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Author(s)	Lai, Wing-shan, Loretta; 黎詠珊
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**Noun and verb production of Cantonese normal and aphasic speakers
in confrontation naming and oral narratives**

Lai Wing Shan, Loretta

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Abstract

This study investigated the ability of 19 Cantonese-speaking participants with aphasia and 19 age-, gender- and education level-matched controls to produce nouns and verbs in confrontation naming and oral narrative tasks. Target items were matched for age-of-acquisition and familiarity between word classes and between tasks. The data from the language database developed by Kong, Law and Lee (2009) following AphasiaBank Project was used. In particular, the performance of participants in object and action naming tasks, picture description tasks, procedural description task and story-telling tasks were analyzed. Results showed that there was no clear evidence of word class effect and participants had significantly better word retrieval in the confrontation naming than narrative tasks. The findings reinforce the importance of task effect on word retrieval in aphasia which leads to consideration for using discourse tasks supplementary to confrontation naming task in assessment and treatment.

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Anomia which refers to difficulty in retrieving intended words in picture naming and discourse contexts is a prominent characteristic in all types of aphasia (Laine & Martin, 2006; LaPointe, 2005). Lexical models give account for single word production process and it is widely agreed that word production involves separate semantic and phonological stages (Dell, Schwartz, Martin, Saffran & Gagnon, 1997; Nickels, 2001). Semantic stage involves activation and selection of the semantic and grammatical features of the intended word, whereas the phonological level activates the phonological properties for articulation (Caramazza, 1997). Acquired brain damage in aphasia may result in selective disruption to central semantic system, phonological output lexicon or access between the two stages and cause naming difficulty (LaPointe, 2005). There are different factors affecting word retrieval such as age of acquisition (AoA), frequency, familiarity, imageability and word length (Goodglass, Kaplan, & Barresi, 2001). Among the factors, age of acquisition has been found to be the strongest predictor of naming performance in confrontation naming tasks (Cuetos, Aguado, Izura, & Ellis, 2002; Law, Weekes, Yeung, & Chiu, 2009). The effect of AoA was also found to be significant in Chinese naming (Weekes, Shu, Hao, Liu, & Tan, 2007); speakers take less time to retrieve words that are acquired early in life than the later acquired words (Law et al., 2009). Besides, Bird, Howard and Franklin (2003) suggested that noun-verb dissociation might be explained by the strong effect of imageability. Individuals find it harder to retrieve verbs than nouns as verbs involve more complex semantic representation and lower imageability.

As nouns and verbs differ in imageability, semantic and grammatical properties that can be differentially impaired, naming of nouns and verbs will be evaluated separately (Nickels, 2002). The effect of word class on word retrieval has been investigated in most psycholinguistics studies and it has been found that noun retrieval accuracy was generally higher than verbs. Matzig, Druks, Masterson and Vigliocco (2009) conducted a critical

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review of 38 papers between year 1984 to 2005 on picture naming of nouns and verbs in participants with aphasia and revealed that 75 percent of 280 patients with different types of aphasia were found to have relatively more verb deficits. The authors then carried out a new study to further explore noun-verb dissociation in nine participants with mild to moderate aphasia and nine normal controls and the findings also revealed advantage of naming nouns. Druks, Masterson, Kopelman, Clare, Rose, & Rai (2006) also reported that healthy speakers demonstrated slower response time to name action than object pictures which implies greater word finding difficulties for verbs. On the other hand, some studies reported verb advantage in individuals with fluent aphasia (Mayer & Murray, 2003; Pashek & Tompkins, 2002), but there were only 13% of participants with Broca's, fluent or mixed aphasia showed verb advantage as reported in the review of Matzig et al. (2009). The discrepancy in findings was possibly due to different types of participants and control measures on psycholinguistic variables.

From clinical perspectives, there has been a bias towards assessing object naming performance in published naming tests such as the Cantonese version of the Western Aphasia Battery (CAB; Yiu, 1992), Boston Naming Test (BNT; Kaplan, Goodglass, & Weintraub, 2001), and Psycholinguistic Assessment of Language Processing in Aphasia (PALPA; Kay, Lesser, & Coltheart, 1992). There is only limited naming assessment such as the Object and Action Naming Battery (OAB; Druks & Masterson, 2000) which examine production of both nouns and verbs. The investigation on noun-verb differences may provide insight into the validity of naming assessment which barely elicits noun production.

Noun and verb retrieval is typically assessed by confrontation naming task in which the speaker will be presented with visual stimuli of object and action and required to name the target word. However, single word picture naming does not resemble daily communication as people do not communicate by just labeling items. Besides, individuals with mild

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naming impairment may also show word finding difficulty in discourse level. Therefore, the adequacy of single word picture naming task for assessing one's functional lexical retrieval ability remains questionable.

Lexical retrieval in discourse has only been recently researched as discourse narrative is unconstrained and there is less agreement on the use of measures for quantifying lexical retrieval at discourse level (Laine & Martin, 2006). Few studies have reported significant differences in naming accuracy between confrontation naming and connected speech tasks. Mayer and Murray (2003) and Pashek and Tompkins (2002) reported superior word finding ability in discourse task in speakers with aphasia. It was suggested that word retrieval in picture naming relies only on the semantic features of the target, and it may be achieved via direct activation of visual-to-phonological representation bypassing the semantic system (Raymer and Kohen, 2006). In contrast, word finding in connected speech may be facilitated by contextual priming of the multiple lexical items in sentences. During the retrieval process, the phonological representations engage in a network of semantic and syntactic nodes which facilitate activation of the target word (Pashek & Tompkins, 2002; Raymer & Kohen, 2006). However, Mayer and Murray (2003) did not match nouns and verbs for variables that might affect naming and there was a lack of control group which made it difficult to make inferences about the causes of the observed effect. Besides, Pashek & Tompkins (2002) matched the target nouns and verbs for frequency and familiarity only, but not age of acquisition which has been found to be the strongest predictor of picture naming accuracy (Cuetos, et al., 2002; Law et al. 2009). On the other hand, Williams and Canter (1982) reported a lack of overall significant difference in accuracy for naming nouns between confrontation naming and picture description tasks in aphasic group, but the target nouns across tasks were matched for frequency only. The findings were inconsistent which could be due to different types of discourse tasks used, inconsistent procedures for matching

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stimuli across tasks and different subject criteria.

