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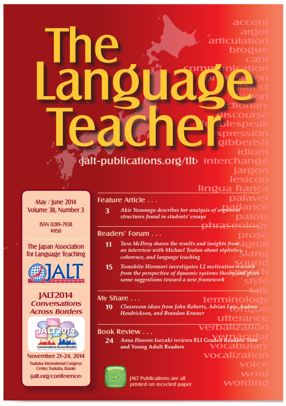

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Becoming aware of what's going on in these few areas of theory and research has really made me view my role differently, has helped me understand how to help my students become better learners, and given me a direction on how to possibly overcome those problems that seemed so insurmountable when I first came across them a few years ago.

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This essay has not been changed from its original publication.

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Re-examining semantic clustering: Insight from memory models

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It has been repeatedly argued that semantically related words should not be learned together because the learning is impeded. However, the results of past research are not all in agreement, with some providing favorable results for semantic clustering, and some seeming to suggest different types of similarity affect memory in different ways. The types of connections that truly cause the problem therefore need to be discussed more carefully. Focusing on a visual component, which is commonly observed across different models of working memory, a study was conducted to examine if learners have difficulty memorizing a group of words that describe items with a common *physical* feature. The study compared the learning of three types of word sets: unrelated, semantically related, and physically related. While no statistically significant difference was observed between semantically related and unrelated sets, the scores for physically related sets were significantly lower than those for the other two types. This suggests the possibility that the impeding effect of semantic clustering reported in the past could be partly due to the nature of semantically similar words, which sometimes share visual features.

SIG Spotlight: VOCAB SIG

The Vocabulary SIG is dedicated to research of the learning, teaching, and assessment of vocabulary. It currently produces two publications, Vocabulary Education Research Bulletin (VERB) and Vocabulary Learning and Instruction (VLI), and hosts an annual symposium. Past events have featured Paul Nation and Batia Laufer, and our 2015 event hosted in Fukuoka will feature Stuart Webb and Rie Koizumi.

「意味的に関連のある語を同時に学習すると記憶の妨げになる」という考え方が（語彙習得研究者の間に）繰り返し論じられている。しかし、先行研究の中には逆の結果を示すものや、意味上の関連性が異なると学習効果が異なることを示すものもあり、記憶の妨げになる要因が何であるのかは、慎重な検証が求められる。本論は、心理学におけるワーキングメモリーの研究において視覚イメージが重要視されていることに着目し、「関連のない語群」「意味的に関連のある語群」「形状の似ている物を指す語群」の記憶の効率性を検証したものである。その結果、「意味的に関連のある語群」と「関連のない語群」は統計的に有意差が見られなかったが、「形状の似ている物を指す語群」が他の語群よりも記憶しにくいことが示された。「意味的に関連する語は記憶しにくい」と言われているのは実は、意味的に関連する語は形状の似ているものを指すことがしばしばあるからではないか、という可能性が示された。

Background

Among researchers of second language vocabulary learning, semantic clustering is often considered something to be avoided. This issue has long been investigated, with many empirical studies (e.g., Higa, 1963; Tinkham, 1993, 1997; Waring, 1997). They suggest that if words that fall in the same semantic field such as "fruits" (e.g., *apple*, *orange*, *pear*) or "furniture" (e.g., *table*, *chair*, *bed*) are learned simultaneously, learning is impeded because of confusion stemming from semantic overlap. Following such research, the negative impact of semantic clustering is sometimes treated almost as if it were an established fact. However, the results of more recent research on this issue are not entirely uniform: Erten and Tekin (2008) report on the negative effect of semantic clustering, whereas Papathanasiou (2009) and Davies (2012) suggest mixed results, and Hashemi and Gowdasiaei (2005) present support for semantic clustering.

One void in this area of research is the lack of serious discussion on what is causing the confusion. Words can be connected semantically in different ways and to different degrees: among co-ordinates of "musical instruments", many people would recognize *piano* as being closer to *organ* than to *cymbals*. It is unreasonable to assume that different types and degrees of similarity affect learning in the same manner. Tinkham (1997) suggests that while semantic clustering has a negative impact, thematic clustering, which includes words along one theme such as "frog" (*frog*, *hop*, *slimy*, *pond*, *croak*, *green*), has facilitative effects. Although labeled differently, they are in effect both semantically connected, and what Tinkham (1997) shows is that different types of semantic relationship affect memory in different ways. More consideration on what in semantic similarity has an impact on learning is therefore necessary.

