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Comparing the Knowledge of EFL Students' General Vocabulary and Medical Terminology

Yoko Ichiyama

Faculty of International Studies, Kyoritsu Women's University, Japan

Abstract: ***Acquiring sufficient vocabulary knowledge in the English as a foreign language (EFL) context has been acknowledged as one of the essential components of English language acquisition (Grabe, 2009; Hudson, 2007; Koda, 2005).This study aimed to investigate the comparative difficulties between general vocabulary and medical terminology for nursing students. Using Rasch analysis, we examine whether there are differences in students' achievements between semantic processing skill, ability to formulate meaning from the inputted words, and graphophonemic processing skill, which is the ability to match letters and sounds. There were no significant differences between medical and non-medical English vocabulary scores regarding sematic processing (M=−0.04, SD = 0.97, and M=−0.07, SD = 1.24, respectively; t(174)=0.27; p=0.005), while there were significant differences in the scores for medical and non-medical vocabulary (M=0.28, SD=1.2 and M=−0.26, SD=0.8, respectively; t(74)=0.03; p=0.005) regarding graphophonemic processing skills. These results indicate that to succeed in acquiring English medical-specific vocabulary, the students require input regarding graphophonemic processing skills.***

Keywords: vocabulary learning, medical-specific terms, EFL nursing students, Rasch analysis

1. Introduction

While acquiring an adequate amount of vocabulary in a target language is one of the most important factors for successful language acquisition, research indicates that 98% of the target language's words should be acquired to be able to read unassisted in the target language (Nation, 2001; Nation and Chung, 2009). Adolphs and Schmitt (2004) claim that to comprehend the meaning of authentic material(such as journals and newspapers), learners need to have a vocabulary size of approximately 8,000 to 9,000 words. Among all factors, the acquirement of the English with a specific purpose (ESP), such as technical, specialized medical words or hard science words, is acknowledged as one of the most difficult tasks (Hsu, 2013; Dang, 2018). According to Nation (2001), vocabulary can be categorized into four groups:(1) high-frequency or general service vocabulary;(2) academic/sub technical vocabulary; (3) technical vocabulary; and (4) low frequency vocabulary. Beck, McKeown, and Kucan (2013) simplified the categories and divided vocabulary into three categories: (1) basic vocabulary; (2) high frequency/utility words that are interdisciplinary; (3) and low frequency, domain-specific words. Based on the preceding categorization, here we will refer to the vocabulary in this study's focus as medical-specific words.

The difficulty of acquiring medical-specific words has been acknowledged by several ESP researchers, such as Al-Jamal (2018) and Khan (2016). Al-Jamal (2018), after administering vocabulary tests to 20 medical students, argued that while the students were reading, they employ a particular linguistic clue or word morphology clue compared to other linguistic clues, such as word association or sentence grammar. Khan (2016) interviewed 76 medical trainees who participated in a medical-specific vocabulary acquisition program, regarding their perspectives on the difficulties of acquiring medical-specific vocabulary. Among the general responses, such as the lack of opportunities to rehearse the target vocabulary and the lack of communicative English proficiency, many claimed that comprehending the complex structure of medical vocabulary was difficult. Their claims seem to be justified after taking into account that approximately 75% of medical-specific vocabulary words are either Latin or Greek in origin or have Latin or Greek elements (Salagar 1985). According to Khan (2016), medical vocabulary is composed of at least two aspects of the followings: (1) word root(the core meaning of a word);(2) combining form, such as "o" or other vowels;(3) a suffix, which is added at the end of a word in order to modify the meaning, and (4) a prefix, which is attached to the beginning of a word. The term "neuropathy" consists of the word root "neuro-", which is derived from a Greek term "neûron", meaning neuron and the suffix "-pathy", having a Greek origin and meaning diseases or disorder. Moreover, researchers, such as Fang (1985) and Khan (2016), claim that students who are learning medical terms as a foreign language will benefit not only by gaining morphological knowledge, including the knowledge of suffixes and prefixes, but also the pronunciation of English letters that do not have one-to-one relationships between sounds. Ichiyama (2018) noted that medical vocabulary letters contain relatively more difficult letter–sound relationships than general words do. Ichiyama argues that there is a need to administer a test that (during the students' earlier entrance periodsinto medical training institutions) elucidates not only students' knowledge concerning the meaning of vocabulary but also their knowledge on letter–sound relationships in medical-specific terms.

Rasch analysis, developed by Rasch (1980), provides a log odds ratio of probability. As Wright and Linacre (1989) point out, a Rasch analysis transforms raw scores (that is, nominal measures, which do not have an equal interval scale and therefore item scores cannot be summed up) of items and persons (test takers) into measures that have interval scales (that is, one point in question number one is equivalent to one point in question number two). Hendriks, Fyfe, Styles, Skinner, and Merriman (2012) argue that nominal or ordinal scales, which are traditionally used in assessment, are less precise measures than the interval or ratio scales, and therefore, the use of a Rasch analysis should be encouraged.