Clinically, most published aphasia assessment involves the use of confrontation naming only for assessing lexical retrieval for example the CAB (Yiu, 1992) and PALPA (Kay et al., 1992). There is few standardized assessment evaluating one's word finding ability in discourse such as the Test of Word Finding in Discourse (TWFD; German, 1991) which provides norms for children only. Besides, treatment for naming impairment in aphasia commonly involves the use of semantic feature analysis (SFA) that requires an individual to describe salient features, functions and associations of pictured target (Boyle, 2004). Although it has been found to have direct treatment effect, there was limited evidence of generalization of treatment effect to discourse level (Boyle, 2004; Boyle & Coelho, 1995). By exploring the effects of naming context, the findings may allow clinician to evaluate whether typical confrontation naming task can truly reflect and improve the ability of speakers with aphasia to retrieve words in daily communication.

To summarize, the current study aimed to evaluate effect of word class and task on naming with a better methodological control by matching AoA and familiarity between grammatical classes and different linguistic contexts. It is expected that (i) naming accuracy is higher for noun than verb retrieval as nouns are more imageable. It is also anticipated that (ii) word retrieval in narrative task is easier than in confrontation naming due to the possible semantic, syntactic and phonological priming effect which facilitates word retrieval (Pashek & Tompkins, 2002).

Method

Participants of Stage I

In the first stage of the project, a group of 30 native Cantonese speakers (15 males; mean age \pm SD: 25 ± 3 , range: 21 - 30) was recruited to rate the age of acquisition (AoA), familiarity and imageability of the stimuli used in the present study.

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Participants of Stage II

In the second stage, the data of 19 participants with aphasia (17 males; mean age \pm SD: 55 ± 11 , range: 41 - 85) and 19 age-, gender- and education level-matched controls (17 males; mean age \pm SD: 53 ± 10 , range: 40 - 77) from the language database developed by Kong, Law and Lee (2009) following the AphasiaBank Project was examined. All participants were native Cantonese speakers with normal or corrected-to-normal vision. Participants in the aphasic group were at least 6 months post-onset at the beginning of the study. All patients were diagnosed with anomic aphasia according to the CAB (Yiu, 1992) based on the profile of fluency, comprehension, repetition and naming. In comparison to other forms of aphasia, anomic aphasia just involves word retrieval difficulties while other language modalities including auditory comprehension, spontaneous language production and repetition remain preserved (Goodglass et al., 2001). Therefore, this study focused on examining word finding in anomic aphasia to prevent confounding factors.

Materials

The data used in the current study were from the language database developed by Kong, Law and Lee (2009) following the Aphasia Bank Project. To examine word retrieval ability in aphasic and control participants, the data of the participants' performance in confrontation naming and various narrative tasks in the language database was analyzed. Confrontation naming task consisted of 60 line-drawing object pictures from BNT (Kaplan et al., 2001) and 50 line drawing action pictures from Verb Naming Test (VNT; Thompson, 2011). The following narrative tasks were selected from the database as they facilitate elicitation of content-based words; (i) picture description tasks ("Broken Window", "Refused Umbrella", "Cat Rescue", and "Flood"), (ii) procedural description of making a sandwich, and (iii) story telling tasks ("龜兔賽跑- The Tortoise and the Hare" and "狼來了- The Cry Wolf"). The speakers' naming and narrative production was audio- and video-taped, and had been

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transcribed at utterance level in Codes for the Human Analysis of Transcripts (CHAT) format (MacWhinney, 2000).

Selection of stimuli for comparison

The stimuli used for comparison between word classes and between tasks were selected from production of nouns and verbs in confrontation naming and narrative tasks by 120 control participants in the database. Five identical nouns and three verbs across naming and narrative task were first selected as stimuli for comparison. Then, the following analysis for selecting words in the narrative task to match with those in the naming task was carried out. Firstly, the Computerized Language Analysis program (CLAN; MacWhinney, 2000) was used to perform a frequency analysis on transcripts of 120 healthy participants to count and list out different nouns and verbs. Words with frequency greater than 120 (total number of participants) were selected to ensure that it is produced by a significant number of healthy participants. Secondly, these words were input to the Powergrep program (Goyvaerts, 2013) to determine how many participants have produced each of these words. Words that have been produced by more than 50% of the healthy participants were then selected as stimuli to be used in the rating test. A total number of 87 nouns (60 items from BNT and 27 items from narrative tasks) and 87 verbs (50 items from VNT and 37 items from narrative tasks) were selected to be used in the rating tests (see Appendix A).

The group of 30 native Cantonese speakers have been recruited to rate the AoA, familiarity and imageability of the selected 174 words on a computer in a quiet room. The items were randomized and presented in six sub-tests in a pre-determined random order. Participants were required to rate (i) AoA using a 7-point scale with a two-year age band on each point, (ii) familiarity on a 5 point scale from 1 for unfamiliar (never had seen) to 5 for extremely familiar (had seen very often), and (iii) imageability on a 7 point scale from 1 for not at all imageable to 7 for highly imageable (Law et al., 2009) (see Appendix B).

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The AoA, familiarity and imageability of the words were matched across the picture naming and narrative tasks. Two sets of 27 nouns and 20 verbs were identified to be used in this study. To verify if the two sets of the words are matched for AoA, familiarity, imageability and word length, Mann Whitney U tests were employed to compare them between tasks (naming and narrative) and between word classes (nouns and verbs). Non-parametric tests were used as the data violated normality assumptions (Field, 2009).

Scoring procedure

After adding the identical targets to the two sets of words, there were a total of 29 nouns and 21 verbs for confrontation naming task, as well as 32 nouns and 23 verbs for narrative tasks. However, one target noun (樹枝) and two target verbs (到, 住) were deleted from narrative tasks as the occurrence frequency of the noun was less than 50% in 120 healthy participants due to technical problem and the verbs were mainly produced as verb particles by the 120 healthy participants.

