

## Original Article

## Internet Search Methods to Recall Word Forms

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## Abstract

In two different experiments, 16 and 24 subjects were randomly assigned to four search conditions of NO AID, GLOSS, CLICK and CLICK & SPELL to investigate unknown words while reading an assigned passage. For the first experiment, different time limits to read a passage were allotted to three of the four search conditions. For the second experiment, time limits were the same for all search conditions. Overall, the results from both experiments revealed that the CLICK and CLICK & SPELL search conditions were the most efficient and that the GLOSS search condition was the least efficient to foster the retention of word forms for English as a second language students.

## Background

Over the past decade, on-line dictionaries have become more advanced and more popular for second language learners. For example, with regard to their development, from 1997 to 2010, *Onelook.dictionary.com* now has increased its index from 188 to 1052 dictionaries while *World Language.com* has over 2269 dictionary products in 175 languages. In addition, with regard to their popularity, Lan (2005) stated that 70% of students surveyed at Polytechnic University in Hong Kong used an on-line dictionary more frequently compared to book dictionaries. However, although these resources may be more attractive to use because of their ease in investigating word meaning, to date there has been no empirical research to examine how on-line dictionaries may contribute to learning the forms or spellings of words which are unfamiliar to students. Looking at previous research, although some studies suggest that output in the form of sentence writing may foster the retention of new words (Coomber et al., 1986; Laufer, 1997), other studies suggest that sentence writing may have strong negative effects (Barcroft, 1998; 2000; 2004) while fill-in-the-blank exercises are more effective (Folse, 2006). Because the findings concerning sentence writing appeared mixed, it is necessary to look at several studies which focus specifically on the effects of copying words.

Thomas and Dieter (1987), for example, conducted three experiments to examine how writing practice, by means of copying, affects the recall of word forms. They found that, for English-speaking learners of L2 French, those subjects who were afforded writing practice, scored higher on the free recall test as opposed to those subjects who did not copy words. On the other hand, more recent studies have found negative effects for copying words. Barcroft (2006), for instance, conducted two experiments involving English-speaking learners of Spanish. For both immediate and delayed tests, results revealed

word writing had a negative effect on productive vocabulary learning. Likewise, in a second experiment, word writing had a negative effect on learning new words and that this negative effect was maintained over time. In another study, Barcroft (2007) compared the word writing condition to the conditions of no word writing and fragment writing, the writing of a selected underlined syllable in each target word. The overall hierarchy for this study of the tested conditions ranked as: 1 ) no writing, 2 ) word writing, and 3 ) fragment writing, respectively.

Although there have been studies demonstrating that book dictionaries (Cho & Krashen, 1994; Knight, 1994; Luppescu & Day, 1993) and marginal glosses (Hulstijn, 1992; Hulstijn, Hollander & Greidanus, 1996; Jacobs Dufon & Fong, 1994; Watanabe 1997) are beneficial for the retention of word meanings, these studies did not examine how the search conditions of typing, mouse-clicking, or viewing a gloss of an unknown word on a computer may impact the retention of word forms or word spellings. This is an issue of importance because, as Koren (1997) notes, the skills needed for using an electronic dictionary differ from those needed for using a printed monolingual or bilingual dictionary in that learners see, "information pop up after clicking some buttons without really having to search" (p. 9). In addition, Laufer and Hill (2000) found that students who looked up words more frequently using electronic dictionaries did not, statistically speaking, remember or recall the meanings of words. They argue there may be a form of shallow processing when using electronic dictionaries to look up words because some of the mental effort of the search process, which may be important for the learning and retaining words, may not be being exercised.

