AN INVESTIGATION INTO HOW LEARNING STRATEGIES AFFECT THE MENTAL LEXICON OF L2 LEARNERS

Noriko Aotani[1]

(aotani@tokaigakuen-u.ac.jp)

Tokai Gakuen University, Japan

Naoki Sugino

(gwisno@is.ritsumei.ac.jp)

Ritsumeikan University, Japan

Simon Fraser

(fraser@hiroshima-u.ac.jp)

Hiroshima University, Japan

Yuya Koga

(yuyakoga@ruri.waseda.jp)

Graduate School of Education, Waseda University, Japan

Kojiro Shojima

(shojima@rd.dnc.ac.jp)

The National Center for University Entrance Examinations, Japan

Abstract

In order to investigate how learning strategies affect the expansion of a learner's L2 mental lexicon, this study picked up eight words and investigated how they were networked, and if the network structure differs among learners who have different learning strategies. Data were collected from 45 Japanese EFL learners at different proficiency levels. Data obtained from similarity judgement among eight words were analyzed using AMISESCAL (Asymmetric von Mises Scaling), which is a statistical model that visualizes asymmetric relations among elements on a two-dimensional map. Using factor analysis, three subscales were identified from the obtained learning strategy scores: analogical strategy, consideration strategy, and working strategy. For every subscale, the participants were divided into two groups based on the frequency of using the strategy. Differences in visualized network representations between higher frequency strategy users and lower frequency strategy users were examined. Limitations of the study and directions for further research are discussed.

1 Introduction

In the process of vocabulary acquisition in a second language, new lexical items presumably have to be weaved into a learner's existing mental lexicon. This process involves psychological and cognitive processing, which differs from one learner to another, and has been difficult to observe. In our previous research, we have been applying recent

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[1] Corresponding author: aotani@tokaigakuen-u.ac.jp

developments in statistics and graph theory, namely, AMISESCAL (Asymmetric von Mises Scaling; Shojima, 2011, 2012), and *Gephi* (Bastian, Heymann, & Jacomy, 2009) in order to explicate and visualize the network properties of the mental lexicon. So far, we have obtained promising results that enable us to depict a learner's developing mental lexicon (Aotani, Fraser, Koga, Shojima, & Sugino, 2014; Fraser, Sugino, Aotani, Koga, & Shojima, 2014; Sugino, Fraser, Aotani, Shojima, & Koga, 2015). These models indicate that relationships among lexical items in the mental lexicon are directional/asymmetric in nature, and that the structure of learners' lexical networks differs greatly from that of native speakers; differences among learners were also significant.

2 The aims of the present study

In one of our previous studies, we used learners' learning strategies as analytical scales to assess a CALL program, which we developed for Japanese learners of English to expand the polysemous senses of adjectives (Aotani, Kameyama, Sugino, & Amaya, 2009). As a more detailed investigation into L2 lexical networks, this study also focuses on how language learning strategies affect restructuring of a learner's mental lexicon. The interplay between strategies employed by learners and changes in the visualized network representations is examined.

3 Method

3.1 Participants

Participants were 45 Japanese university students majoring in Education. Ages ranged from 18 to 22 years old. Their English proficiency level ranged from 265 to 635 points on the TOEIC Test.

3.2 Procedure

First, a survey for investigating their learning strategies was administered. To assess participants' learning strategies, the 22-item scale constructed by Kubo (1999) and revised by Mori (2004) was used. Responses were scored on a six-point scale from 1 (never use) to 6 (always use). A questionnaire was given in Japanese.

Secondly, eight words that share the same etymological feature were chosen for the experiment: *emotion, mobile, motion, motivation, motor, move, remote*, and *remove.* A stimulus word was chosen from among the eight words, and participants were instructed to judge the distance between the stimulus word and each of the other seven words. Responses were scored on a five-point scale from 1 (*strongly related*) to 5 (*not related*). Another stimulus word was then chosen, and the procedure was repeated until all eight words had played a role as a stimulus word.

