



The distinctive effect of providing syllables in letter fluency testing: Literate vs. illiterate elderly persons

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Abstract

The aim of the study reported in this paper was to investigate the effects of providing syllables in a letter fluency test. We compared the performance of 81 healthy elderly participants in a phonemic fluency test to their performance in a syllabic fluency test. These tests formed subtests within a letter fluency test in which participants were given either an initial phoneme or an initial syllable as a cue for word retrieval. Based on their scores on the literacy level test, we divided the participants into four groups, namely pure-illiterate, semi-illiterate, literate, and high-level literate. The pure-illiterate and semi-illiterate participants produced more correct words in the syllabic fluency test than in the phonemic fluency test. In contrast, literate and high-level literate participants produced more correct words in the phonemic fluency test than in the syllabic fluency test. An important implication of these findings is that the effect of providing phonemes/syllables to assist word retrieval might differ among people with varying literacy levels. Providing an initial phoneme to literate people leads to activation of many words beginning with the phoneme. Literates might use a strategy for retrieval of the appropriate words from the plentiful list of candidate words. However, providing an initial syllable to literates might lead to the activation of fewer words, as the pool of candidate words becomes smaller, constraining the word-generating capability. On the other hand, providing the direct and concrete information of a syllable might be more helpful to those with low literacy skills who lack access to such a strategy. © 2015 Elsevier B.V. All rights reserved.

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1. Introduction

It is reported by UNESCO (2009) that 20% of the world's population is illiterate, a percentage which may be regarded as relatively high. The range of percentage of literacy varies widely from one country to another, with the lowest percentage (20%) occurring in Mali, and the highest (99%) in Japan and Finland (UNESCO, 2009). In

Korea, the percentage of literacy in the total population is 99.8%, which implies a low illiteracy percentage of 0.2% (Lee et al., 2002). However, as a result of factors like the Korean War and poverty, elderly people over 65 years of age are likely to make up the majority of illiterate people in Korea. Over the years, the relationship between illiteracy and cognition/language in this population has received significant attention.

A number of previous studies have reported on the effect of literacy on cognitive processing (Ardila et al., 2010; Lezak et al., 2004). In particular, researchers have used brain imaging to compare the neural pathways involved in problem solving in literate and illiterate groups

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(Castro-Caldas et al., 1998; Deloche et al., 1999). In addition, research has suggested that neural activation related to linguistic function might be affected by literacy (Castro-Caldas et al., 1998; Deloche et al., 1999). Reading and writing require the analysis of words into syllables and syllables into phonemes, as well as the synthesis of phonemes into syllables and words. Other phonological awareness skills involved in reading and writing include grapheme-to-phoneme conversion processes, and both verbal and visual memory. Thus, it seems clear that literacy may impact all spheres of cognitive-linguistic functioning.

In clinical settings, word fluency tests requiring verbal output are commonly used to evaluate the linguistic and cognitive abilities of those who are literate and illiterate. In a semantic fluency test, the clinician provides a particular semantic category and the client is required to respond by producing a word in that category. In a letter fluency test, the clinician provides the name of the initial letter (i.e., [ei] for the letter A) and the client is required to respond by producing a word that begins with that letter. Responding appropriately to such word fluency tests requires integrated processing at semantic, lexical, and phonological levels. In particular, a letter fluency test requires phonological awareness in terms of both phonemes and letters. Phonological awareness includes the ability to recognize that words are comprised of a number of sound units, as well as an understanding of the connection between sounds and printed letters. Due to a lack of knowledge of the phoneme–grapheme relationship in the composition of a word (Morais et al., 1979; Reis and Castro-Caldas, 1997), illiterate and semi-illiterate people have been found to perform poorly in letter fluency tests (Kosmidis et al., 2004a; Montiel and Matute, 2006).

According to Montiel and Matute (2006) and Morais et al. (1987), illiterate participants in their research performed better at the syllabic level (the syllable being a larger linguistic unit than the phoneme). These researchers, however, did not systematically investigate the difference between the phonemic and syllabic conditions in their word fluency testing. Moreover, the findings reflect the performance of participants using an alphabetic language system. Similar evaluation of performance among populations with non-alphabetic systems ought to be based on language-specific characteristics.

In the Korean case, it has been suggested that the syllable is the basic storage unit for words in the lexicon (Kwon et al., 2005; Nam et al., 1997) because the Korean syllable is easily recognizable by its separation from other sets of characters. From this perspective, providing a syllable in a Korean word fluency test may embody a language-specific manner of cueing for Korean people and might be more effective in aiding word retrieval than would a letter or a phoneme.

With this in mind, we hypothesized that providing a syllable to Korean individuals might maximize their word production during letter fluency testing, regardless of literacy level. According to literacy level, we compared their

performance in a phonemic fluency test with that in a syllabic fluency test, both of which fall within a letter fluency test. Based on our findings, however, it appeared that providing one syllable was only effective for the illiterate participants. Performance on phoneme and syllable fluency tests differed from one literacy level group to another.

2. Methods

2.1. Participants

We initially recruited 90 healthy elderly (HE) people living in Korea between June 2013 and January 2014. In much of the gerontological literature, people older than 60 years of age constitute the “elderly” segment of the population (Meisheri, 1992; Prakash, 1999). According to Korea’s Welfare of the Aged Act (Ministry Health and Welfare, 2013), however, “elderly” refers to people aged 65 years and older, taking retirement age and activity level into account. Accordingly, we included people aged 65 years and older in our HE group.

The Korean Mini-Mental State Examination (K-MMSE, Kang, 2006) was administered to all participants. The mean score on the K-MMSE was 22.08 (± 4.30). Nine adults with K-MMSE scores less than -1 standard deviation (SD) from the norm was excluded due to a probable influence of decreased cognitive function on their language test scores. Thus, 81 HE people (6 males and 75 females) ranging in age from 65 to 89 years participated in this study. The mean age of participants was 77.03 (5.56) years. Their mean number of years of education was 3.26 (± 4.29). All participants were right-handed and spoke standard Korean.

In order to measure literacy levels, a literacy test designed by Kim et al. (2014), consisting of six items, was conducted (see Appendix A). This test includes two items from the reading subtest of the Screening Test for Aphasia and Neurologic-Communication Disorders (STAND, Kim et al., 2009), two items requiring answers after reading medication instructions (testing paragraph level comprehension), one item involving writing one’s name (testing word level production), and one item involving writing at least three features of one’s appearance (testing sentence level production).

Based on their scores on the literacy test, we divided the participants into four groups: (1) pure illiterate: cannot read and write at all, can occasionally write their own names (scoring 0–1 out of 6); (2) semi-illiterate: can read to a certain extent, can write their names, but cannot write beyond a short sentence level (scoring 2–3 out of 6); (3) literate: can read and write at sentence level (scoring 4–5 out of 6); and (4) high-level literate: can read and write perfectly at paragraph level (scoring a perfect 6). Demographic information for the 81 participants is shown in Table 1. Statistical examination of the homogeneity in terms of age, years of education, and K-MMSE score among the four literacy groups revealed statistically significant differences for all variables.

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