### **Purpose of Study**

There is the question as to whether mouse-clicking away from a reading passage, or the four-step process of mouse-clicking, spelling the new word into a computer, briefly looking at its meaning, and clicking back to a reading passage, is a distraction from learning word forms. Therefore, the purpose of this study was to examine the effects of using different search methods via an on-line dictionary for the retention of unknown word forms. Specifically, this study will employ the four different search conditions of NO AID, GLOSS, CLICK, and CLICK & SPELL. The NO AID condition served the purpose of the controlled condition, the GLOSS condition, of reading an English passage with targeted words glossed in the margin, served to examine if it is necessary for learners to consistently have access to the meaning of a word. The purpose of the CLICK condition, in which subjects need to click on a targeted word in the reading passage to access its meaning, served to examine if a brief encounter to read and understand the meaning of a new word is sufficient to foster the retention of that word form before returning to the reading passage. Lastly, the CLICK & SPELL condition in which subjects must perform the four-step process of mouse-clicking on a targeted word, spelling that target word into an on-line dictionary, looking at the meaning of the target word and clicking back to the reading passage, served to examine if this condition causes a distraction for learning a form of a word. By comparing these four search conditions to one another, it may be possible to learn how much activity is sufficient to learn the forms of new words. Therefore, while subjects read a passage for content and use an on-line dictionary in two experiments (Experiment #1 – search conditions allotted different times. Experiment #2 – search conditions allotted an equal amount of time), the research questions for this study were as follows:

- 1) When search condition(s) are allotted different times to complete a reading passage, which is/are the most and least effective for the retention of word forms?
- 2) When search condition(s) are allotted the same amount of time to complete a reading passage, which is/are the most and least effective for the retention of word forms?
- 3) Does the overall retention between the NO AID and GLOSS search conditions change from Experiment #1 to Experiment #2?
- 4) Does the overall retention between the CLICK and CLICK & SPELL search conditions change from Experiment #1 to Experiment #2?

### **Participants and Materials**

The participants for the two experiments in this study numbered 16 and 24, respectively, and were first-year Japanese medical students at Jichi Medical University. Before entering the medical university, all participants had at least six years of formal English instruction at their respective junior and senior high schools. In addition, upon entering the university, all participants were administered an abridged version of the TOEIC test which measured listening and reading ability. The average score for participants in this study was 550.

The experiments of this study took place during a trimester (10 weeks) when participants were enrolled in a required medical course which covered medical terms, phrases and medical issues in English. Two of the ten class sessions took place in the university computer lab where participants engaged in reading different medical-related passages via the instructor's webpage and an on-line dictionary. Participants were told that the exercise of reading the health passages via computer using both context and an on-line dictionary would help increase their medical terminology in English. In addition, participants were told that this exercise was part of the instructor's research and that they had the right to decline from participating. However, if they did participate, all personal identification of the participants would remain anonymous.

Two reading passages were prepared by first selecting a textbook passage and using an Internet vocabulary profiling instrument designed by Tom Cobb, a Canadian linguistics professor, to assess its high and low frequency words. Second, words profiled to be low frequency by the Internet vocabulary profiling instrument were screened by the chairperson of English language department at Jichi Medical University in order to assess, based on professional study and experience, which words first-year university students may or may not know. Third, low frequency words noted to be unfamiliar by the department chair were then screened again by six upperclassmen. These students, who were either second or third-year students at Jichi Medical University, indicated whether or not they were, as first-year students, already familiar with the low frequency words when they entered the university.

After a total of 16 words were selected on the high probability of being unknown to first-year students by means of the Internet vocabulary profiling instrument, the English language department chair, and six upperclassmen, eight unknown words for each passage were incorporated in to the reading passages. In addition, both passages were written to be as statistically similar to each other with regards to word length, readability and grade level. For example, the Sleep and Food & Health reading passages totalled 273 and 239 words, respectively. Also, readability was based on the Flesch Reading Ease test provided by the Microsoft Word software program which states that for most passages, the Flesch Reading Ease

test score should range between 60 – 70 on a 100 point scale. As a result, the Sleep and Food & Health reading passages were written to have similar readability with scores of 59.1 and 62.2, respectively. Finally, grade level, based on the Flesch-Kincaid Grade Level test, was also provided by the Microsoft Word software program. It states that most passages for the Flesch-Kincaid Grade Level test should be between 7.0 to 8.0 or 7th to 8th grade reading level in the United States. Therefore, the Sleep and Food & Health reading passages were written at the same grade level with scores being 7.9 and 7.7, respectively (Appendix A).

