1.28)	1.43 (1.59)	2.91 (2.31)
Delays	.51 (.71)	.49 (1.03)	1.31 (2.19)

NC=Normal control; MCI=Mild cognitive impairment; DAT=Dementia of Alzheimer's type.

ferences in the proportion of word-finding behaviors. We found that the global index ($F=12.931, p<.001$), word reformulations ($F=3.443, p<.05$), and repetitions ($F=4.815, p<.05$) exhibited significant differences. Empty words ($F=3.435, p<.05$), insertions ($F=7.120, p<.001$), and delays ($F=3.597, p<.05$) showed significant group differences. However, the substitutions ($F=2.731, p>.05$) and time fillers ($F=.538, p>.05$) showed no significant group differences. Post hoc analyses were conducted to determine which groups had significantly different rates of word-finding behaviors. We found significant differences in the global index and insertions between the healthy older population and DAT groups and between the groups of individuals with MCI and DAT. Significant repetitions and empty words were also observed between the healthy older population and DAT groups, and there were significant differences in word reformulations between the MCI and DAT groups. Finally, there were no significant differences between groups in post hoc analyses of delays.

Correlation between the Rate of Word-Finding Behaviors and the Confrontation Naming Test Score

The descriptive statistics of the K-BNT scores for the groups of healthy older adults, individuals with MCI, and those with DAT are presented in Figure 2. An ANOVA was conducted to determine the significant differences in K-BNT scores between the groups ($F=20.664, p<.001$). Post hoc analyses revealed significant differences between the healthy older population and DAT groups and between the groups of individuals with MCI and DAT. Table 3 presents the results of the correlation analysis between the rates of word-finding behaviors and the K-BNT performance of the three groups. The correlation analysis revealed a significant negative correlation between the rates of the global index, word reformulations, empty words, and K-BNT performance; however, the substitutions, repetitions, time fillers, insertions, and delays were not significantly correlated with the K-BNT score.

Table 3. Correlations between ratios of word-finding behaviors and performances of confrontation naming

	GI	Sub	WR	Rep	EW	TF	Ins	Del	K-BNT
GI	1	-.056	.404**	.678**	.602**	.380**	.372**	.522**	-.289**
Sub		1	-.103	-.011	.002	.002	-.180	-.054	.087
WR			1	.239*	.007	-.022	.170	.297**	-.260**
Rep				1	.205*	.146	.136	.378**	-.125
EW					1	-.045	-.050	.075	-.266**
TF						1	-.059	-.056	.074
Ins							1	.398**	-.184
Del								1	-.124
K-BNT									1

GI=Global Index; Sub=Substitutions; WR=Word reformulations; Rep=Repetitions; EW=Empty words; TF=Time fillers; Ins=Insertions; Del=Delays; K-BNT=Korean version-Boston naming test (Kim & Na, 1997).

* $p < .05$, ** $p < .01$.

Table 4. Mean (SD) of K-COWAT by three groups

	NC (N=41)	MCI (N=30)	DAT (N=30)
Semantic generative naming (animal)	14.33 (3.07)	13.63 (4.24)	8.70 (3.43)
Semantic generative naming (supermarket item)	17.73 (4.52)	14.80 (4.06)	11.17 (4.45)
Phonemic generative naming (total)	20.80 (11.85)	17.83 (6.29)	11.87 (6.50)

NC=Normal control; MCI=Mild cognitive impairment; DAT=Dementia of Alzheimer's type.

Table 5. Correlations between ratios of word-finding behaviors and performances of generative naming

	GI	Sub	WR	Rep	EW	TF	Ins	Del
Semantic generative naming (animal)	-.405**	.023	-.239**	-.346**	-.121	-.036	-.387**	-.281**
Semantic generative naming (supermarket)	-.449**	-.011	-.246**	-.202*	-.189	-.153	-.357**	-.339**
Phonemic generative naming (total)	-.250**	.060	-.261**	-.229*	-.003	.080	-.212*	-.214*

GI=Global Index; Sub=Substitutions; WR=Word reformulations; Rep=Repetitions; EW=Empty words; TF=Time fillers; Ins=Insertions; Del=Delays.