Rasch provides fit statistics to assess the unidimensionality, the extent to which the items are measuring a single construct (an attribute or variable that a test is attempting to assess), in this case, the knowledge of general and medical-specific vocabulary words of test items. Fit statistics provide information on the extent to which the observed response corresponds to the expected response based on the Rasch model. By deleting items and persons that do not fit a Rasch model, items and persons that do not assess the knowledge of general and medical-specific vocabulary words are removed, and therefore, the requirement of unidimensionality is met.

The use of Rasch analysis is also beneficial for research that is relatively small in scale. As Hambleton, Swaminathan, and Rogers (1991) point out, Rash requires relatively few subjects (i.e, 30 persons) to obtain useful and reasonable estimates.

Unfortunately, while numerous studies have been administered using a Rasch analysis to validate their test, little has been done in the field of medical-specific vocabulary (Belgar, 2010; Read, 2015; Heming, 2012). Belgar (2010), for example, analyzed the results of a test consisting of 140 test items that assessed the meaning of general English vocabulary administered to 19 English native speakers and 178 Japanese learners of English. Belgar claimed that the use of the Rasch analysis enabled assessments of test items assessing one ability-relatedtrait (unidimensionality). Moreover, because the results show a good fit to the Rasch model, the students' scores can be transformed from ordinal to interval data, which enables comparison between the scores. One of the very few examples of research that compared the students' proficiency level between medical and general terms was administered by Heming (2012). Heming required that the 263 medical students to read a text that contained 87 medical-specific terms and 223 general terms. The students were asked to read the text and circle unknown words. The main focus of the study was, however, to compare students with differing backgrounds. Moreover, there were no differences between the difficulty of medical-specific terms and general vocabulary words.

The purpose of the present study was to examine whether there were any differences between medical-specific and general vocabulary regarding both semantic and graphophonemic processing.

2. Materials and Methods

A test consisted of 250 test items, including 175 meaning-focused items and 75 letter–sound relationship-focused items. 114 entrants who had entered a nursing faculty in a university in Tokyo took a placement test for their English classes.

Table 1: The Type and the Number of Test Items

	Medical-specific vocabulary	General Vocabulary	Total
Meaning focused	35	140	175
Letter –Sound relationship focused	25	50	75
Total	55	195	250

For the Rasch analysis, the computer program WINSTEPS Rasch version 3.81.0 was used (Linacre, 2006). After the Rasch analysis was performed, an independent sample t-test was conducted to compare students' semantic and graphophonemic processing skills in both medical-specific English and non-medical English vocabulary.

3. Results

Of the 114persons and 250 items measured, all mean square (MNSQ) ranges fell between 0.7 and 1.3. As Wright (1994) has proposed, items that did not fit the Rasch model (i.e., with an infit value exceeding 1.3 or an infit value less than 0.7) were deleted until all items fit the Rasch model. Tables 2 and 3 show the basic statistics of the Rasch analysis.

Table 2: Summary of 114 Measured Pearson

	Total Score	Count	Measure	Model Error	Infit		Outfit	
					MNSQ	ZSTD	MNSQ	ZSTD
Mean	160.8	249	0.74	0.15	1	0	0.99	0
SD	14.5	0.4	0.3	0	0.11	1.8	0.15	1.5
Max.	191	150	1.43	0.16	1.36	6.4	1.5	5.5
Min.	121	245	−0.07	0.14	0.77	−4.0	0.61	−3.2

Real RMSE	0.15	True SD	0.26	Separation	1.78	Person Reliability	0.76
Model RMSE	0.15	True SD	0.27	Separation	1.82	Person Reliability	0.77

Table 3: Summary of 250 Measured Items

	Total Score	Count	Measure	Model Error	Infit		Outfit	
					MNSQ	ZSTD	MNSQ	ZSTD
Mean	73.3	113.5	0	0.23	1	0.1	0.99	0.1
SD	22	6.9	1	0.09	0.04	0.7	0.08	0.8
Max.	113	114	2.2	1.17	1.14	3.9	1.29	3.9
Min.	3	4	−4.03	0.19	0.76	−2.4	0.66	−2.4

Real RMSE	0.25	True SD	0.97	Separation	3.85	Person Reliability	0.94
Model RMSE	0.25	True SD	0.97	Separation	3.87	Person Reliability	0.94

The person separation measure was relatively low (1.78–1.82), which indicates that the number of items used was rather small to be able to distinguish between individuals. Its person reliability was moderately high (0.77), which indicates that if the participantswere given other comparable groups of test items, there is a probability that the test would reproduce a similar order of the test taker's hierarchy. The reliability of items was high(0.94), which indicates that if the items were given to other comparable groups of test takers, there is ahighprobability that the test would reproduce a similar order of the item's hierarchy. The item separation measure of 3.85–3.87 indicates that the items can be separated into more than three strata of difficulty (Karim, Shah, Din, Ahmad, & Lubis, 2014).

