Asia Pacific Journal of Corpus Research
Vol. 4, No. 2, 57-74

http://www.icr.or.kr/apjcr
e-ISSN 2733-8096
https://doi.org/10.22925/apjcr. 2023.4.2.57

An Attempt to Measure the Familiarity of Specialized Japanese in the Nursing Care Field

Haihong Huang
(Kyoto University)
Hiroyuki Muto
(Osaka Metropolitan University)
Toshiyuki Kanamaru
(Kyoto University)

Huang, H., Muto, H., & Kanamaru, T. (2023). An attempt to measure the familiarity of specialized Japanese in the nursing care field. *Asia Pacific Journal of Corpus Research, 4*(2), 57-74.

Having a firm grasp of technical terms is essential for learners of Japanese for Specific Purposes (JSP). This research aims to analyze Japanese nursing care vocabulary based on objective corpus-based frequency and subjectively rated word familiarity. For this purpose, we constructed a text corpus centered on the National Examination for Certified Care Workers to extract nursing care keywords. The Log-Likelihood Ratio (LLR) was used as the statistical criterion for keyword identification, giving a list of 300 keywords as target words for a further word recognition survey. The survey involved 115 participants of whom 51 were certified care workers (CW group) and 64 were individuals from the general public (GP group). These participants rated the familiarity of the target keywords through crowdsourcing. Given the limited sample size, Bayesian linear mixed models were utilized to determine word familiarity rates. Our study conducted a comparative analysis of word familiarity between the CW group and the GP group, revealing key terms that are crucial for professionals but potentially unfamiliar to the general public. By focusing on these terms, instructors can bridge the knowledge gap more efficiently.

Keywords: Corpus Frequency, Word Familiarity, Nursing Care, JSP, Technical Terms

1. Introduction

The importance of vocabulary acquisition in learning a foreign language has been emphasized by many researchers (Laufer, 1997; Nation, 2013; Schmitt & Schmitt, 2020). Proficient communicative ability in a foreign language is closely tied to vocabulary knowledge. However, Sato et al. (2004) note, “People cannot grasp all vocabulary. Generally, people share the vocabulary necessary for communication, and comprehension beyond that varies among individuals or community” (p. 503). Therefore, it is realistic to prioritize learning essential vocabulary and in determining the criteria for important vocabulary.

Word frequency is a primary criterion for word selection (Divjak, 2019). Teaching high-frequency words is important because learners encounter these words more frequently. Furthermore, words that are commonly used in everyday communication and academic contexts are essential for learning (Hyland & Tse, 2007). Many sight words, which are high-frequency words, are taught to young readers (Johns & Wilke, 2018). Generally, word frequency refers to how often a word appears in a given corpus. Corpus tools, widely used by lexicographers, help them make decisions on which words to include in dictionaries based on corpus frequency (Williams, 2003). In vocabulary selection for language learning, corpus frequency is often used as an objective indicator of learning importance. Words with high

frequency are more likely to be encountered repeatedly and are thus given higher priority in learning. It is known that high-frequency words have a shorter latency for lexical decision and pronunciation than medium and low-frequency words (Balota, 2012).

With the development of large-scale corpora, vocabulary selection based on occurrence frequency in the corpus has become popular, and numerous word lists for learning have been developed. However, Williams and Morris (2004) argue that "there is concern that frequency counts derived from text-based corpora do not provide a representative sample of frequency of exposure as they do not take into account exposure to words through speaking and listening "(p. 314). Richard (1970) points out that words with high occurrence frequency often include function words and words with general meanings, with a scarcity of concrete nouns beneficial to learning. He also emphasizes the importance of considering word familiarity, which indicates how well-acquainted one is with a word, when creating vocabulary lists. Thus, when selecting words for learning, relying solely on frequency is insufficient, and investigating the familiarity of words is also crucial. The frequency with which a word appears in a large corpus is assumed to correlate with word familiarity. As Leroy and Kauchak (2014) put it, "Words with a low occurrence frequency are assumed to be less familiar and therefore more difficult because a reader will mot encounter them as often and is less likely to know their meaning" (p. e169). Kuperman and Van Dyke (2013) argue that evaluations based on subjective frequency ratings can provide a more accurate result of how familiar a word is compared to estimates derived from corpus frequency counts.