3.3 Analytical method

The obtained data were analyzed using a new multidimensional scaling technique, AMISESCAL, which is an application of directional statistics to visualize the asymmetric structure underlying the data matrix developed by co-author of this paper, Dr. Shojima in 2011. It uses the von Mises distribution (vMd) for its normal distribution, and the vMd can be expressed as a function of μ (the Mean Direction Parameter) and κ (the Concentration Parameter) (Shojima, 2011, 2012)[2,] and a great advantage of AMISESCAL is that it can make us visually understand the relationship between the items.
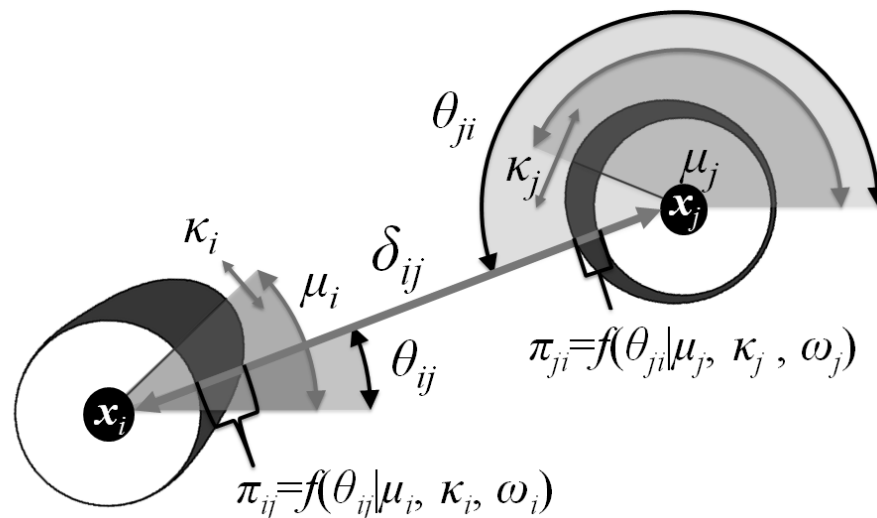

Fig. 1. Graphical representation of asymmetry in AMISESCAL

In this study, a pair of words, *word*A and *word*B, are considered to be in an asymmetric relationship if, for a participant, *word*A is perceived as semantically related to *word*B but not the other way around. In such a case, *word*A is represented with the vMd pointing at *word*B, with a certain distance between the two.

4 Results

The exploratory factor analysis revealed that the participants' learning strategies were explained by three subscales: analogical strategy, consideration strategy, and working strategy. The analogical strategy consists of six items: *When I talk in English or read English, I try to grasp the general meaning instead of sticking to details; To understand unfamiliar words, I make guess; If I do not understand something I hear in English, I guess from the words that I could hear and from gestures; I find the meaning of an English word by dividing it into parts that I understand;* and *I try to guess what the other person will say next in English;* and *I try to notice my language errors and find out the reasons for them.* The consideration strategy consists of seven items: *I create associations between items I learned; I classify words based on their meanings; I do not leave the questions half-done; I make clear what I understand and what I do not; I use the English words I know in different ways; I classify words based on*

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[2] See http://www.rd.dnc.ac.jp/~shojima/ams/index.htm for details of AMISESCAL

their forms; and *I think of relationships between what I already know and new things I learn in English.* The working strategy consists of three items: *I use figures and tables to sort out grammatical items; before I start reading, I look up every new word and write them down in the textbook;* and *I try to explain the way I work out a solution to myself and other person.* The participants were divided into two groups for every subscale based on the frequency of using the strategy.