In the field of psychology, various models of memory have been suggested, and there is one commonality to the different models. The common feature seen across various models of working memory, the first system the information goes through when it is being processed, is that they all have some form of visual component. An early model proposed by Baddely and Hitch (1974) has two initial components: the Phonological Loop, which processes sound, and the Visuo-Spatial Sketchpad, which deals with visual images. These types of information are then fed into the Central Executive, where the information is synthesized and committed to memory. More recent models, such as Logie's (1995) and Baddely's (2000), also have a visual component, and it has remained important in the theories of information processing.

Such importance of visual image gives us a new perspective on research on semantic clustering. Tinkham (1997), for example, employed metal names (*tin, bronze, iron, brass, lead, steel*) for one of his semantic sets, which are very difficult to differentiate visually. This is an extreme case, but a fruit often has a round shape and clothes such as *jacket*, *shirt*, and *coat* share some physical similarity. It is not uncommon for semantically grouped words to have a similar visual image, and this could possibly be the reason why the field has repeatedly observed the negative impact of semantic clustering.

Study

Given the importance attributed to imagery in information processing, as well as its possible connection to semantic clustering, a study was designed under the following research question: "Does grouping semantically unrelated but physically related words have a negative impact on memory?" A total of 64 Japanese students were involved, and the participants learned non-words paired with a Japanese meaning for three different categories: "Unrelated," "Semantically related," and "Physically related." Table 1 shows the nature of each category as well as the Japanese meanings used in the study.

Table 1. Nature of categories and Japanese meanings prepared for the study

Category	Nature	Japanese meanings
Unrelated	There is no obvious link among the words in this group.	rat, cherry, clip, lotus, spoon, mountain elephant, banana, tape, burdock, kettle, stone rabbit, pear, scissors, cabbage, cup, forest
Semantically related	The words fall into one semantic field: "animals," "vegetables," and "kitchen utensils." The words were selected so that they would have little visual similarity.	chicken, pig, giraffe, monkey, snake, whale Japanese radish, cucumber, spinach, okra, tomato, egg plant pan, knife, cutting board, fork, strainer, ladle
Physically related	The words describe the objects that share physical features: *round*, *thin and long*, and *rectangular*.	globe, watermelon, ball, pearl, candy, marble pencil, fishing pole, chopsticks, straw, rope, shoe laces, pass card, playing card, student card, business card, post card, poster

To each Japanese meaning, a nonword generated using a program named *Wuggy* (Keuleers & Brysbaert, 2010) was allocated. The participants looked at six pairs displayed on a computer screen for 45 seconds and were then asked to write the Japanese meaning of each nonword (Test 1). Repeating this cycle of learning and testing nine times, they learned all 54 pairs and were tested on how much they could memorize. After an interval of 20 minutes, the participants were asked again to write Japanese meanings for the nonwords learned earlier (Test 2).

Results

Tables 2 and 3 show the results of the two tests.

Table 2. Results of test 1 (N = 64, possible max = 18)

	Max	Min	Mean	SD	Std. Error
Unrelated	18	1	13.42	3.93	.49
Semantic	18	3	14.00	3.89	.49
Physical	18	0	12.30	4.16	.52

Table 3. Results of test 2 (N = 64, possible max = 18)

	Max	Min	Mean	SD	Std. Error
Unrelated	15	0	5.06	3.58	.45
Semantic	16	0	5.59	3.91	.49
Physical	16	0	4.02	3.50	.44

A repeated measures ANOVA assuming sphericity determined that mean scores for Test 1 differed statistically significantly (F (2, 126) = 11.986, $p < 0.001$). Post hoc tests using the Bonferroni correction revealed that the difference between the unrelated and semantic sets was not significant ($p = .273$), whereas the mean score of the physically related sets was significantly lower than the other two categories ($p = .018$ against the unrelated sets and $p < .001$ against the semantic sets). Likewise, a significant difference was confirmed for Test 2 (F (2, 126) = 12.069, $p < .001$). While post hoc analysis did not show any significant difference between the unrelated and semantic sets ($p = .336$), the physical sets were again shown to have a significantly lower mean ($p = .007$ against the unrelated sets, and $p < .001$ against the semantically similar sets). Partial eta-squared for these analyses were .306 for Test 1 and .286 for Test 2.

Discussion and conclusions

These results suggest that it is harder to learn physically related words simultaneously than learn unrelated or semantically related words. The difficulty may stem from the confusion generated by shared visual images of items described by the words. This study did not observe any impact of the semantic sets that avoided visual connection, which suggests that the impeding effect of semantic clustering reported in the past could be explained partly by the fact that semantically clustered words sometimes share visual features.

Visual similarity is an aspect that has scarcely been addressed in the literature of semantic clustering. Although we need to be cautious not to generalize the results of this small-scale research, the current study raises questions about the source of difficulty in learning semantically grouped words. With more study, the real source of confusion caused by semantic clustering would be further clarified.

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