According to Yokogawa (2006), word familiarity refers to how frequently a person feels they encounter or hear a particular word and is an indication of their acquaintance with that word. It represents the mental frequency with which someone believes a word appears, making it one of the subjective characteristics of a word. Richards (1970) defines word familiarity as "an attempt to measure the degree of importance people attribute to words. This may be measured by asking subjects to rate words on a scale which indicates the degree to which they expect to hear, see or use words" (p. 93).

Deli, et al. (2014) argue that "familiarity rating method is considered important because it tells researchers how frequent language speakers read, hear or uses words and/ or how well they know the meaning of certain language items. This information is important for the validity of studies to do with language acquisition, comprehension and production among other aspects" (p. 46).

Having a good understanding of technical terms and specialized vocabulary is crucial for Japanese for Specific Purposes (JSP). Japanese for Nursing-care Purposes (JNP) is a subset JSP. While JSP has been influenced by ESP (English for Specific Purposes) and LSP (Language for Specific Purposes) theories, it has also uniquely developed its own theoretical framework. LSP is based on specific needs, with examples including business Japanese, Chinese for tourism, and English for air traffic controllers (Widdowson, 1983).

Ageing societies are a matter of public concern globally, and Japan in particular has a significant senior population. Japan is confronting the "2025 problem", referring to the phenomenon of the so-called baby boomers, born between 1947 and 1949, reaching the late-elderly age of 75 by 2025, the peak of Japan's ageing rate. As population ageing proceeds, elderly individuals requiring care are also increasing rapidly, making elderly care an unavoidable social issue. With the growing number of older people needing care increases, there is a rising dependence on care workers although the nursing care sector has faced a manpower shortage for years.

To combat the labor shortage in the nursing care sector, Japan has established several pathways for foreign workers to participate in the labor market. There are four systems in place for accepting foreign care workers: the Economic Partnership Agreement (EPA), the Caregiving residency status, the Technical Intern Training Program, and the Specified Skilled Worker program. In response to the amendment of the Immigration Control Act, the number of foreign care workers is rising. It is anticipated that some caregivers working under frameworks such as the Technical Intern Training or

Specified Skilled Worker programs, where taking the National Certified Care Worker Examination (National Examination) is not mandatory, will eventually choose to take the National Examination to meet on-site requirements or for the purposes of furthering their career advancement.

To pass the National Examination, specialized knowledge in caregiving is essential; mastering relevant vocabulary and technical terms is critical to success (Nakagawa et al., 2018). Foreign care workers aspiring to become specialists need more than just basic conversational Japanese skills. They must master the specialized terminology used in the nursing care profession, which is needed for the National Examination in particular. The specialized vocabulary used in the National Examination is quite different from the language used in daily life. It includes technical terms shared with the medical and nursing fields, and is essential to providing high-quality care.

The National Examination includes five main sections: 1) society and human behavior, 2) care and social welfare, 3) body structure and function, 4) healthcare, and 5) overall understanding through comprehensive questions. It covers 13 specific subjects that range from human dignity and communication techniques to practical caregiving processes and medical care knowledge. Japanese terminology in the field of nursing care encompasses a broad spectrum of disciplines, including medicine, psychology, sociology, and law.

Learning the specialized terminology used in the National Examination helps foreign care workers communicate more effectively and confidently in nursing care settings, thereby enhancing their professional skills. Moreover, understanding and using technical terms accurately is critical to ensuring the safe delivery of care. Miscommunications due to the incorrect use of terminology can lead to care-related errors. However, for foreign care workers, comprehending specialized Japanese can be particularly challenging. By researching word familiarity within the caregiving expert community and identifying words of high importance for learners, we can contribute to the education in Japanese for nursing care.

The following research questions were addressed in this study:

1) Is there a difference in familiarity with technical terms in the nursing care field between experts and the general public?
2) If there is a difference in the first question, what are the terms with high familiarity and those with low familiarity to each group?