Correlation between Ratios of Word-Finding Behavior and Generative Naming Score

Table 4 presents the descriptive statistics of the K-COWAT scores for the healthy older population, MCI, and DAT groups. An ANOVA was conducted to determine if there were significant differences in K-COWAT scores among the groups. The results indicated *t* significant group differences for animals ($F=26.236, p < .001$), supermarket ($F=19.610, p < .001$), and phonemic categories ($F=8.569, p < .001$). Furthermore, post hoc analyses revealed that the differences between the healthy older adult and individuals with DAT groups and between the MCI and DAT groups were significant for the animal and phonemic categories. Additionally, all group differences were important for the supermarket item category. Next, Table 5 presents the results of the correlation analysis between the rates of word-finding behaviors and K-COWAT per-

formance in the three groups. The correlation analysis revealed significant correlations between the scores of semantic and phonemic categories with the global index and the rates of word reformulations, repetitions, insertions, and delays. The rates of substitutions, empty words, and time fillers were not significantly correlated with K-COWAT performance.

Effect of Word-Level Naming Test Performances on the Rate of Word-Finding Behavior

To investigate the effect of word-level naming test performance on the global index, defined as the total rate of word-finding behaviors, a stepwise multiple regression analysis was conducted. The results are presented in Table 6. The analysis indicated that the regression model was appropriate at all levels ($F=22.831, p < .001$). The number of correct responses for semantic generative naming

Table 6. Results of stepwise multiple regression of global index

Model	Independent variable	B	SE	β	<i>t</i>	<i>R</i> ²	adjusted <i>R</i> ²
Step 1	Semantic generative naming (supermarket item)	-.538	.113	-.433	-4.778***	.187	.179
Step 2	Semantic generative naming (supermarket item)	-.377	.127	-.303	-2.968**	.237	.221
	Semantic generative naming (animal)	-.387	.154	-.257	-2.512*		

p* < .05, *p* < .01, ****p* < .01.

(animal and supermarket items) significantly predicted the global index, demonstrating an explanatory power of about 23.7%.

DISCUSSION

This study compared the differences in the rates of word-finding behaviors across groups to determine whether there are correlations between the rates of word-finding behaviors and performance on confrontation and generative naming tasks in healthy older adult, MCI, and DAT groups. The results were as follows. First, the global index, the sum of word-finding behaviors, was higher in individuals with DAT, those with MCI, and healthy older adults. Post hoc analyses revealed significant differences between the healthy older adult population and the DAT groups, as well as between the MCI and DAT groups. However, the difference between the groups of healthy older adults and those with MCI was not significant. This is consistent with the results of previous studies indicating that individuals with DAT have difficulty with naming compared to healthy older individuals (Bowles et al., 1987). Next, we characterized the types of word-finding behaviors and found that empty words had the highest rate in all groups, followed by insertions in the healthy older adult and MCI groups, and repetitions in the DAT group. Substitutions were infrequent in all three groups. First, the most prevalent word-finding behavior was the use of empty words, consistent with a previous study (Choi, 2020) that evaluated the word-finding behavior of healthy older adults across different age groups. The increased production of empty words may be related to previous research (Obler & Albert, 1981) that demonstrated a connection between naming difficulties, an elevated use of ambiguous references and unclear words in spontaneous speech, and increased circumlocution. The findings of this study suggest that the increase in word-finding behaviors, especially the increase in using empty words, is similar in both normal aging and the progression of disease to MCI and

DAT. In other words, individuals with MCI and DAT show language impairment in the semantic aspect. When this impairment leads to difficulties in word retrieval, word-finding behaviors, such as using empty words at delayed intervals, increase. A study by Choi (2020) found that empty words and repetitions are important word-finding behaviors that tend to increase with age. Similarly, repetitions were also common among the individuals with DAT in this study, suggesting that they struggle with word retrieval due to semantic impairment. They use words or phrases repeatedly to gain time to recall the target word. In addition, Schmitter-Edgecombe et al. (2000), who studied age-related word-finding behaviors, reported that substitutions increased with age, contradicting the results of this study. One possible explanation for this difference is the variation in the tasks utilized. Schmitter-Edgecombe et al. (2000) used a standardized test, the TWFD (German, 1991), to analyze word-finding behavior. While the target vocabulary is more clearly presented in a standardized test, making it easier to analyze substitutions when the word is presented with another word, this study's use of a less structured spontaneous speech task in unstructured conversation is believed to have led to differences in results due to difficulties in detecting substitutions. In this regard, a study by Choi (2020) using a task like ours found that the rate of substitutions produced was quite limited across all age groups, consistent with our results. Next, an ANOVA was conducted to determine if significant differences existed between groups in the proportion of word-finding behavioral output. The results indicated significant group differences in the global index, word reformulations, repetitions, empty words, insertions, and delays; however, there were no significant group differences in substitutions or time fillers. These results suggest that word-finding behavior increases with normal aging and that pathological damage contributes to a general increase in word-finding behavior. Substitutions were rarely observed in all three groups, so it is unlikely that any significant differences were observed. The lack