### Procedure

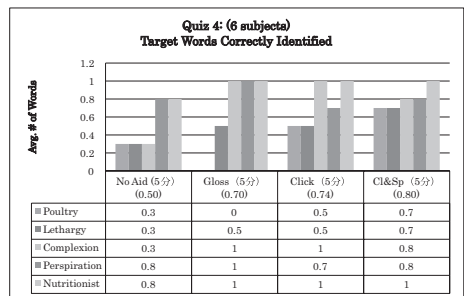
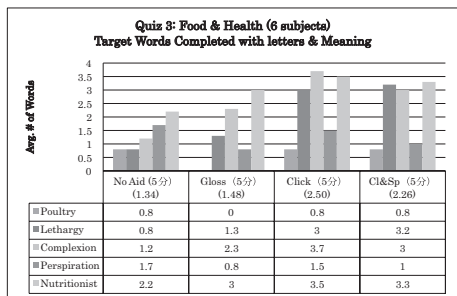
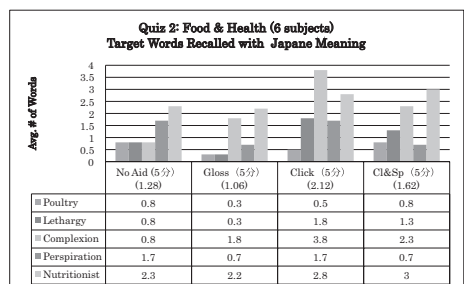
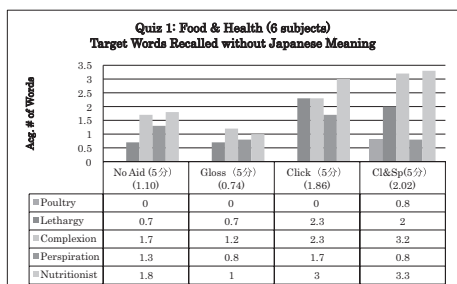
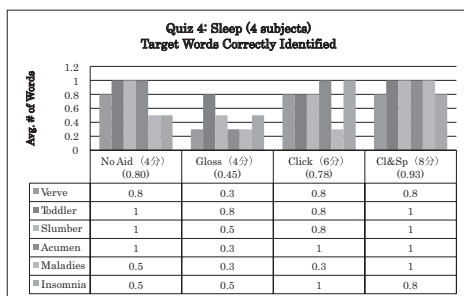
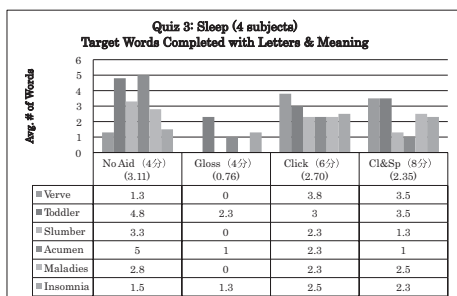
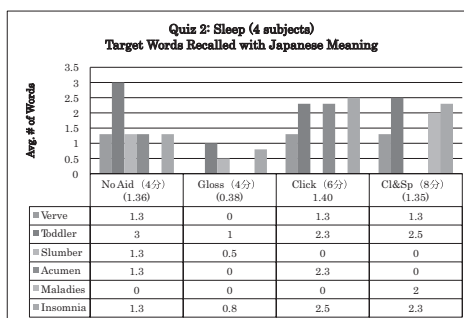
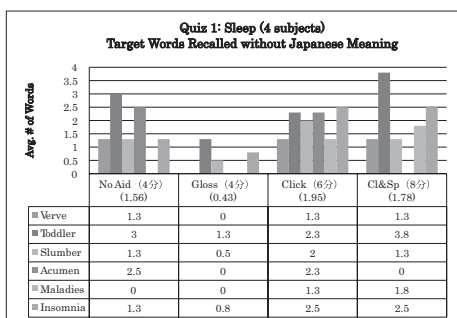
During the first class session of the first trimester, participants were first administered a Word Preview quiz containing 32 words in which they were to indicate which words they did and did not know. Sixteen, or eight for each reading passage, were included in the study. The remaining 16 words were distracters (Appendix B). Next, three weeks later, participants were told to visit the university computer lab and, upon arriving, each student was randomly assigned to read a passage in one of four conditions as provided on the instructor's website. **For example, for the first passage entitled Sleep, four participants were assigned to each of the following conditions: NO AID, GLOSS, CLICK and CLICK & SPELL.** Two weeks later, participants were once again told to visit the university's computer lab. Upon arriving, six subjects were each randomly assigned to one of the four previously mentioned search conditions and assigned to read a passage entitled Food & Health.