2. Literature Review

Word frequency is a critical factor in vocabulary acquisition; however, it is far from the only predictor of a word's difficulty or importance. The word frequency effect is present across various word frequency ranges for individuals with varying levels of language exposure. Reliable frequency lists are derived from a large corpus, which should not be smaller than 20 million words (Brysbaert et al., 2018). Hashimoto and Egbert (2019) suggest that factors other than frequency should also be considered. Leroy and Kauchak (2014) indicate that word familiarity is used as one of the indicators of word difficulty. A word list grounded in word familiarity could reduce the stress of vocabulary learning and enable learners to easily incorporate words by fully utilizing their mental lexicon (Aitchison, 2012).

In related fields such as psychology, word familiarity is believed to be deeply involved in the ease of word recognition, even more so than frequency (Connine et al.,1990; Lewellen et al., 1993; Parks, & Yonelinas, 2015). Cordier and Le Ny (2005) suggest that the understanding speakers possess have of a word's meaning is closely linked to the familiarity ratings of that word. Previous research has established that word familiarity significantly impacts reading comprehension and speed. Words that a reader is familiar with are processed more rapidly compared to unfamiliar ones. The degree to which

a reader is familiar with a word directly influences the amount of time they require to process that word (Connine et al., 1990).

Frequency refers to the number of times a word appears in texts or corpora, while familiarity refers to the psychological closeness or ease a learner feels towards a word, such as whether they believe they often come across that word. The objective frequency derived from written corpora does not account for the frequency with which participants have seen, heard, written, or spoken a word, nor does it consider the particular exposure to words from certain groups of individuals (Ballot et al., 2022). Familiarity is a term often used in vocabulary learning. Information concerning both frequency and familiarity is stored in the brain's lexical knowledge. Some studies suggest that familiarity influences the understanding and acquisition of vocabulary. Word familiarity is considered to be related to the ease of word recognition as much as or more than frequency (Kreuz, 1987). Familiarity ratings are particularly beneficial for low-frequency and longer words where alternative linguistic metrics, such as word frequency, are less accessible. There is a significant interaction between familiarity and word frequency in the lexical processing of Chinese, influencing both accuracy and processing speed. Familiarity has a larger impact on the processing of low-frequency words compared to high-frequency words (Su et al., 2018).

In the field of Japanese language education, word familiarity has been used for the selection of kanji vocabulary (Tokuhiro, 2005). Kawamura and Kitamura (2008) use word familiarity as a criterion in determining the level of difficulty of Japanese sentences and subsequently developed a word familiarity checker. Chen (2014) conducted a survey on word familiarity using a 7-point Likert scale targeting Taiwanese learners of Japanese. Based on Chen's survey, a Japanese word familiarity database consisting of 3,000 words was constructed. Tanaka-Ishii and Terada (2011) note that "frequent words always had high familiarity, but familiar words did not necessarily have high frequency" (p. 114). Additionally, according to Connine et al. (1990), words with high familiarity were found to be faster and more accurate in lexical decision tasks compared to words with low familiarity.

Surveys on word familiarity typically rely on the subjective judgments of individuals. Therefore, to obtain more accurate results, researchers usually conduct large-scale surveys. Amano and Kondo (1998) carried out a pioneering study on word familiarity. They investigated approximately 77,000 headwords from the Shinmeikai Kokugo Dictionary and collected ratings using a 7-point Likert scale, ranging from "unfamiliar" to "familiar". Data were collected from 20 men and 20 women aged between 18 and 30. The results of the survey are available in the NTT Database Series entitled *Vocabulary Characteristics of Japanese* (Amano & Kondo, 1999).

Asahara (2019) conducted a word familiarity survey using crowdsourcing – a method of data collection focused on a specific topic or question, sourced from the online community. Also, crowdsourcing is an efficient method to gather large amounts of data in a relatively short time. The vocabulary explored consisted of approximately 100,000 headwords from the *Bunrui Goihyou* (Word List by Semantic Principles). The survey engaged 3,392 participants, aged 20 and above, and addressed familiarity levels, querying participants on whether they "know", "write", "read", "speak", or "listen". Word familiarity was rated on a 5-point scale ranging from "completely unfamiliar" to "very familiar". In a follow-up study, Asahara (2020) employs the Bayesian linear mixed model (Sorensen et al., 2016) to statistically model word familiarity estimates with the aim of reducing the effects of individual variability in the familiarity ratings.