Objective measurement on naming accuracy of the finally selected 29 nouns and 21 verbs in confrontation naming task as well as 31 nouns and 21 verbs in narrative tasks (see Appendix C) were made and analyzed to test the hypotheses. All responses from picture naming tasks were transcribed orthographically and phonetically while responses from narrative tasks were transcribed in CHAT format. One point would be given to a response if it was the target word or a plausible alternative which describes the object or action. For confrontation naming task, a word was considered as a plausible alternative if it shares the same semantic meaning with the target. As narrative tasks involve free speech and it was not possible that all participants produced the targets selected, all plausible alternative words were identified in the lexicon files in CLAN which contain different words produced. Participants who produced the target or the plausible alternative words (see Appendix D) will be credited one point in narrative lexical retrieval.

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Statistical analysis

Before verifying if the two sets of nouns and verbs are matched for different variables (AoA, familiarity and imageability) that may affect naming performance, normality of data was tested using Shapiro-Wilk test to decide whether to use parametric or non-parametric test. If the data was normally distributed, independent t-tests with Bonferroni adjustment would be used to compare each variable between tasks and between word classes; otherwise, non-parametric Mann Whitney U test will be performed for comparison (Field, 2009).

To examine the effect of contexts and word classes on word retrieval ability in aphasic and normal speakers, a three-way mixed design ANOVA would be performed; with one between-subjects factor “group” (Aphasic, Control) and two within-subjects factors “task” (Confrontation naming and oral narratives) and “word class” (nouns and verbs). If significant 3-way and/or 2-way interactions were found, subsequent two-way ANOVA and t-tests would be performed as post-hoc analysis to examine the source of interaction

As previous studies suggested that imageability could result in word class effect and influence naming performance, a hierarchical multiple regression analysis would be carried out to evaluate the influence of imageability independent of the effect of the others. Imageability, word class and task would be entered as predictor variables and accuracy as predicted variable for analysis (Field, 2009).

Results

Matching psycholinguistic variables between word classes and between tasks

Prior to evaluating if the two sets of nouns and verbs were matched for AoA, familiarity, imageability and word length, normality tests were conducted to determine the use of parametric or non-parametric tests. Descriptive statistics and results are presented in Appendix E. According to the normality test of Shapiro-Wilk, the data of AoA, familiarity, imageability and word length were not normally distributed (see Appendix E). Therefore,

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Mann Whitney U tests were performed to compare the psycholinguistics variables between word classes and between tasks. The analyses showed no significant difference in AoA between nouns and verbs in naming ($U = 253.50, p = .722$), and in narrative task ($U = 255.00, p = .747$). There was also no significant difference in familiarity between the two word classes in naming ($U = 212.50, p = .216$) and in narrative tasks ($U = 186.50, p = .072$). Significant difference was found in imageability between nouns and verbs in naming ($U = 122.00, p < .01$) and in narrative tasks ($U = 88.00, p < .01$), with verbs rated lower in imageability. The difference in word length between word classes in the narrative task was significant ($U = 126.00, p < .001$), with nouns longer than verbs, but no significant difference was found in the naming task ($U = 260.50, p = .823$).

In addition, the comparisons between tasks showed that there was significant difference in imageability of nouns ($U = 191.50, p < .01$) and verbs ($U = 88.00, p < .01$) between naming and narrative tasks. There was also significant difference in word length of verbs between naming of narrative tasks ($U = 115.50, p < .01$), with longer verbs in naming than in narrative task. No significant difference in AoA and familiarity between tasks was found ($p > .10$).

Analysis of word class and task effects on word retrieval

To examine the effect of word class and naming context on word retrieval ability in aphasic and normal speaker groups, a three-way mixed design ANOVA was performed; with one between-subjects factor “group” (aphasic vs. control) and two within-subjects factors “task” (confrontation naming vs. oral narratives) and “word class” (nouns vs. verbs). The descriptive statistic results are summarized in Table 1.

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Table 1. *Descriptive statistics of naming accuracy of nouns and verbs in two speech tasks*

	Naming nouns		Naming verbs		Narrative nouns		Narrative verbs	
	M	SD	M	SD	M	SD	M	SD
Aphasic	0.88	0.08	0.72	0.21	0.68	0.18	0.63	0.19
Control	0.98	0.04	0.88	0.09	0.85	0.08	0.78	0.11

Note: M = mean, SD = standard deviation

The three-way ANOVA revealed a significant main effect of task ($F(1, 36) = 60.56, p < .001$), with a higher accuracy in the naming task ($M = .86, SD = .02$) than in the narrative task ($M = .73, SD = .02$). There were also significant main effects of word class ($F(1, 36) = 45.68, p < .001$), with nouns ($M = .84, SD = .01$) retrieved more easily than verbs ($M = .75, SD = .02$), as well as speaker group ($F(1, 36) = 16.25, p < .001$), with higher accuracy found in controls ($M = .73, SD = .03$) than participants with aphasia ($M = .87, SD = .03$). Besides, there was a significant interaction between task and word class ($F(1, 36) = 8.59, p < .01$), which indicated that the accuracy of the two word classes differed in naming and narrative tasks. All other two-way interactions were not significant ($p > .10$).