of significant difference between groups in the case of time fillers is related to their serving various functions beyond aiding in word retrieval for individuals with naming impairment, and the lack of significant difference between groups is based on the overall rate of time fillers were produced, without considering their specific functions. Similarly, Ha, Jung, & Sim (2009) found that the difference in the rate of time fillers produced by healthy older individuals and individuals with DAT was not significant, consistent with the results of this study. Post hoc analyses of group differences revealed significant variations in the global index and insertions between the healthy older adult and DAT groups and between the MCI and DAT groups. Significant differences in repetitions and empty words were observed between the healthy older adult and individuals with DAT groups.

There were significant differences in word reformulations between the MCI and DAT groups. In the case of empty words and repetitions, only the difference between the groups of individuals with MCI and DAT was significant. As previously mentioned, empty words and repetitions are word-finding behaviors that may explain the changes in naming ability with aging. The significant difference between the groups of healthy older adults and those with DAT suggests that these two word-finding behaviors increase with normal aging and reflect the decline in naming ability caused by dementia. Next, insertions significantly differed between the healthy older adult and the individuals with DAT groups. Insertions indicating naming difficulties also increased during the normal aging process, suggesting that insertions may reflect pathological changes in naming ability in individuals with DAT. There were significant differences in insertions and word reformulations between individuals with MCI and those with DAT. Word reformulations are word-finding behaviors that involve changing or modifying words while attempting to find the right ones. It is observed that individuals with DAT exhibit more word-finding errors and, correspondingly, increasingly modify their behavior, which is significantly more common than in the MCI stage. There was no significant difference in the rate of all word-finding behaviors produced between the healthy older adult and MCI groups. Existing research on naming in individuals with MCI is controversial. Some studies suggest that naming abilities are preserved in the MCI stage, while others indicate that naming is already im-

paired (Choi et al., 2013). These differences in findings may be attributed to the tasks utilized and the characteristics of the individuals with MCI in the studies. In this study, individuals with MCI exhibited relatively high cognitive abilities. Therefore, the difference in the frequency of word-finding behaviors between this group and the general population is not considered significant. Similarly, the K-BNT also revealed no significant difference between the groups of healthy older adults and those with MCI.

The correlations between group-specific rates of word-finding behavior and performance on confrontation naming revealed significant inverse correlations between the rates of global index, word reformulations, and empty words, and the score on the K-BNT. The substitutions, repetitions, time fillers, insertions, and delays were not significantly related to the K-BNT score. The correlation analysis revealed a significant association between the K-BNT and the global index, indicating the rate of all word-finding behaviors. This suggests a lower confrontation naming score is associated with a higher rate of word-finding behavior. Next, the correlation was also significant for empty words, suggesting that as confrontation naming ability decreases, producing words unrelated to the target increases. This suggests that the rate of empty words is associated with confrontation naming abilities in both cognitively healthy and neurologically impaired elderly individuals.

The rate of word reformulations was also inversely correlated with K-BNT scores. This suggests that the significant decline in confrontation naming in individuals with DAT may be attributed to increased word-finding behaviors that limit producing the target vocabulary, resulting in modifying and altering the words produced. As mentioned earlier, empty words and repetitions are the most significant word-finding behaviors that distinguish the three groups, although the correlation was significant only in the case of empty words. The reason for this is as follows. In the spontaneous recall task, participants are asked to recall target words and then integrate them into sentences. Damage to the semantic system prolongs the time required to access the target word, and word-finding behavior involves repeatedly producing the word or phrase to compensate for this delay. Repetition during word-finding behaviors may be more related to a time delay in word retrieval than to a failure to retrieve the word. However, in the case of the K-BNT, where the user is shown a picture and asked to name the ob-

ject, the correlation with repetition behavior is not significant because it only assesses the accuracy of word retrieval without considering the reaction time. These results suggest that word-level naming tests do not provide information about the word retrieval delays people frequently experience daily.