Fujita et al. (2020) also conducted a word familiarity survey using crowdsourcing, using a similar approach to Asahara (2019). Participants were asked to rate words on a 7-point Likert scale, ranging from "unfamiliar" to "familiar". The survey engaged 52 participants, aged between 18 and 35 and collected ratings for approximately 163,000 words. These results were compiled and released in the *Reiwa Edition Japanese Word Familiarity Database* (Fujita & Kobayashi, 2022). The database containing word familiarity data is divided into three files. The first, entitled *Word Familiarity* (Heisei 11 edition), was an initial survey conducted and published by NTT Communication Science Laboratories (NTT),

which recorded 88,569 words. After the release of the Heisei 11 edition, to expand the data volume NTT conducted an additional survey and published a new edition, *Word Familiarity* (Heisei 20 expanded edition). Given the time since the initial survey and with the appearance of many new words reflecting the changes of the times, as well as the possibility of annual changes in existing words, the new edition was required. The number of data records for this edition is 33,200. On further updating the database, *Word Familiarity* (Reiwa edition) was produced, with an impressive 170,306 data records.

There have been several vocabulary lists compiled based on word familiarity. For native speakers, notable lists include the *MRC Familiarity List* (Coltheart, 1981). This comprehensive list contains 150,837 words, accompanied by 4,894 indicators that denote word familiarity. Additionally, the *Amano List*, crafted by Amano and Kondo in 2000, presents word familiarity data for 68,550 words.

In contrast, for second-language speakers, particularly those from East Asia, there are specialized lists. The English word familiarity database, edited by Yokogawa in 2006, is tailored for Japanese English learners and comprises 2,999 words. Similarly, Chen (2014) devises a word familiarity database specifically for Taiwanese learners of Japanese.

Word familiarity is becoming a popular criterion for selecting basic vocabulary. However, the utility of word familiarity is limited only to general vocabulary and its effectiveness for technical terms remains unknow, and research on specialized Japanese in specific field remains unexplored. We believe that understanding the familiarity of technical terms is instrumental for effective vocabulary instruction.

This study attempts to measure the familiarity of specialized Japanese in the field of nursing care. Since word familiarity is a subjective measure, without collecting large datasets, it is challenging to secure dependable outcomes. The familiarity surveys undertaken so far have been demanded considerable human effort and time investment. Since it is impractical to investigate the familiarity of all specialized terms in the nursing care field, we decided to select the keywords to investigate.

3. Methods

Due to the impact of the COVID-19 pandemic, it was difficult to conduct surveys in nursing care facilities, and we therefore outsourced our survey to an external agency. We compared several research companies and decided to use the academic research services of Cross-Marketing. A significant factor in our choice of Cross-Marketing was their panel of registered certified care workers. Our survey was the distributed to respondents from this specialized panel. We were responsible for the development of the survey content and the verification of the display interface, while the survey was conducted by Cross-Marketing. Upon initiating our collaboration with Cross-Marketing, we provided a detailed research protocol that outlined our specific needs and expectations. Together, we crafted an online survey precisely suited to our research objectives, ensuring it met our methodological criteria. To maintain the quality of the data, we implemented two screening criteria. Respondents who consistently selected only a single option were excluded. Additionally, we excluded respondents who chose two options arbitrarily. We also developed two versions of our survey interface -one optimized for PCs and another for smartphones - to enhance usability. We also engaged in extensive communication with Cross-Marketing throughout the survey period.

The rating scale used was a 7-point Likert scale, ranging from 1 (not familiar at all) to 7 (very familiar). This use of this scale not only follows the precedent set by previous research but also allows for a direct comparison with established databases, such as the NTT Database. The target number of experimental participants was 50 care workers and 50 individuals from the general public. The number of participants was determined in advance in the context of independent t-test power analysis by setting a significance level at 5%, an effect size using Cohen's d at 0.6, and power at 0.8. Calculations were made using the software G*Power 3.1.9.7 (Faul et al., 2007) for power analysis. The results from

this analysis indicated a requirement of 45 participants per group. To accommodate any potential deviations, we set the target sample size for each group at 50 people.