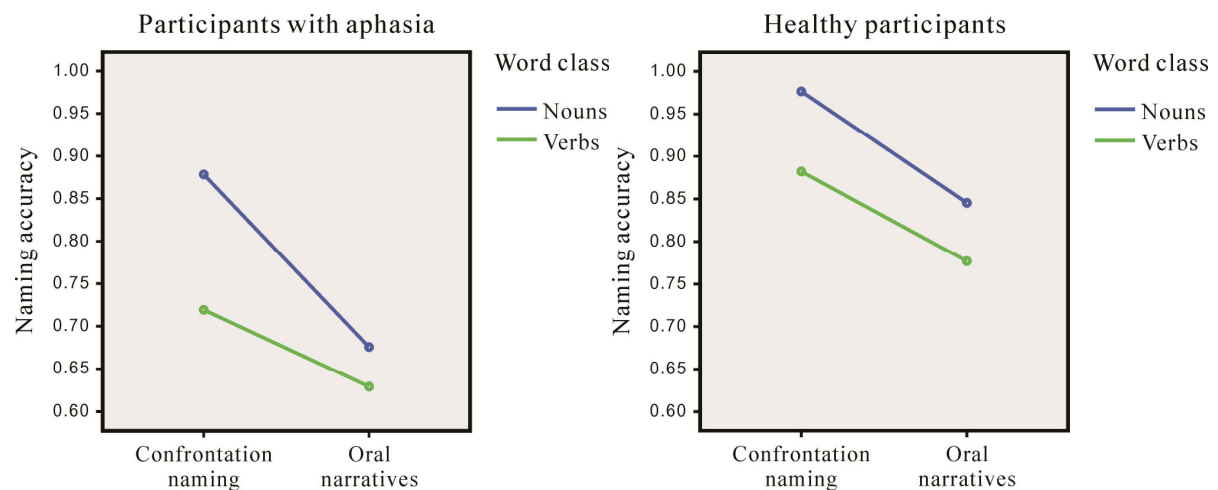
Four pairwise t-tests were performed as post-hoc analysis with the Bonferroni adjustment of alpha value as 0.0125. There was significant difference in naming nouns and verbs between the confrontation naming and narrative tasks ($t(37) = 2.85, p < .01$). The noun-verb difference was greater in the picture naming ($M = .13, SD = .13$) than in the narrative tasks ($M = .06, SD = .09$). In addition, the difference in naming accuracy between the picture naming and narrative tasks was significant in nouns and verbs, but the difference in nouns ($M = .17, SD = .13$) was greater than in verbs ($M = .10, SD = .13$) (Table 2).

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Table 2. *Pairwise comparisons of naming accuracy of different word class between different tasks*

Comparisons			<i>t</i> (37)	<i>p</i> -value
Naming nouns	vs.	Naming verbs	6.1	<.001
Narrative nouns	vs.	Narrative verbs	3.78	<.001
Naming nouns	vs.	Narrative nouns	8.2	<.001
Naming verbs	vs.	Narrative verbs	4.58	<.001

There was also a marginally significant 3-way interaction of group, task and word class ($F(1, 36) = 3.40, p = .074$). Two-way repeated measures ANOVA with task and word class as factors for each speaker group were carried out. The results showed a significant interaction effect in the aphasic group but not in the control group (Figure 1).

Figure 1. *Naming accuracy in different word classes and tasks in aphasic and control groups*

Paired-t tests were performed on naming accuracy in the aphasic group. The results showed that participants with aphasia retrieved significantly more nouns ($M = .88, SD = .08$) than verbs ($M = .72, SD = .21$), $t(18) = 4.40, p < .01$, but there was a lack of significant difference between nouns ($M = .68, SD = .18$) and verbs ($M = .63, SD = .19$), $t(18) = 2.20, p$

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= .04) in narrative tasks. In addition, there were significant differences in performance between naming and narrative tasks in nouns and verbs. Participants achieved a higher accuracy rate for naming objects in the naming task ($M = .88, SD = .08$) than in the narrative task ($M = .68, SD = .18$), $t(18) = 5.85, p < .001$, and a higher accuracy rate for naming verbs in the naming task ($M = .72, SD = .21$) than in the narrative tasks ($M = .63, SD = .19$), $t(18) = 2.81, p < .0125$).

Analysis of imageability effect

A hierarchical multiple regression was performed to investigate the effect of imageability on naming accuracy as imageability differed between nouns and verbs in both the naming and narrative tasks. Since longer word length of nouns was associated with better performance, the effect of word length was not further analyzed. The three independent variables “imageability”, “word class”, and “task” were entered step by step to the regression analysis with naming accuracy as dependent variable. The results of the multiple regression on naming accuracy are shown in Table 3.

Table3. *Hierarchical Regression Model of Naming Accuracy*

	R^2	R^2 change	SE	B	T
Step 1	.24	.24			
Imageability			.02	.49***	5.15
Step 2	.24	.001			
Imageability			.02	.48***	4.43
Word class			.04	-0.03	-.30
Step 3	.29	.05			
Imageability			.02	.35**	2.96
Word class			.04	-.09	-.88
Task			.04	-.25*	-2.37

Note: Statistical significance: * $p < .05$; ** $p < .01$; *** $p < .001$

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In Step 1, only “imageability” was included in the regression analysis. The results showed that the model accounted for a significant 24% of variances with a significant beta value of .49. In Step 2, “word class” was also entered and the total variance remained 24%. In Step 3, all three variables were included in the regression analysis. The variance accounted for by this model increased to 29 %, and the beta values for both “imageability” (.35) and “task” (-.25) were significant.

Discussion

The aim of current study was to examine if word retrieval ability would be affected by word class and different linguistic contexts in Cantonese-speaking individuals with anomic aphasia, compared with the age-, gender- and education-matched controls. Most of the previous studies examined naming performance in confrontation naming task only and did not control for variables that may have contributed to noun-verb differences. This study compared word retrieval in two different linguistic contexts and controlled for the age-of-acquisition and familiarity of nouns and verbs between picture naming and narrative tasks. Based on the previous research, it is predicted that retrieving nouns is easier than retrieving verbs, and narrative production may facilitate better word retrieval than picture naming task due to contextual effects.

As predicted, all participants retrieved more nouns correctly in both picture naming and narrative tasks. The finding was consistent with Matzig et al. (2009) who reported more accurate naming for nouns than verbs by nine patients with different types of aphasia and nine age-matched controls, and Berndt, Burton, Haendiges, & Mitchum (2002) who found relative verb difficulties in 10 speakers with aphasia naming frequency-matched nouns and verbs. The present findings may further support the hypotheses suggested in Chen and Bates (1998) that verbs may involve a higher level of linguistic processing than nouns as verbs assign roles to its arguments while nouns are for filling up the argument. Besides,

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concrete nouns involve sensory attributes including shape, color, size and function, and are organized into categories and hierarchies that share semantic features, which may facilitate processing and account for the superior noun retrieval (Matzig et al., 2009).