Tables 4–7 show the final results of Rasch scores for each item.

Table 4: Rasch Scores of 25 Test Items that Assessed Medical-specific Vocabulary's Graphophonemic Processing Skills

Maximum score	2.15
Minimum score	–1.1
Average	0.81
SD	0.28

Table 5: Rasch Scores of 35 Test Items that Assessed Medical-specific Vocabulary's Semantic Processing Skills

Maximum score	2.15
Minimum score	–1.53
Average	0.97
SD	–0.04

Table 6: Rasch Scores of 50 Test Items that Assessed General Vocabulary's Graphophonemic Processing Skills

Maximum score	2.2
Minimum score	–2.91
Average	1.38
SD	–0.26

Table 7: Rasch Scores of 140 Test Items that Assessed Medical-specific Vocabulary's Semantic Processing Skills

Maximum score	1.94
Minimum score	–2.61
Average	0.84
SD	0.05

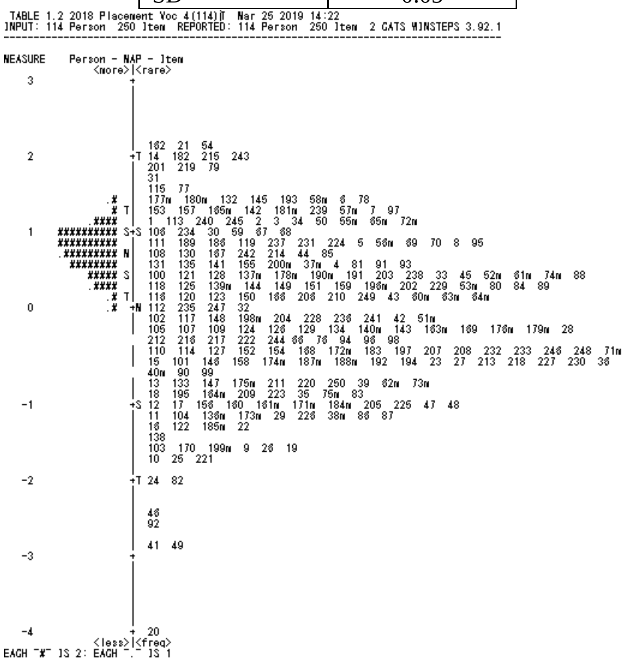

Figure 1: Item and person map of Rasch analysis

Figure 1 shows that a test takers' mean (0.74) is located above the items mean that is set to 0.00 by default and indicates that on average, items are relatively easy for the test takers to understand. Moreover, there are items whose item difficulty estimates fall far below a test takers' ability estimates for the test.

An independent sample t-test was conducted to compare students' graphophonemic processing skills in medical-specific versus non-medical English vocabulary. There were significant differences between the scores for medical-specific English and non-medical vocabulary (M=0.28, SD=1.2 and M=−0.26, SD=0.8, respectively; t(74)=0.03;*p=0.005*). These results suggest that medical-specific English vocabulary requires a more advanced level of graphophonemic processing skills in English reading than non-medical vocabulary.

An independent sample t-test was conducted to compare students' semantic processing skills between medical-specific and non-medical English vocabulary. There were no significant differences for the scores for medical-specific and non-medical English vocabulary ((M = −0.04, SD = 0.97, and M = −0.07, SD = 1.24, respectively; t(174)=0.27; *p=0.005*). These results suggest that there are no differences in the levels of semantic processing skills between medical-specific and non-medical English vocabulary.

4. Discussion and Conclusion

The study revealed a difference in the students' proficiency levels in graphophonemic processing skills between medical-specific and general vocabulary, while there were no differences in students' semantic processing skills. The results appear to indicate the need to provide more medical/nursing student interventions that focus on teaching graphophonemic processing skills for medical terms.

The implication of the study is consistent with the result of a previous study done by Yang (2005), who administered a questionnaire to 89 Taiwanese nursing students regarding their strategies for learning medical-specific vocabulary. Among 42 learning strategies, written and verbal repetition ranked highest of all, and especially with the low-level learners. According to Dewen (2012), nursing students indicated that the most meaningful classroom experience was medical term pronunciation practices and the retention rates of these words were higher than those words which did not have pronunciation practices. Wakabayashi (1996) stated that giving the opportunity to pronounce the medical terms increases the psychological difficulty of medical translation.

As Yang (2012) noted, one of the problems in vocabulary teaching classrooms is that many English textbooks used in nursing classrooms lack perspectives on teaching the letter and sound relationships in medical-specific vocabulary. Therefore, there is a need to cultivate the understanding of teachers who teach medical-specific English vocabulary and the need to implement learning material that emphasizes the development of graphophonemic awareness in medical-specific vocabulary exists.

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