Next, a one-way ANOVA was conducted to determine if there were significant group differences in generative naming scores, and the results indicated significant group differences in both semantic and phonemic generative naming performance. Post hoc analyses revealed significant differences between the groups of healthy older adults and individuals with DAT, individuals in the MCI and DAT groups, and all three groups for the animal category in semantic and phonemic generative naming. Additionally, there were significant differences among the three groups in the semantic generative naming of supermarket items. These results suggest that during the word naming test, including confrontation naming, the task that best discriminates between normal older adults, those with MCI, and those with DAT is the semantic generative naming task in the supermarket item category.

These results can be related to the findings of Suh and Choi (2022), who examined the relationship between naming ability and both objective and subjective memory in healthy older individuals. They found that only the supermarket item category was significantly associated with objective and subjective memory in the semantic generative naming task. The supermarket item category includes words closely related to real life and represents the easiest and most sensitive tasks to assess pathological changes in naming ability in normal older adults, those with MCI, and those with DAT. We also conducted a correlation analysis between the rates of word-finding behaviors and generative naming performance in the three groups. We found that performance in both semantic and phonemic generative naming were significantly inversely correlated with the global index and the rate of word reformulations, repetitions, insertions, and delays. These results differ somewhat from the correlations between the rate of word-finding behaviors and confrontation naming. The rate of word reformulations was significantly associated with both confrontation and generative naming performance. However, the empty word was only associated with confrontation naming, while repetitions, insertions, and delays were only linked to generative naming. The

differences in the tasks of confrontation naming and generative naming can explain this. Confrontation naming is expected to be linked to empty words, such as pronouns like “this” and “that,” to find the correct word when a specific word cannot be recalled, as there is only one accurate response. Conversely, there could be numerous correct answers in generative naming, reducing the likelihood of producing empty words. Participants can suggest alternative words when they cannot recall a specific word. In addition, the significant correlation between word-finding behaviors such as repetitions, insertions, and delays, and generative naming can be attributed to the nature of generative naming, which requires participants to produce as many different words in a category as possible within one minute. This contrasts with the confrontation naming task, which is completed when a single word is produced. Finally, to examine the effect of word-level naming test performance on the global index, defined as the overall rate of word-finding behavior, we conducted a stepwise multiple regression analysis. Our findings revealed that the number of correct responses in semantic generative naming (animal & supermarket items) significantly predicted the global index.

The significance of this study is that it evaluated word-finding behaviors in spontaneous speech. This study aims to assess natural word-finding behaviors in everyday life and compare these findings to the performance on conventional naming tasks, such as confrontation naming and generative naming, in the healthy older adult, MCI, and DAT groups. The spontaneous speech-based naming assessments detected various naming problems in individuals with MCI and DAT compared to a typical word naming task. Although assessing naming difficulties in spontaneous speech by analyzing word-finding behaviors is clinically valuable, it is difficult to evaluate all aspects of these behaviors. Consequently, research focused on word-finding behaviors that are significant for older adults, including those with neurolinguistic disorders, should be ongoing. Furthermore, a limitation of this study is that it was not examine the relationship between the rate of word-finding behaviors and various aspects of naming, other than the correct responses on the word-level naming test. Therefore, we suggest that future research investigate the relationship between characteristics such as reaction time and error rate on word-level naming tests and the rates of word-finding behaviors.