In the first experiment, or first session in the computer lab, all participants began reading the Sleep passage at the same time; however, for this reading passage, search conditions were allotted a designated amount of time because, for example, the CLICK and CLICK & SPELL conditions required more activity to search for target word forms and their meanings. Therefore, while participants in the NO AID and GLOSS conditions were both afforded four minutes, participants of the CLICK condition were afforded six minutes and participants of the CLICK & SPELL condition were afforded eight minutes to read the Sleep passage. However, for the second experiment three weeks later, all four conditions (NO AID, GLOSS, CLICK, CLICK & SPELL) were afforded the same amount of time of five minutes to read and search for target words.

For both class sessions, when students finished reading their passage, they were then given four short unannounced quizzes to test their retention of the target word forms embedded in the assigned reading passages. Participants were given five minutes to complete each quiz. Quiz #1, *Target Words Recalled with Japanese Meaning*, required participants to write, in English, all the target words that they were able to recall. Quiz #2, *Target Words Recalled without Japanese Meaning*, required participants to write down the English target words that corresponded to its Japanese translation. Quiz #3, *Target Words Completed with Japanese Meaning*, also provided Japanese word translation but only required participants to complete the English spelling of the target word. Lastly, Quiz #4, *Target Words Correctly Identified*, asked participants to identify, out of four possible choices, the correct spelling of a target word (Appendix C).

The sequencing of the quizzes was administered in this manner in order to obtain true and authentic scores. That is, if the participants were first administered Quiz #4, the receptive quiz of identifying the correct form of a word, their scores on the following three quizzes would most likely be higher because the receptive quiz would have provided additional exposure to the form of a word.

Soon after the classes were over, the four quizzes were evaluated, and scored. Because the first three quizzes examined the productive knowledge for the form of a target word, a rating scale was created in order to award partial credit for those participants who were able to demonstrate some recollection of a word form (Appendix D). However, because Quiz #4 measured the receptive knowledge for the form of a target word, the scoring for this quiz was scored as either right or wrong. When all four quizzes were scored and entered into a Microsoft Exel software program, numerical averages and visual graphs were produced to compare and analyze the trends among the four search conditions in the two experiments.



## Results

The results from the two experiments conducted in this study were based on two different reading passages containing different target words with a different number of subjects. Therefore, using the Microsoft Excel program, a direct statistical comparison could not be made between the two passages. Nevertheless, by examining the overall averages scored from the different search conditions in the two experiments, some overall patterns can be detected.

With regard to the first research question, (When search conditions are allotted different times to complete a reading passage, which is/are most and least effective for the retention of word forms?), Quiz #1, *Target Words Recalled without Japanese Meaning*, showed that the average scores of the CLICK (1.95) condition were the highest, followed by the CLICK & SPELL (1.78), NO AID (1.56), and GLOSS (0.43) conditions. Quiz #2, *Target Words Recalled with Japanese Meaning*, revealed a similar trend with the CLICK (1.40) condition scoring the highest and the GLOSS (0.38) condition scoring the lowest. The NO AID (1.36) condition scored slightly higher than CLICK & SPELL (1.35). However, this trend was not the case for the latter two quizzes. For example, Quiz # 3, *Target Words Completed with Japanese Meaning*, the NO AID (3.11) condition scored the highest, followed by the CLICK (2.70), CLICK & SPELL (2.35) and GLOSS (0.76) conditions. For Quiz, #4, *Target Words Correctly Identified*, the CLICK & SPELL (0.93) condition scored the highest, followed by the NO AID (0.80), CLICK (0.78) and GLOSS (0.45) search conditions.

