An exploration of density in L2 word association networks in the mental lexicon of Japanese learners of English

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Introduction
There are not many studies concerning the mental lexicon of one’s second language (L2) compared to those on the mental lexicon of one’s first language (L1). Some say that the structure of the L2 mental lexicon is similar to that of the L1 mental lexicon (e.g., Wolter, 2001), while others say that the opposite is true (Channel, 1990). This shows that not much is yet known about one’s L2 mental lexicon. We examined the density of lexical networks of L2 vocabulary in the mental lexicon of learners of English in Japan to investigate the structure of one’s L2 mental lexicon. This study was done as a replication of Wilks and Meara (2002), but we applied modified methods to our experiments and analyses as shown below.

Background
Wilks and Meara (2002) compared the relative densities of L1 and L2 lexical networks of their subjects by analyzing their word association data using a mathematical approach called graph theory. The participants in their experiment were thirty learners of French whose L1 was English and thirty native speakers of French. In their experiment, participants worked through a questionnaire composed of sets of randomly chosen five French words. They were instructed to choose two words which seemed strongly linked to each other out of five words in each word set.

Their results suggested that the density of lexical networks in the L1 mental lexicon is ‘denser’ than that in the L2 mental lexicon. This was inferred from the fact that their participants who were native speakers of French had a higher hit rate (i.e., perceived significantly more associations) than the learners of French.

Method
Participants
In our study, we modified their methods and applied them to Japanese learners of English. We compared performances of five Japanese university students and five Japanese researchers. The university students, who ranged from their 1st- to 4th year, had an average TOEIC score of 600 out of 990 (i.e., slightly above the average score of university students in Japan.). All of them had studied English in English-speaking countries for 6 to 12 months. The researchers --two of whom were near-native speakers of English who learned English abroad, and the rest had learned English in Japan--were in their 40s and 50s. All of them used English for their work.

Procedure
The ten participants were told that there were series of randomly chosen sets of five
English words in a test booklet. They were instructed to circle two words that seemed most strongly associated to each other in each word set while they worked through the booklet in order.

Materials
Words in our experiment were selected from ‘The List of English Vocabulary for Junior High School and High School Students’ which is an additional list of the New JACET List of 8000 Basic Words (a list of essential English vocabulary for university students compiled in Japan).

The selected words were comprised of two types: 1,090 words that were considered as essential words for junior-high-school students (Group A), and 1,744 words that were considered as essential words for senior-high school students (Group B). There were eighty word sets in a test; the first forty sets were composed of words from both Group A and B (henceforth Group A+B), while the latter half included words from Group B alone. We compared the hit rate of the first half set with that of the latter half set in each test.

Results
The results showed that there was a clear distinction between the mean hit rate of the students and that of the researchers. As for the students, there was a significant difference between the mean hit rate in Group A+B and that in Group B. The mean number of associations was 141 out of 200 in Group A+B with the mean hit rate of 0.705. In contrast, the number of associations they found in the items consisted of only Group-B words was only 110 out of 200 with the mean hit rate of 0.550. This showed that the students may have had difficulty in finding associations among the test items consisted of Group-B words only. As for the researchers, the mean hit rate of Group A+B and that of Group B were almost the same (0.780 for Group A+B and 0.800 for Group B).

This tendency also became evident in terms of estimated density. As for the students, the estimated density of Group-B words was 0.0767 while that of Group A+B was 0.1149. This indicated that the density of the Group-B words was sparser than that of Group A+B. However, there was not much difference in the density of both word groups in the case of the researchers. The estimated density of Group-B words was 0.1487 and that of Group A+B was 0. 1405. This was also verified by Welch t-test.

Discussion
The results suggested that the students tended to start from Group-A words (i.e., basic words) and headed for Group-B words (i.e., advanced words) when making word pairs. In other words, Group-A words may have worked as “hubs” that helped them make associations in their L2 mental lexicon. Thus, it may be helpful for learners if new words were introduced together with semantically related Group-A words, which may help make semantic clusters in their L2 mental lexicon.
Conclusion

Currently, teaching programs which promote intentional vocabulary learning are not systematically implemented in the curriculum for English education in Japan. However, the findings in this study which suggested the effectiveness of introducing new vocabulary in association with fundamental vocabulary that are already known to learners may help develop more effective vocabulary learning programs in Japan.

We found similar tendency in another experiment that we later did in Tanaka & Takahashi (2019). Participants were 32 Japanese university students whose proficiency level of English was intermediate (their TOEIC score was approximately 400 in average). We found a significant difference between the mean hit rate in Group A+B and that in Group B. This suggests that this tendency may be universal in learners of L2.

References