However, the current results contrast with Pashek and Tompkins (2002) who reported that 20 speakers with residual anomia showed more difficulties in retrieving nouns than verbs, which were matched for frequency and familiarity. The authors suggested that relative noun deficits might be due to word length effects as 12 nouns were composed of two or more syllables while there was only one multisyllabic verb. Zingeser and Berndt (1990) also reported superior verb retrieval in five participants with anomic aphasic but their lexical items were again matched for frequency and familiarity only. The inconsistent findings may be due to the use of different word stimuli in the current and previous studies. In Pashek and Tompkins (2002), only five percent of targets verbs was verbal VN compound (play cards), however, there were 26% of target verbs were compounds in the current study. The imbalance amount of verb compounds may contribute to discrepancy of results as compounds involve more complex word structure and modification which render retrieval more difficult (Chen & Bates, 1998). In addition, the present study has matched the lexical items between word classes and tasks for the robust predictor of picture naming accuracy, AoA, which had not been controlled for in either of their studies (Cuetos et al., 2002).

Bird et al. (2003) suggested that noun-verb differences in naming may be attributed to the effect of imageability. In the present study, imageability of verbs is lower than the AoA- and familiarity-matched nouns. Since the nouns and verbs were not matched for imageability, the contribution of this variable to naming accuracy was evaluated by hierarchical multiple regression analyses. Imageability was found to be a significant predictor for naming accuracy which suggests that the noun-verb difference in word retrieval can be explained by the imageability effect. In addition, word class effect was entered in the

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second step of the analysis to examine its relative contribution to naming after controlling for imageability. The result reveals a lack of significant word class effect on naming accuracy when the targets were matched in AoA and familiarity and the effect of imageability was controlled. This study provides further evidence on the influence of imageability on naming.

Linguistic context is another aspect that is of interest for investigation in this study. It is expected that word retrieval is easier in narrative task as semantic, syntactic and phonological aspects of multiple words in a sentence may constrain the number of candidates of a specific target word (Pashek & Tompkins, 2002). Besides, individuals with anomia who rely heavily on compensatory strategies such as circumlocution (LaPointe, 2005) and use of coordinate (Beeson, Holland, & Murray, 1995) may produce discourse with a greater amount of total words and less pauses (Johnson & Jacobson, 2007). Contrary to the expectation, both groups of participant in the current study showed greater difficulty retrieving words in narrative task than in confrontation naming task. The result was inconsistent with the findings of Pashek and Tompkins (2002) who reported better naming performance in video narration task than in picture naming task in 20 individuals with anomia and 10 age- and education- matched controls. Mayer and Murray (2003) also found that 14 participants with mild and moderate aphasia had superior word retrieval and more self-corrections of errors in picture description task; however, the study lacked control participants for comparison. In Pashek and Tompkins (2002) study, the use of motion pictures in video narration may be more imageable and facilitate retrieval of nouns and verbs. Besides, Mayer and Murray's study examined word retrieval ability at discourse level with picture description task only, while this study investigated word retrieval in different types of narrative task. The restricted single narrative task in previous study may give account for the observed difference.

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The current results on naming performance between different linguistic contexts also contrast with the findings of Dai, Kong and Weekes (2012) who studied the word retrieval ability of YF, a Cantonese-Mandarin speaking individual with mild anomic aphasia, and observed limited naming difficulties during discourse task. The differences may be attributed to different sample size. Specifically, Dai et al. (2012) was a single case study whereas the present study investigated naming performance of groups and included one subject (sub 3) who demonstrated better word retrieval ability in narrative than in confrontation naming task, similar to YF. Moreover, unlike Dai et al. (2012) who did not control the lexical items for different psycholinguistic variables between the two tasks, the target nouns and verbs in this study were matched between word classes and tasks for analysis. In addition, the authors did not specify noun or verb retrieval when comparing naming performance between picture naming and discourse tasks.

It has been found in this study that 'task' remained a significant predictor even after controlling for the covariates 'imageability' and 'word class'. Inferior word retrieval in narrative task may be due to additional linguistic processing demands such as thematic role assignment and selectional constraints in connected speech (Fitzpatrick, Obler, Spiro & Connor, 2012; Kohn & Cragolino, 1998). It was also suggested that word finding in discourse requires knowledge about events, inferences, and additional attention for selecting from multiple potential target words to form sentences or holding a target word in memory while focusing on other aspects of sentence (Fitzpatrick et al., 2012). Therefore, participants had relative difficulties in retrieving words in narrative contexts than picture naming task as discourse retrieval requires extra linguistic and cognitive demand. This study supports the assertion that noun and verb retrieval in picture naming do not accurately predict word retrieval at discourse level due to different contexts (Dai et al., 2012).

In addition, individuals with anomic aphasia demonstrated significantly greater

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noun-verb difference in naming than in narrative task. The greater noun-verb difference in picture naming task may be explained by the imbalance amount of nominal and verbal compounds (two compound nouns and nine compound verbs). Besides, all nouns are concrete in picture naming while abstract noun (終點) and superordinate noun (動物) are targeted in narrative task. The relatively smaller noun-verb difference in narrative may also be due to the relationship between two word classes in sentence construction; retrieval of noun and verb is related at sentence level as verb determines the argument structure and noun phrase is necessary in a sentence to fully express the meaning of verb (Tsai, Yu, Lee, Tzeng, Hung & Wu, 2009). Nonetheless, the word class effect was not significant after controlling for imageability. Furthermore, the difference in imageability between nouns and verbs in picture naming task was smaller than that in narrative task in this study. This suggests that the interaction effect in the aphasic group was not directly related to the difference in imageability.

While the present study has considered two different levels of production, single word versus connected speech, with nouns and verbs matched for important psycholinguistic variables, there are still limitations. One is that response to naming was evaluated in accuracy only. As individuals with anomia exhibit word retrieval difficulties characterized by a lack of content words, filled pauses, silent pauses and circumlocution when they struggle to retrieve the appropriate word, and inaccurate word selection which resembles that target's semantic meaning or phonological form (Tingley, Kyte, Johnson, & Beitchman, 2003), response to naming can be analyzed with additional parameters including pauses and error pattern in future study. Investigation of different naming parameters allows a more comprehensive analysis of naming and avoids ceiling effect in control group as neurologically unimpaired participants can likely retrieve high naming accuracy in picture naming task.