With regard to the second research question, (When search conditions are allotted the same amount of time to complete a reading passage, which is/are most and least effective for the retention of word forms?), Quiz #1, *Target Words Recalled without Japanese Meaning*, showed the CLICK & SPELL (2.02) condition scored the highest, followed by the CLICK (1.86), **NO AID (1.10), and GLOSS (0.74) conditions**. Quiz #2, *Target Words Recalled with Japanese Meaning*, revealed the CLICK (2.12) condition as having the highest scores, followed by CLICK & SPELL (1.62), **NO AID (1.28) and GLOSS (1.06) conditions**. Quiz # 3, *Target Words Completed with Japanese Meaning*, revealed the CLICK (2.50) condition scored the highest, followed by CLICK & SPELL (2.26), GLOSS (1.48) and NO AID (1.34) conditions. Quiz #4, *Target Words Correctly Identified*, showed the CLICK & SPELL (0.80) condition had the highest score, followed by the CLICK (0.74), GLOSS, (0.70) and the NO AID (0.50) search conditions.

With regard to the third research question, (Does the overall retention between the NO AID and GLOSS search conditions change from Experiment #1 to Experiment #2?), it seems that even though both conditions were afforded the same amount of time (Experiment #1 NO AID and GLOSS conditions were allotted four minutes and in Experiment #2 both NO AID and GLOSS were allotted five minutes), the GLOSS condition revealed to be slightly more effective in the second experiment for the third and fourth quizzes that required more receptive knowledge.

With regard to the fourth research question, (Does the overall retention between the CLICK and CLICK & SPELL search conditions change from Experiment #1 to Experiment #2), it appears that these two search conditions are the most effective when they are given the same amount of time to research a word. However, in Experiment #1, even though the CLICK & SPELL subjects were afforded more time to read and investigate target words compared to the other three search conditions, their productive retention of word forms did not score higher than the NO AID or CLICK search conditions.

## Discussion

Results pertaining to the first two research questions appear to show that, for the first experiment, the first two quizzes in which participants were required to completely write the spelling of a target word, the CLICK condition was the most effective to recall word forms. However, when participants were afforded lettering to partially spell and complete the spelling of a word (Quiz #3), or entire spellings to choose the correct form of a word (Quiz #4), the CLICK condition was the second, or close to second, most effective condition to recall word forms. Meanwhile, the GLOSS condition, for all four quizzes, was the least effective. However, when time was kept constant for the second experiment, both the CLICK and CLICK & SPELL conditions proved to be the most effective and the NO AID and GLOSS conditions proved to be the least effective to recall word forms for all quizzes.

It appears that going away from the passage in the CLICK or CLICK & SPELL search condition, may not be a distracting factor. Rather, the CLICK condition seemed to be a better search condition for participants if they conducted productive knowledge (i.e. **write the entire target word**) of a word from memory. The CLICK & SPELL condition also seemed to be slightly better for participants if they conducted receptive knowledge (i.e. partially write or identify a target word) of a word form from memory.

Typically English lessons are held only once a week during a 90 minute lesson at Japanese universities. Therefore, the findings of mouse clicking or mouse clicking and typing in order to foster the retention of word forms may be of interest to language teachers because such information can help them to design lessons with the most efficient and productive use of available resources and time. However, some considerations need to be made before accepting the results of this study as conclusive. First, as mentioned previously, the experiments in this study were conducted by one group of 16 to 24 subjects who read different passages with different target words. Second, this study was based from averages produced from the Microsoft Excel software program rather than a more sophisticated analysis from SPSS. As a result, this study shows, not the significance, but rather the trends of using different search conditions. Third, this study did not administer delayed quizzes to measure the retention of word forms over time. Fourth, for the first three quizzes (Quiz #1, Quiz#2, Quiz #3) only one rater as opposed to several raters was used to measure productive recall. Therefore, future studies examining the retention of word forms via an on-line dictionary should consider these issues in order to conduct a more in- depth research analysis concerning the recall or word forms.