Term extraction is an application of natural language processing technologies. To select vocabulary for the survey, the following procedures were implemented. First, the content of the National Examinations from the past ten years (24th-33rd) was collected and saved as text files. Subsequently, morphological analysis was performed using the MeCab0.996 morphological analyzer and the ComeJisyoUtf8-3(1) morphological analysis dictionary. Due to the nature of the ComeJisyoUtf8-3(1) dictionary, there is a predisposition towards selecting medical terms over those from other fields, such as sociology and law. The results obtained from the morphological analysis were then organized using Excel's pivot table feature to rank the vocabulary by frequency of appearance. This vocabulary list was then compared with the *Balanced Corpus of Contemporary Written Japanese* (BCCWJ) *Long Unit Word List* (Version 1.1), which included words with a frequency of two or more (Maekawa et al., 2014). Statistic criteria Log Likelihood Ratio (LLR) was used to extract the term candidates.

For the extraction of caregiver keywords, we used the statistical criterion called LLR, proposed by Dunning (1993) and widely used in corpus linguistics to extract characteristic words. According to Dunning (1993), LLR provides a valid measure regardless of the text size, large or small.

The formula for calculating LLR is as follows:

$$LLR = a\log\frac{aN}{(a+b)(a+c)} + b\log\frac{bN}{(a+b)(b+d)} + c\log\frac{cN}{(a+c)(c+d)} + d\log\frac{dN}{(b+d)(c+d)}$$

Where:
a: frequency of the word in the National Examination Corpus
b: frequency of the word in BCCWJ
c: total number of words in the National Examination Corpus - a
d: total number of words in BCCWJ - b

Finally, from the words ranked highest according to the LLR, we selected those that were listed in at least three out of four nursing care terminology books. We picked the top 250 kanji words and the top 50 katakana words. For the kanji words, our selection was narrowed down to multi-character words with a character count from two and four.

The survey was conducted from 24 November to 1 December 2022. A survey of 300 words was carried out for certified care workers. For the general public, 140 of the 300 words were surveyed after excluding 160 words that were included in the NTT's *Reiwa Edition Japanese Word Familiarity Database*. Online surveys allowed the target words to be presented in random order, with each participant first responded to 250 randomly arranged kanji words, after which katakana words were presented in random order.

The survey initially collected responses from 151 care workers and 186 individuals from the general public. After a rigorous screening process, the final valid sample was narrowed down to 51 care workers and 64 individuals. The reason for the large number of invalid responses is attributed to the extensive nature of the questionnaire combined with the strict screening criteria. Rather than standard procedures that exclude only responses selecting a single option, this survey also eliminated those that arbitrarily chose two distinct options, such as only choosing 1 and 7. Once the survey was completed, the raw data and GT tables were delivered by Cross-Marketing. Based on the raw data, we attempted to estimate word familiarity. Given that individual variations significantly influence word familiarity surveys, we employed the Bayesian linear mixed model to address and mitigate these effects.

The Bayesian linear mixed model analysis is a type of parameter estimation method that employs

Bayes' theorem (Hoff, 2009). It is recognized that estimates derived from the Bayesian method exhibit little bias, even with small sample sizes (McNeish & Stapleton, 2016).

In analyzing the data obtained from the familiarity survey, we assumed that the individual differences in familiarity rating values followed different normal distributions for both the group of certified care workers (CW group) and the general public group (GP group). Following this assumption, we applied a linear mixed model to examine the familiarity rating values. This model allowed us to distinguish between three primary components: the "familiarity intrinsic to each word", the "baseline rating value for each individual", and the "noise that follows a normal distribution other than these two components".

It is important to emphasize that in this study, the target words for the survey were limited to words appearing in the National Examination Corpus. This study did not intend to generalize findings to other words outside the nursing care field. Additionally, given our interest in the familiarity of individual words, we did not assume a probability distribution for variability between the familiarity estimate values of words. The equation of the model employed is provided below. To ensure the transparency of the research, the data and analysis scripts used in this study are publicly available via the Open Science Framework (https://doi.org/10.17605/osf.io/ukp2h).