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Another limitation may be the imbalance distribution of nominal and verbal compounds used in the naming tasks. It was suggested that 80% of words in modern Chinese are compounds which composed of two open-class morphemes that belong to different grammatical categories (Chen & Bates, 1998) for example nominal compound 鉛筆 ‘pencil’ consists of two nominal parts; 鉛 ‘lead’ and 筆 ‘pen’. It was also suggested that verbal VN compound is one of the major forms targeted for action naming for example 洗面 ‘to wash face’ with the verbal element 洗 ‘to wash’ and the nominal element 面 ‘face’. In this study, there are five nominal compounds and nine verbal compounds (6 VN, 2 VVN and 1 VNN compounds) in picture naming task, and there is only one compound noun and two VN compound verbs in narrative task (See Appendix C). Compared to single nouns or verbs, the word structure of compounds may be more complex and difficult to retrieve as it composed of more than one element which undergoes modification (Chen & Bates, 1998). Besides, Chen and Bates (1998) reported that patients with fluent aphasia had difficulty producing nominal elements in verbal VN compounds. Therefore, relative verb impairment may also be attributed to the larger proportion of compound verbs used in the naming tasks. In future study, the number and type of compounds should be controlled and matched between word classes and tasks for a more precise naming analysis. Besides, same set of nouns and verbs can be developed for comparing one’s naming ability between different linguistic contexts for stringent evaluation.

The findings of the present study have crucial clinical implications for assessing word retrieval ability in individuals with aphasia. It has been found that participants demonstrated significantly better word retrieval in confrontation naming task than in discourse task. This finding suggests that picture naming task targeting just single word cannot infer one’s word retrieval problems at connected speech level. As word finding problems may occur in

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single word production, connected speech or both contexts (Tingley, Kyte, Johnson & Beithman, 2003) and the differences in naming performance between tasks were found to be inconsistent among patients (Fitzpatrick et al., 2012), clinicians should also assess lexical retrieval in discourse using narrative assessment such as the Cantonese Linguistics Communication Measure (Kong & Law, 2004) and Main Concept Analysis (Kong, 2009) which have been shown to be useful in objectively measuring aphasic narratives in clinical setting. These narrative tasks are more related to functional communication and can supplement the structured single word naming task to obtain a comprehensive evaluation of one's word retrieval ability. Besides, the findings of significant context effect may give account for the limited generalization of naming treatment effect from single word to discourse level (Boyle, 2004). It may also suggest that word retrieval ability of individuals with aphasia should be treated relative to various contexts. Instead of targeting naming errors in picture naming task, clinicians may provide SFA treatment targeting errors in discourse task which has been found to have generalization effect to untrained targets, increased productivity and informativeness of discourse in individuals with anomic aphasia (Peach & Reuter, 2010).

The current design may serve as a model for examining word finding ability of a relatively large group of participants with anomic aphasia as compared to previous studies. It focuses on patients of a single type of clinical diagnosis which can exclude other potential confounding factors. Further research is warranted to study retrieval of nouns and verbs in individuals with other types of aphasia.

Conclusion

This study provides new evidence of the effect of word class and speaking context on naming performance of Cantonese-speaking individuals with anomic aphasia and neurologically unimpaired controls. There is no clear evidence of word class effect and both

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groups of participants had relatively less difficulty in retrieving words in picture naming task than oral narrative task. The discrepancy in performance between tasks suggested word retrieval in confrontation naming task may not be equivalent to that in discourse which is a more common communicative situation. Clinicians should consider using narrative tasks for supplementary evaluation and treatment for naming difficulties.

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Appendix A

Word stimuli of confrontation naming task and narrative tasks for rating tests

Nouns*60 items from Boston Naming Test*

八爪魚	Octopus	長凳	Bench	搖鈴	hand bell
士多啤梨	Strawberry	屋	House	煙	Cigarette
大炮	Cannon	星星	Star	獅子	Lion
大笨象	Elephant	洋蔥	Onion	裙	Dress
手襪	Gloves	皇冠	crown	較剪	Scissors
牙刷	Toothbrush	紅蘿蔔	carrot	鉛筆	Pencil
牛	Cow	飛機	areoplane	電單車	motor bike
仙人掌	Cactus	梳	comb	電話	Telephone
多士爐	Toaster	匙羹	spoon	蝸牛	Snail
帆船	Sailboat	唱機	gramophone	豬	Pig
老虎	Tiger	掃把	broom	遮	Umbrella
老鼠	Mouse	教堂	church	樹	Tree
西瓜	Watermelon	蛇	snake	褲	Trousers
呔	Tie	雀仔	bird	薯仔	Potato
戒指	Ring	雪茄	cigar	檸檬	Lemon
私家車	private car	雪櫃	fridge	鎖匙	Key
車厘子	Cherry	鹿	deer	鎖鏈	Chain
波	Ball	喇叭	horn	鎚	Hammer
狗	Dog	插蘇	plug	蘋果	Apple
花樽	Vase	雲	cloud	聽診器	Stethoscope

27 items from narrative tasks

人	People	身	body	梯	Ladder
三文治	Sandwich	兔仔	rabbit	終點	finishing point
女仔	Girl	雨	rain	森林	Forest
小朋友	Child	屋企	home	窗	Window
山	Mountain	玻璃	glass	媽咪	Mom
火腿	Ham	消防員	fireman	樹枝	tree branch
羊	Sheep	烏龜	tortoise	貓	Cat
村民	Villager	狼	wolf	雞蛋	Egg
男人	Man	動物	animal	麵包	Bread