REFERENCES

- Adlam, A. L. R., Bozeat, S., Arnold, R., Watson, P., & Hodges, J. R. (2006). Semantic knowledge in mild cognitive impairment and mild Alzheimer's disease. *Cortex*, 42(5), 675-684.
- Albert, M. S., Moss, M. B., Tanzi, R., & Jones, K. (2001). Preclinical prediction of AD using neuropsychological tests. *Journal of the International Neuropsychological Society*, 7(5), 631-639.
- Appell, J., Kertesz, A., & Fisman, M. (1982). A study of language functioning in Alzheimer patients. *Brain and Language*, 17(1), 73-91.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Publishing.
- Bowles, N. L., Obler, L. K., & Albert, M. L. (1987). Naming errors in healthy aging and dementia of the Alzheimer type. *Cortex*, 23(3), 519-524.
- Chertkow, H., & Bub, D. (1990). Semantic memory loss in dementia of Alzheimer's type: what do various measures measure? *Brain*, 113(2), 397-417.
- Choi, H. (2015). Ratio of correct information unit and cognitive functions in healthy elderly adults. *Communication Sciences & Disorders*, 20(3), 435-445.
- Choi, H. (2020). Word-finding behaviors of discourse production task in healthy elderly adults. *Audiology & Speech Research*, 16(4), 347-355.
- Choi, H., Kim, J. H., Lee, C. M., & Kim, J. I. (2013). Features of semantic language impairment in patients with amnesic mild cognitive impairment. *Dementia & Neurocognitive Disorders*, 12(2), 33-40.
- Choi, H., & Lee, J. Y. (2017). Relationship to ratio of correct information unit and cognitive functions in patients with amnesic MCI and EAD. *Communication Sciences & Disorders*, 22(3), 550-560.
- Cho, M., Bae, J., Suh, G., Hahm, B., Kim, J., Lee, D., & Kang, M. (1999). Validation of geriatric depression scale, Korean version (GDS) in the assessment of DSM-III-R major depression. *Journal of Korean Neuropsychiatric Association*, 38(1), 48-63.
- Connor, L. T., Spiro III, A., Obler, L. K., & Albert, M. L. (2004). Change in object naming ability during adulthood. *The Journals of Gerontology Series B: Psychological Sciences & Social Sciences*, 59(5), 203-209.
- Duker, A. P., Espay, A. J., Wszolek, Z. K., Rademakers, R., Dickson, D. W., & Kelley, B. J. (2012). Atypical motor and behavioral presentations of Alzheimer disease: a case-based approach. *The Neurologist*, 18(5), 266-272.
- Duong, A., Tardif, A., & Ska, B. (2003). Discourse about discourse: what is it and how does it progress in Alzheimer's disease? *Brain & Cognition*, 53(2), 177-180.
- Fleming, V. B., & Harris, J. L. (2008). Complex discourse production in mild cognitive impairment: detecting subtle changes. *Aphasiology*, 22(7-8), 729-740.
- German, D. J. (1991). *Test of word finding in discourse TWFD: Administration, scoring, interpretation, and technical manual*. Pro-Ed.
- German, D. J., & Glasnapp, D. R. (1990). The test of word-finding in discourse: diagnostic utility evidence. *Educational & Psychological Measurement*, 50(2), 383-392.
- Goodglass, H., & Kaplan, E. (1983). *The assessment aphasia and related disorders* (2nd ed.). Lea and Febiger.
- Ha, J. W., Jung, Y. H., & Sim, H. S. (2009). The functional characteristics of fillers in the utterances of dementia of Alzheimer's type, questionable dementia, and normal elders. *Korean Journal of Communication & Disorders*, 14(4), 514-530.
- Heller, R. B., & Dobbs, A. R. (1993). Age differences in word finding in discourse and nondiscourse situations. *Psychology & Aging*, 8(3), 443-450.
- Kang, Y. (2006). A normative study of the Korean mini-mental state examination (K-MMSE) in the elderly. *Korean Journal of Psychology*, 25(2), 1-12.
- Kang, Y., Chin, J. H., Na, D., Lee, J., & Park, J. (2000). A normative study of the Korean version of controlled oral word association test (COWAT) in the elderly. *Korean Journal of Clinical Psychology*, 19(2), 385-392.
- Kim, H., & Na., D. (1997). *Korean version of Boston naming test (K-BNT)*. Seoul: Hakjisa.
- LaBarge, E., Balota, D. A., Storandt, M., & Smith, D. S. (1992). An analysis of confrontation naming errors in senile dementia of the Alzheimer type. *Neuropsychology*, 6(1), 77-95.
- Lee, J. H., Lee, K. U., Lee, D. Y., Kim, K. W., Jhoo, J. H., Kim, J. H., ..., & Woo, J. I. (2002). Development of the Korean version of the consortium to establish a registry for Alzheimer's disease assessment packet (CERAD-K) clinical and neuropsychological assessment batteries. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 57(1), P47-P53.
- Mahoney. (1965). Functional evaluation: the Barthel index. *Maryland State Medical Journal*, 14, 61-65.
- Marini, A., Boewe, A., Caltagirone, C., & Carlomagno, S. (2005). Age-related differences in the production of textual descriptions. *Journal of Psycholinguistic Research*, 34, 439-463.
- Morris, J. C. (1993). The clinical dementia rating (CDR): current version and scoring rules. *Neurology*, 43(11), 2412-2414.