CW Group	GP Group
$i \in \{1,2,\ldots 51\}, j \in \{1,2,\ldots,300\}$	$i \in \{1,2,\ldots 64\}, j \in \{1,2,\ldots,140\}$
$Y_{ij}^{(CW)} \sim \text{Normal}\left(\beta_j^{(CW)} + \gamma_i^{(CW)}, \sigma^{(CW)}\right)$	$Y_{ij}^{(GP)} \sim \text{Normal}\left(\beta_j^{(GP)} + \gamma_i^{(GP)}, \sigma^{(GP)}\right)$
$\gamma_i^{(CW)} \sim \text{Normal}\left(0, \eta^{(CW)}\right)$	$\gamma_i^{(GP)} \sim \text{Normal}\left(0, \eta^{(GP)}\right)$

Where:

i: respondent ID for each group

j: word ID（words ID 141-300 were presented only to the CW group）

$Y_{ij}^{(CW)}, Y_{ij}^{(GP)}$: familiarity of word j by respondent i

$\beta_j^{(CW)}, \beta_j^{(GP)}$: familiarity of word j

$\gamma_i^{(CW)}, \gamma_i^{(GP)}$: baseline familiarity rating value of respondent i

$\eta^{(CW)}, \eta^{(GP)}$: Standard deviation representing the variation between individuals in the baseline rating value

$\sigma^{(CW)}, \sigma^{(GP)}$: Standard deviation representing intra-individual variation in the rating value

4. Results

4.1. Participants' Information

Tables 1 and 2 provide a summary of the participants' demographic details. In the CW group, there were 51 certified care workers between the ages of 25 to 61, of whom 28 were men and 23 were women. They resided in 23 different prefectures, and the majority had over five years working experience. The GP group consisted of 64 participants between the ages of 20 to 91, of whom 30 were men and 34 women, residing in 24 different prefectures. Notably, most of them had no experience in taking care of family members.

Table 1. Certified Care Workers (CW Group)

Category	Background Data
Age	25-61 (Avg. 50, SD 11)
Gender	28 (M), 23 (F)
Region	from 23 prefectures
Years of Experience	3-5 years (7), 5-10 years (12), 10-20 years (26), over 20 years (6)

Table 2. General Public (GP Group)

Category	Background Data
Age	20-91 (Avg. 46, SD 16)
Gender	30 (M), 34 (F)
Region	from 24 prefectures
Years of Experience in Family Care	None (46), Under 3 years (8), 5-10 years (4), 10-20 years (2)

4.2. Model and Analytical Method

We implemented the Markov Chain Monte Carlo (MCMC) method for the Bayesian estimation of parameters using the CmdStanR 0.5.3 package in the statistical analysis software, R (version 4.2.1). Four chains were generated, each with a length of 4,500, and a warm-up period of 500 iterations was set for hyperparameter tuning. The posterior distribution was approximated using the 16,000 MCMC samples obtained. As one of the convergence criteria, the Rhat, was less than 1.05 for all parameters, we judged that the model had achieved adequate convergence.

Table 3. Results of Parameters Related to Inter-group Variability in Familiarity Estimation

Parameter	EAP	MED	MAP	SD	2.5%	97.5%	Rhat
$\eta^{(CW)}$	0.964	0.957	0.948	0.099	0.794	1.179	1.001
$\eta^{(GP)}$	0.985	0.978	0.952	0.092	0.827	1.190	1.001
$\sigma^{(CW)}$	1.393	1.393	1.394	1.394	1.378	1.409	1.001
$\sigma^{(GP)}$	1.435	1.435	1.433	1.433	1.414	1.456	1.000

For point estimates of the posterior distribution, we calculated the expected a posteriori (EAP, mean), median (MED), and maximum a posteriori (MAP, mode). Additionally, we summarized the variability of the posterior distribution using the standard deviation (SD) and a 95% credible interval, ranging from the 2.5th to the 97.5th percentile. The estimated results for the variability parameters are shown in Table 3.

4.3. Familiarity Estimation Values for Each Group

In response to research question 1: Is there a difference in familiarity with technical terms in the nursing care field between experts and the general public?