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Verbs (Con't)*50 items from Verb Naming Test*

s4/滑梯	to slide	爬	to crawl	揸車	to drive
大笑	to howl	剃羊毛	to shave (wool)	游水	to swim
切	to cut	剃鬚	to shave	睇電視	to watch
打字	to type	咬	to bite	搵	to pinch
打關斗	to tumble	指揮	to conduct	搽	to spread on
划艇	to row a boat	洗衫	to wash (clothes)	照鏡	to look into mirror
行乞	to beg	洗面	to wash (face)	跪	to kneel down
吠	to bark	食	to eat	跳水	to dive in
吸塵	to vacuum	倒	to pour	聞	to smell
坐	to sit	倒垃圾	to take out trash	彈琴	to play the piano
批皮	to peel	梳頭	to comb	熨衫	to iron
求婚	to propose	做手術	to perform surgery	磅重	to weigh
刷牙	to brush teeth	剪紙	to paper-cut	餵養	to feed
拉拉鍊	to zip	推	to push	織	to knit
拖地	to mop	教	to teach	騎馬	to ride a horse
拖車	to tow away	揸牛奶	to milk	曬太陽	to sunbathe
放, 擠	to put down				

37 items from narrative task

冇	not to have	追	to chase	瞓	to sleep
去	to go	做	to do	諗住	to think
叫	to ask/call	帶	to bring	踢	to kick
有	to have	救	to save	踢波	to play football
行	to walk	望	to look over	幫	to help
住	to live	睇	to look at	講	to speak
見	to see	跌	to fall down	嚟	to come
走	to leave	跑	to run	擺	to put
來	to come	嗌	to shout	贏	to win
到	to arrive	煎	to fry	攞	to get
玩	to play	落雨	to rain	聽	to listen to
畀	to give	話	to say	驚	to afraid of
返學	to go back to school				

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Appendix B

Rating tests for AoA, familiarity and imageability

(a) Instructions and criteria for rating AoA of nouns/ verbs

在這測試中，我們需要你來評定你是在多大年齡首次學會某個名/動詞。

所謂首次學會是指第一次學會該詞和它的意思，不管是口頭形式或是書面形式。

請你為一系列名/動詞的習得年齡進行評定，在適當的格中填 "1"。

例子 (名詞)

媽媽: 如果你認為此詞是在 1 歲學會的→ 0-2 歲

字典: 如果你認為此詞是在 7 歲學會的→ 7-8 歲

保險箱: 如果你認為此詞是在 14 歲學會的→ 13 歲或以上

例子 (動詞)

俾: 如果你認為此詞是在 3 歲學會的→ 3-4 歲

選擇: 如果你認為此詞是在 8 歲學會的→ 7-8 歲

體驗: 如果你認為此詞是在 13 歲學會的→ 13 歲或以上

請認真仔細填寫每個項目，在過程中注意不要翻看前面的選擇，亦不必考慮是否已

選擇某個年齡段多次。

	0-2 歲	3-4 歲	5-6 歲	7-8 歲	9-10 歲	11-12 歲	13 歲或以上	不適用
(目標詞)		1						

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(b) Instructions and criteria for rating familiarity of nouns/ verbs (Con't)

請為一系列名/動詞的熟悉程度進行評定，在適當的格中填 "1"。

您可根據在日常生活中接觸該名/動詞所表達的物件/事物/動作/事件的次數作評定。

如每天都會接觸到的可選擇「經常」，有時接觸到的可選擇「間中」，如此類推。

例子(名詞)	例子(動詞)
原子筆: 每天也接觸到→ 經常	睡覺: 每天也做/遇見→ 經常
燈泡: 有時接觸到→ 間中	游水: 有時做/遇見→ 間中
火箭: 很少接觸到→ 極少	攀石: 很少做/遇見→ 極少

請認真仔細填寫每個項目，在過程中注意不要翻看前面的選擇，亦不必考慮是否已選擇某個頻率多次。

	從不	極少	間中	頻密	經常	不適用
(目標詞)			1			

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(c) Instructions and criteria for rating imageability of nouns/ verbs

請為一系列名/動詞的可表象性高低進行評定，在適當的格中填 "1"

可表象性是指當您見到一個詞語時，能夠引發相應、有意義的視覺形象的難易和快慢程度。

當你看到一個名/動詞時，如果能夠很容易、很快產生與之對應的具體清晰的視覺形象，那麼就表明該名/動詞的可表象性很高，應給予較高的評分；如果覺得該名/動詞很難使你產生對應的視覺形象，那麼表明該名/動詞的可表象性很低，應給予較低的評分，如此類推。

例子(名詞)	例子(動詞)
原子筆: 可表象性極高→ 7	唱歌: 可表象性極高→ 7
路線: 可表象性中等→ 4	選擇: 可表象性中等→ 4
思想: 可表象性極低→ 1	相信: 可表象性極低→ 1

請認真仔細填寫每個項目，在過程中注意不要翻看前面的選擇，亦不必考慮是否已選擇某個數字多次。

	1 (很低)	2	3	4 (中等)	5	6	7 (很高)	不適用
(目標詞)						1		

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Appendix C

Final selection of words from confrontation naming and narrative tasks for analysis

Confrontation naming		Narrative task	
Nouns	Verbs	Nouns	Verbs
牙刷	坐	人	瞓
蘋果	食	媽咪	講
波	咬	女仔	畀
狗	爬	雞蛋	玩
豬	刷牙	雨	做
牛	洗面	貓	見
電話	睇電視	屋企	來
褲	照鏡	麵包	帶
屋	推	男人	落雨
梳	梳頭	窗	嗌
雲	大笑	身	驚
鉛筆	聞	小朋友	幫
裙	/s;4/滑梯	動物	追
西瓜	切	山	贏
雀仔	教	羊	踢波
獅子	拉拉鍊	兔仔	救
老鼠	倒	烏龜	諗住
鎖匙	磅重	玻璃	煎
薯仔	吸塵	三文治	食
掃把	搵牛奶	火腿	吠
私家車	吠	梯	爬
電單車		消防員	
手襪		森林	
蝸牛		狼	
鹿		終點	
吠		村民	
鎖鏈		樹	
樹		遮	
遮		狗	
		波	
		屋	

Note: words in bold indicate compound words that consist nouns and verbs

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Word internal structure of compounds that consists nouns and verbs