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**(APPENDIX A)****Food and Health**

The food we eat has a direct effect on our health. For example, eating a good diet helps your immunity (1). A good diet also prevents lethargy (1). It can even effect your complexion (1). On the other hand, a poor diet can cause certain health problems such as heart disease. Or, it may put you at risk for becoming overweight. As a result, it is imprtant to eat a healthy diet to help your body to look and feel its very best.

Water, for example, makes up 50 to 75% of a human body. Therefore, drinking plenty of water is a very important sustenance (1) for our health. People should try to drink about two and a half liters of water every day to help spread important minerals throughout the body. In addition, drinking plenty of water helps the body to remove waste through perspiration (1).

Nutritionists (1) understand what it is that makes up a healthy diet. In 1992, the United States Department of Agriculture developed a food pyramid. It reveals the daily quota (1) for people to follow in order to eat a healthy diet: 6-11 servings a day of bread, cereal, rice or pasta; 3-5 servings a day of vegetables; 2-4 servings a day of fruit; 2-3 servings a day of milk, yogurt or cheese; 2-3 servings a day of meat such as poultry (1) and few sweets.

**Food and Health**

Word Count = 239

Flesch Reading Ease = 62.2

Flesch Kinkaid Grade Level = 7.7

**Sleep**

Word Count = 273

Flesch Reading Ease = 59.1

Flesch Kinkaid Grade Level = 7.9

## (APPENDIX B)

## WORD PREVIEW

Name: (*Romaji*) \_\_\_\_\_ Student Number : \_\_\_\_\_

Do you know the meaning of the words below? If you do, write a short meaning of the word in English 英語 or Japanese 日本語。

WORD	NO, I do not know it.	YES, I do know it.	<i>It means</i> (英語・日本語)
<i>Example:</i> <i>Limb</i>	_____	_____	_____

- 
- |                  |       |       |       |
|------------------|-------|-------|-------|
| 1. extremities   | _____ | _____ | _____ |
| 2. aficionado    | _____ | _____ | _____ |
| 3. gear          | _____ | _____ | _____ |
| 4. routine       | _____ | _____ | _____ |
| 5. vigor         | _____ | _____ | _____ |
| 6. quandary      | _____ | _____ | _____ |
| 7. hindrance     | _____ | _____ | _____ |
| 8. octogenarian  | _____ | _____ | _____ |
| 9. sanatorium    | _____ | _____ | _____ |
| 10. poultry      | _____ | _____ | _____ |
| 11. complexion   | _____ | _____ | _____ |
| 12. quota        | _____ | _____ | _____ |
| 13. obese        | _____ | _____ | _____ |
| 14. slumber      | _____ | _____ | _____ |
| 15. acumen       | _____ | _____ | _____ |
| 16. verve        | _____ | _____ | _____ |
| 17. malady       | _____ | _____ | _____ |
| 18. compromise   | _____ | _____ | _____ |
| 19. peer         | _____ | _____ | _____ |
| 20. toddler      | _____ | _____ | _____ |
| 21. insomnia     | _____ | _____ | _____ |
| 22. narcolepsy   | _____ | _____ | _____ |
| 23. immunity     | _____ | _____ | _____ |
| 24. resilience   | _____ | _____ | _____ |
| 25. strain       | _____ | _____ | _____ |
| 26. novice       | _____ | _____ | _____ |
| 27. osteoporosis | _____ | _____ | _____ |
| 28. progeny      | _____ | _____ | _____ |
| 29. adolescents  | _____ | _____ | _____ |
| 30. wholesome    | _____ | _____ | _____ |
| 31. sustenance   | _____ | _____ | _____ |
| 32. perspiration | _____ | _____ | _____ |

## Part I

## (APPENDIX C)

## FOOD &amp; HEALTH Quiz #1

Group #: \_\_\_\_\_ Name: \_\_\_\_\_ Student #: \_\_\_\_\_

**DIRECTIONS:** Write as many of the bold (dark) words that you can remember from the reading passage on the lines below.