- Nicholas, L. E., & Brookshire, R. H. (1993). A system for quantifying the informativeness and efficiency of the connected speech of adults with aphasia. *Journal of Speech, Language, & Hearing Research, 36*(2), 338-350.
- Obler, L., & Albert, M. (1981). Language and aging: a neurobehavioral analysis. In D. Beasley & G. Davis (Eds.), *Aging: Communication processes and disorders* (pp. 107-121), Grune & Stratton, New York.
- Perry, R. J., Watson, P., & Hodges, J. R. (2000). The nature and staging of attention dysfunction in early (minimal and mild) Alzheimer's disease: relationship to episodic and semantic memory impairment. *Neuropsychologia, 38*(3), 252-271.
- Petersen, R. C., Doody, R., Kurz, A., Mohs, R. C., Morris, J. C., Rabins, P. V., ..., & Winblad, B. (2001). Current concepts in mild cognitive impairment. *Archives of Neurology, 58*(12), 1985-1992.
- Salmon, D. P., Heindel, W. C., & Lange, K. L. (1999). Differential decline in word generation from phonemic and semantic categories during the course of Alzheimer's disease: implications for the integrity of semantic memory. *Journal of the International Neuropsychological Society, 5*(7), 692-703.
- Schmitter-Edgecombe, M., Vesneski, M., & Jones, D. (2000). Aging and word-finding: a comparison of spontaneous and constrained naming tests. *Archives of Clinical Neuropsychology, 15*(6), 479-493.
- Shewan, C. M. (1988). The Shewan spontaneous language analysis (SSLA) system for aphasic adults: description, reliability, and validity. *Journal of Communication Disorders, 21*(2), 103-138.
- Ulatowska, H. K., North, A. J., & Macaluso-Haynes, S. (1981). Production of narrative and procedural discourse in aphasia. *Brain & Language, 13*(2), 345-371.
- Williams, B. W., Mack, W., & Henderson, V. W. (1989). Boston naming test in Alzheimer's disease. *Neuropsychologia, 27*(8), 1073-1079.
- Yi, B. (2015). *Korean grammar for speech-language pathologists*. Seoul: Hakjisa.
- Yoon, M. S., Kim, S. J., Kim, J. M., Chang, M. S., & Cha, J. E. (2013). Reliable sample size for mean length of utterance analysis in preschooler. *Communication Sciences & Disorders, 18*(4), 368-378.

Appendix 1. 단어찾기 행동의 설명과 예시

단어찾기 행동	설명	예시
대치(substitutions)	단어찾기에 실패한 목표단어를 다른 단어로 바꿈	책상(의자)을 가져와서...
단어재구성(word reformulations)	사용한 단어를 변경, 수정함	여자가, 엄마가 설거지를...
반복(repetitions)	음절, 단어, 구를 반복함	과자, 과자를...
무의미어(empty words)	그림설명 내용에 포함되지 않거나 특정되지 않는 단어 등이 나타남	거기, 동생은 과자를 꺼내고...
삽입어(time fillers)	그림설명의 앞뒤 문맥에 영향을 주지 않는 모음이나 음절 등의 발화 행동이 나타남	접시를 닦고, 어, 음, 싱크대 위에...
첨가(insertions)	담화산출에 자신의 생각 등이 첨가됨	여기 엄마가... 이거 이름을 뭐라고 하더라?
연장(delays)	5초 이상의 연장된 침(pause)이 담화산출 과정에서 나타남	엄마가...(5초)...접시를 닦고 있네

출처: Choi (2020).