(a) Confrontation naming task

Compound nouns	Word internal structure	Compound verbs	Word internal structure
牙刷 'toothbrush'	NN: 牙 'teeth' 刷 'brush'	刷牙 'to brush teeth'	VN: 刷 'to brush' 牙 teeth
鉛筆 'pencil'	NN: 鉛 'lead' 筆 'pen'	洗面 'to wash (face)'	VN: 洗 'to wash' 面 'face'
鎖匙 'key'	VN: 鎖 'to lock' 匙 'key'	睇電視 'to watch TV'	VN: 睇 'to watch' 電視 'TV'
手襪 'gloves'	NN: 手 'hand' 襪 'stockings'	照鏡 'to look into mirror'	VN: 照: 'to look into' 鏡 'mirror'
鎖鏈 'chain'	VN: 鎖 'to lock' 鏈 'chain'	梳頭 'to comb'	VN: 梳 'to comb' 頭 'head'
		/s _i 4/滑梯 'to slide'	VVN: /s _i 4/ 'to slide' 滑 'to slide' 梯 'slide'
		拉拉鍊 'to zip'	VVN: 拉 'to zip' 拉 'to zip' 鍊 'zip'
		吸塵 'to vacuum'	VN: 吸 'to vacuum' 塵 'dust'
		搵牛奶 'to milk'	VNN: 搵 'to milk' 牛 'cow' 奶 'milk'

(b) Narrative tasks

雞蛋 'egg'	NN: 雞 'chicken' 蛋 'egg'	落雨 to rain	VN: 落 'to fall' 雨 'rain'
		踢波 to play football	VN: 踢 'to kick' 波 'football'

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Appendix D

Plausible alternative words for naming in narrative tasks

Noun targets	Plausible alternatives
人	途人, 行人, 大人, 成人, 成年人, 人家, 路人, 女人
媽咪	媽媽, 阿媽
女仔	女, 妹, 細妹, 女孩, 細路女, 少女
雞蛋	蛋, 荷包蛋, 太陽蛋, 蛋黃, 蛋白, 滑蛋, 反蛋, 炒蛋, 餐蛋, 鵪鶉蛋
雨	雨水, 風雨, 暴風雨, 暴雨
貓	花貓, 貓咪, 喵喵
屋企	家, 客廳
麵包	多士, 方包, 麥包, 包
男人	爸爸, 爹哋, 老竇, 父親, 男, 叔, 屋主, 主人, 戶主, 主人家, 鄰居,
	隔壁鄰舍, 成人, 成年人
窗	窗戶, 窗門
身	身體, 頭, 頭髮
小朋友	細路, 細路哥, 孩子, 小童, 靚仔, 細蚊仔, 學童
動物	野獸
山	山坡, 山頂, 村落, 村莊, 鄉村, 牧場, 野外, 農場, 農村, 草地, 草皮
羊	羊咩咩, 山羊, 羊群, 綿羊, 羊咩
兔仔	兔, 白兔
烏龜	龜, 龜仔
三文治	蛋治, 腿蛋治, 火腿蛋治
火腿	午餐肉, 煙肉
梯	雲梯, 消防梯
消防員	消防, 消防人員, 救火員
森林	樹林, 動物園, 草叢
狼	狼群, 野狼, 豺狼
終點	終點站
村民	樵夫, 攞人, 農夫, 農民, 牧民, 民居, 市民, 居民, 街坊
遮	雨傘, 雨遮
狗	狗隻, 狼狗, 臘腸狗
波	足球

CANTONESE WORD RETRIEVAL IN DIFFERENT CONTEXTS

Verb targets	Plausible alternatives (Con't)
瞓	瞓醒, 瞓低, 瞓醒, 瞓覺, 瞓眼瞓, 瞓著, 瞓醒覺, 瞓著覺, 瞓唔著覺, 瞓著
講	講笑, 講述, 話, 說
玩	玩耍
見	睇見
來	嚟到, 嚟齊
帶	帶齊, 攜帶, 拎, 攞
嗌	叫, 叫醒, 嗌醒
驚	怕, 害怕, 驚醒
幫	幫手, 幫幫手, 幫忙, 幫助, 協助
追	超前, 扒頭, 超越, 超過, 追趕, 趕上
贏	勝出, 成為冠軍, 攞到冠軍, 得到冠軍, 變咗冠軍
踢波	打波
救	救人, 拯救, 搶救, 救濟, 救助, 攀救, 營救
諗住	心諗, 以為, 諗
煎	煎好, 煎熟, 煎香, 煎熱, 煎兩煎
食	食飯, 喫飯, 吃, 喫
爬	爬樹, 爬行

CANTONESE WORD RETRIEVAL IN DIFFERENT CONTEXTS

Appendix E

Descriptive statistics of AoA, Familiarity and Imageability of different nouns in two speech tasks

		Mean	SD	Skewness	Kurtosis	Shapiro-Wilk Test		
						Statistic	df	Significance
Naming	N_AoA	2.40	.56	1.14	1.40	.90	27	.01*
	V_AoA	2.41	.57	.63	.55	.94	20	.2
	N_Familiarity	3.79	.72	-.37	-.73	.96	27	.31
	V_Familiarity	3.97	.83	-1.05	.78	.90	20	.04*
	N_Imageability	6.53	.18	-.76	-.11	.94	27	.1
	V_Imageability	6.15	.54	-1.64	2.27	.80	20	<.01**
	N_Word length	1.67	.62	.35	-.54	.76	27	<.001***
	V_Word length	1.75	.79	.50	-1.15	.78	20	<.01**
Narrative	N_AoA	2.38	.61	1.19	2.92	.91	27	.02
	V_AoA	2.43	.55	.85	.47	.91	20	.07
	N_Familiarity	3.83	.77	-.30	-1.24	.93	27	.06
	V_Familiarity	4.24	.54	-.92	-.07	.89	20	.02*
	N_Imageability	6.19	.54	-1.68	2.05	.78	27	<.001***
	V_Imageability	4.96	1.05	.20	-1.09	.94	20	.29
	N_Word length	1.78	.64	.22	-.49	.78	27	<.001***
	V_Word length	1.15	.37	2.12	2.78	.43	20	<.001***

*Note: Statistical significance: * $p < .05$; ** $p < .01$; *** $p < .001$*