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

7. \_\_\_\_\_

8. \_\_\_\_\_

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Part II

## FOOD &amp; HEALTH Quiz #2

Group #: \_\_\_\_\_ Name: \_\_\_\_\_ Student #: \_\_\_\_\_

**DIRECTIONS:** Write the English spelling from the reading passage that best matches the Japanese definition.

English Word	Japanese definition
1. _____	維持
2. _____	汗
3. _____	免疫の
4. _____	量
5. _____	鶏肉
6. _____	無気力
7. _____	栄養学者
8. _____	顔の色つや

## Part III

## (APPENDIX C - continued)

## FOOD &amp; HEALTH Quiz #3

Group #: \_\_\_\_\_ Name: \_\_\_\_\_ Student #: \_\_\_\_\_

DIRECTIONS: Complete the spelling of the English word for each Japanese definition.

- |              |       |
|--------------|-------|
| 1. p_____y   | 鶏肉    |
| 2. q_____a   | 量     |
| 3. su_____ce | 維持    |
| 4. co_____on | 顔の色つや |
| 5. le_____gy | 無気力   |
| 6. nu_____st | 栄養学者  |
| 7. pe_____on | 汗     |
| 8. im_____ty | 免疫の   |

## Part IV

## FOOD &amp; HEALTH Quiz #4

Group #: \_\_\_\_\_ Name: \_\_\_\_\_ Student #: \_\_\_\_\_

DIRECTIONS: Choose the English word that best matches the Japanese definition.

- |                |                  |               |
|----------------|------------------|---------------|
| 1. 免疫の _____   | 2. 量 _____       | 3. 維持 _____   |
| a. immuuity    | a. quota         | a. sustenance |
| b. imounity    | b. quota         | b. sustenence |
| c. immunity    | c. quttoa        | c. sutaneance |
| d. imunity     | d. qutoa         | d. sustanence |
| 4. 無気力 _____   | 5. 汗 _____       | 6. 鶏肉 _____   |
| a. lethargy    | a. perspiration  | a. pourly     |
| b. lethergy    | b. perspiration  | b. poltry     |
| c. letheargy   | c. perspiration  | c. poultry    |
| d. lethearagy  | d. perspiration  | d. plotury    |
| 7. 顔の色つや _____ | 8. 栄養学者 _____    |               |
| a. completion  | a. nutritionist  |               |
| b. complexion  | b. nutrittionist |               |
| c. complexion  | c. nutrusionist  |               |
| d. complexsion | d. nutrussionis  |               |

**(APPENDIX D)****Rating Scale**

<b>Points</b>	<b>Description</b>
0 =	Letters are not provided or spelling does not resemble the target word.
1 =	Two or three letters that resemble a target word are provided, but the spelling is incomplete.
2 =	The spelling of the target word is distinguishable but three (3) letters are wrong (absent, added, or misplaced).
3 =	The spelling of the target word is distinguishable but two (2) letters are wrong (absent, added, or misplaced).
4 =	The spelling of the target word is distinguishable but one (1) letter is wrong (absent, added, or misplaced).
5 =	The spelling of the target word or its related form is correct.

# インターネットを利用した語彙調査方法の ワードスペリング習得効果

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## 要 約

英文読解時に未知の語を調べる上で、4つの調査方法（補助無し、注解、クリック、クリック&スペル）を学習者に対してランダムに与え、その効果をさぐる実験を、16人と24人のグループに対して、別々の機会におこなった。最初の実験では、4つのうち3つの方法で、英文を読むのにそれぞれ異なる時間制限でおこなった。

二度目の実験では、全ての方法は同じ時間制限でおこなわれた。両方の実験を通じて、英語学習者にとって英単語のスペルを記憶する上で、クリックとクリック&スペルが最も効率が良く、注解が最も効率が悪いという結果が明らかになった。