국문초록

경도인지장애와 알츠하이머형 치매 노인의 단어 찾기 행동과 이름대기 능력 간의 관계

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배경 및 목적: 경도인지장애(Mild cognitive impairment, MCI)와 알츠하이머형 치매(Dementia of Alzheimer's type, DAT) 노인의 이름대기 장애는 다양한 형태의 단어 찾기 행동으로 나타난다. 이 연구는 건강한 노인, MCI, DAT 노인을 대상으로 단어찾기 행동의 산출 비율과 이름대기 능력의 관련성을 살펴보는 것을 목표로 하였다. **방법:** 이 연구에는 건강한 노인 41명, MCI 노인 30명, DAT 노인 30명, 총 101명이 참여하였다. 자발화 산출 과제로는 그림설명 과제를 사용하였고, 이름대기 과제는 대면이름대기(Korean version of the Boston naming test, K-BNT)와 생성이름대기(Korean version of the controlled oral word association test, K-COWAT)를 사용하였다. **결과:** 첫째, 세 집단 간 단어 찾기 행동의 산출 비율, 특히 글로벌 지수에서 유의미한 차이가 관찰되었다. 둘째, 상관관계 분석 결과, 글로벌 지수, 단어 재구성, 무의미어의 비율과 대면이름대기 검사 수행 간에 유의미한 음의 상관관계가 있는 것으로 나타났다. 마지막으로, 글로벌 지수, 단어 재구성, 반복, 지연, 삽입의 비율과 생성이름대기 검사 수행 간에 유의미한 음의 상관관계가 있었다. **논의 및 결론:** 이 연구에서는 건강한 노인, MCI, DAT 노인 간의 단어의 산출 비율과 이름대기 능력 간의 관련성을 발견하였다. 이러한 결과는 MCI와 DAT 노인의 이름대기를 효율적으로 평가하기 위해 자발화 기반 이름대기 평가 척도를 개발해야 할 필요성을 시사한다.

핵심어: 일반 노인, 자발화, 그림설명, 이야기담화, 주제담화, 단어 찾기 행동

이 논문은 2021년 대한민국 교육부와 한국연구재단의 지원을 받아 수행된 연구임(NRF-2021R111A3040309).

참고문헌

- 강연옥 (2006). K-MMSE (Korean-Mini Mental State Examination)의 노인 기준 연구. *한국심리학회지*, 25(2), 1-12.
- 강연옥, 진주희, 나덕렬, 이정희, 박재설 (2002). 통제 단어 연상 검사(Controlled oral word association test)의 노인 기준 연구. *한국심리학회지: 임상*, 19(2), 385-392.
- 김향희, 나덕렬 (1997). *한국판 보스톤이름대기 검사(K-BNT)*. 서울: 학지사.
- 윤미선, 김수진, 김정미, 장문수, 차재은 (2013). 평균발화길이 분석을 위한 발화 표본의 크기. *Communication Sciences & Disorders*, 18(4), 368-378.
- 이봉원 (2015). *언어치료를 위한 한국어 문법*. 서울: 학지사.
- 조맹재, 배재남, 서국희, 함봉진, 김장규, 이동우, 강민희 (1999). DSM-III-R 주요우울증에 대한 한국어판 Geriatric Depression Scale (GDS)의 진단적 타당성연구. *신경정신의학*, 38(1), 48-63.
- 최현주 (2015). 일반 노인의 정보 전달 능력과 인지기능과의 상관. *Communication Sciences & Disorders*, 20(3), 435-445.
- 최현주 (2020). 일반 노인의 담화 산출 과제에서의 단어찾기 행동. *Audiology & Speech Research*, 16(4), 347-355.
- 최현주, 김지현, 이상민, 김재일 (2013). 기억형 경도인지장애 환자의 의미적 측면에서의 언어장애 특성. *대한치매학회지*, 12(2), 33-40.
- 최현주, 이준영 (2017). 기억상실형 경도인지장애와 초기 알츠하이머병 환자의 정보전달 능력과 인지기능과의 상관. *Communication Sciences & Disorders*, 22(3), 550-560.
- 하지원, 정윤희, 심현섭 (2009). 알츠하이머 치매 및 치매의심 집단과 정상 노인의 발화 비교분석을 통한 삽입어(filler)의 기능 연구. *언어청각장애연구*, 14(4), 514-530.

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