Comparison of the visualized models between the higher (hereafter HFS) users and the lower frequency strategy (hereafter LFS) users indicated no remarkable differences on the analogical strategy and the working strategy. The visualized model of the HFS users of the consideration strategy is shown in Fig. 2, and Fig. 3 represents the result from the LFS users. Represented two-dimensional maps depicting relations among eight words showed some similarity between the two groups; *move* came closer to the center, which means it was perceived as a word that is connected with all other words. Asymmetry/directionality of relations between words were found to some extent in both groups; for example, the vMd of *move* pointed to *remove*. From the distribution of the eight words, it appears that the HFS users have a greater perception of these relations than the LFS users.
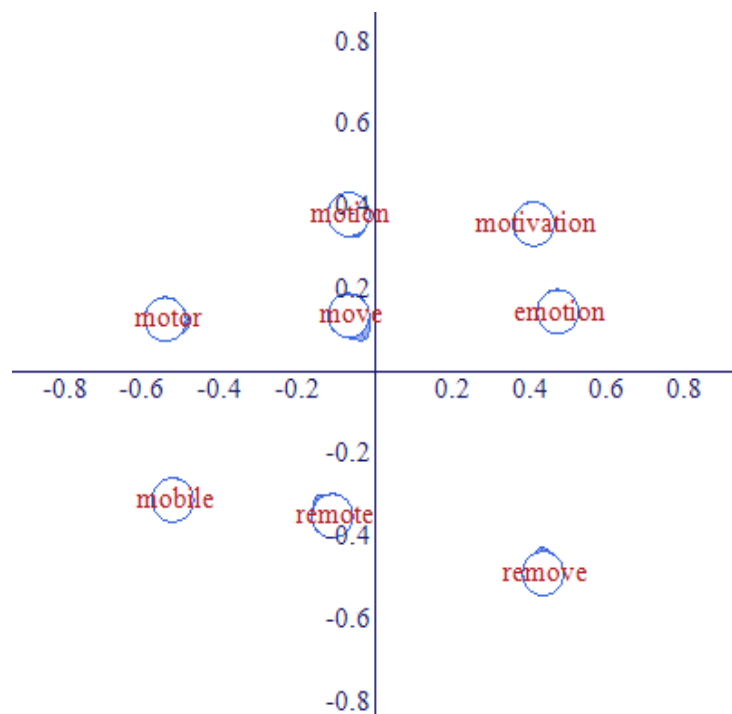
Fig. 2. AMISESCAL mapping of the eight-word-network of the HFS users
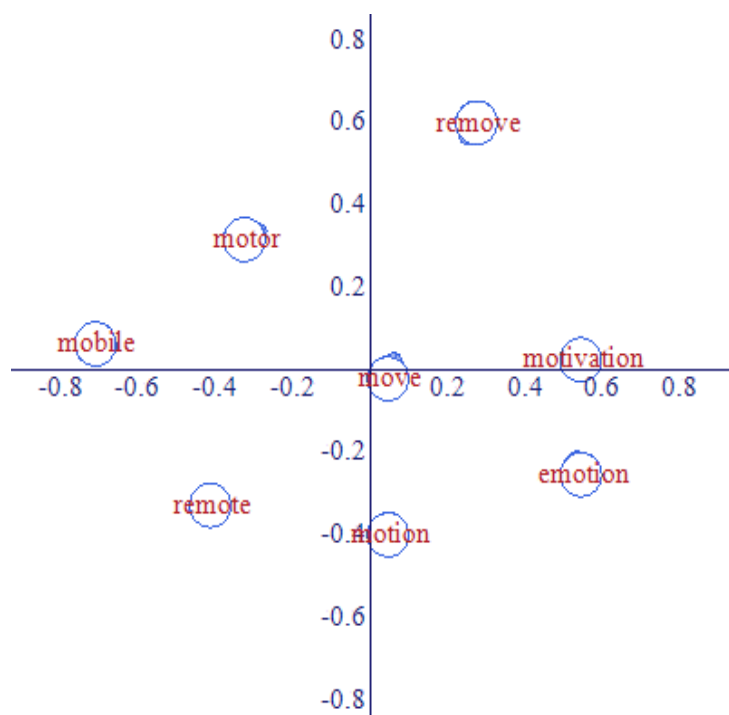
Fig. 3. AMISESCAL mapping of the eight-word-network of the LFS users

5 Discussion

Learning strategies are steps taken by students to enhance their own learning. The consideration strategy is seen as affecting a learner's recognition of the relations between lexical items, which implies that engaging in careful consideration, or a deeper psychological process, is effective to structure their mental lexicon. We have to admit, however, that the differences found between HFS users and LFS users were not very salient. The present study is the very first instance of investigating and visualizing the correlation between the strategies used by learners and the structure of their mental lexicon. The effectiveness of learning strategies should be assessed further by the use of (1) more detailed strategy scales; (2) a variety of word sets including both paradigmatic and syntagmatic relations; and (3) a larger number of participants and/or periodical observation of individual learners.

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