The posterior distribution of the average familiarity $\beta^{(CW)}$ for the CW group and the average familiarity $\beta^{(GP)}$ for the GP group is shown in Figure 1. The error bars in Figure 1 represent a 95% credible interval and the black dot represent the EAP.

$$\overline{\beta^{(CW)}} = \frac{1}{140}\sum_{j=1}^{140}\beta_j^{(CW)}$$

$$\overline{\beta^{(GP)}} = \frac{1}{140}\sum_{j=1}^{140}\beta_j^{(GP)}$$

$$\bar{\delta} = \overline{\beta^{(CW)}} - \overline{\beta^{(GP)}}$$

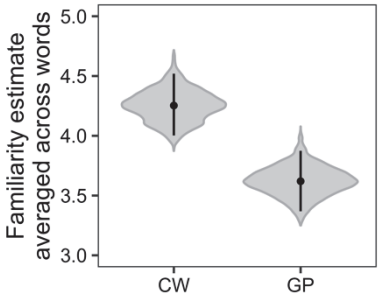

Figure 1. Average Familiarity Estimation Values for the CW Group and GP Group

Table 4. Results of Average Familiarity Estimation Values for the CW Group and GP Group

Parameter	EAP	MED	MAP	SD	2.5%	97.5%	Rhat
$\overline{\beta^{(CW)}}$	4.322	4.315	4.262	0.137	4.064	4.592	1.025
$\overline{\beta^{(GP)}}$	3.676	3.676	3.663	0.132	3.422	3.932	1.024
$\bar{\delta}$	0.646	0.641	0.643	0.190	0.277	1.038	1.015

Table 4 presents the estimated average familiarity values for the CW group and the GP group, and the difference between the groups. The results indicate a reliable difference in familiarity with technical terms in the nursing care field between the two groups. Notably, the CW group, consisting of certified care workers (experts), exhibited higher familiarity with these terms compared to the GP group.

In response to research question 2: What are the terms with high familiarity and those with low familiarity to each group? Tables 5 and 6 display the top 10 words with the highest familiarity and the bottom 10 words with the lowest familiarity as estimated by the CW group and GP group, respectively. There is significant similarity among the words with low familiarity. Experts will naturally have a better understanding of the technical terms associated with their specialty due to their regular use of these terms in practice. It is interesting that there is a similarity among the words with low familiarity between the two groups, suggesting that such terms are not just unfamiliar to the general public but may also be less commonly used by experts. Words with low familiarity include many katakana words. Those katakana words are highly domain specific. The Japanese writing system uses katakana to denote foreign words, technical or scientific terms. These words can be difficult for both the general public and professionals because they used to represent new, foreign, or highly technical concepts with no direct equivalent in common Japanese. Words which are least familiar across both groups, could be areas where further educational focus is needed.

Further analysis was conducted to identify words with varying degrees of familiarity between the CW group and the GP group. Examples of these inter-group differences in familiarity can are provided in Appendix 1 and 2.

Table 5. High and Low Familiarity Words Rated by the CW Group

N	High Familiarity Words	Fam.	Low Familiarity Words	Fam.
1	認知症 dementia	6.33	ウェルビーイング well-being	2.41
2	介護 long-term care	6.15	昇華 sublimation	2.63
3	要介護度 level of care needed	6.11	インテーク intake	2.66
4	尿失禁 urinary incontinence	6.09	ゴールドプラン Gold Plan	2.71
5	血圧 blood pressure	6.05	児童委員 commissioned child welfare volunteer	2.73
6	水分補給 hydration	6.05	防衛機制 defense mechanism	2.75
7	頻尿 polyuria	6.01	スーパービジョン supervision	2.77
8	体位変換 postural change	5.92	指文字 sign language	2.77
9	看護師 nurse	5.91	エコマップ ecomap	2.83
10	腰痛 lumbago	5.91	グリーフケア grief care	2.83

Table 6. High and Low Familiarity Words Rated by the GP Group

N	High Familiarity Words	Fam.	Low Familiarity Words	Fam.
1	水分補給 hydrated	5.97	インテーク intake	1.56
2	認知症 dementia	5.85	ゴールドプラン Gold Plan	1.77
3	高齢社会 ageing society	5.85	グリーフケア grief care	1.91
4	バリアフリー accessible	5.75	対麻痺 paraplegia	1.91
5	食物繊維 dietary fiber	5.71	見当識 orientation	1.93
6	感染症 infectious diseased	5.59	中核症状 core symptom	1.95
7	医療保険 medical insurance	5.53	応益負担 benefit-received principle	1.97
8	デイサービス Day Service	5.39	感情失禁 affective incontinence	2.03
9	骨粗鬆症 osteoporosis	5.37	スーパービジョン supervision	2.07
10	血糖値 blood glucose level	5.35	ウェルビーイング well-being	2.13

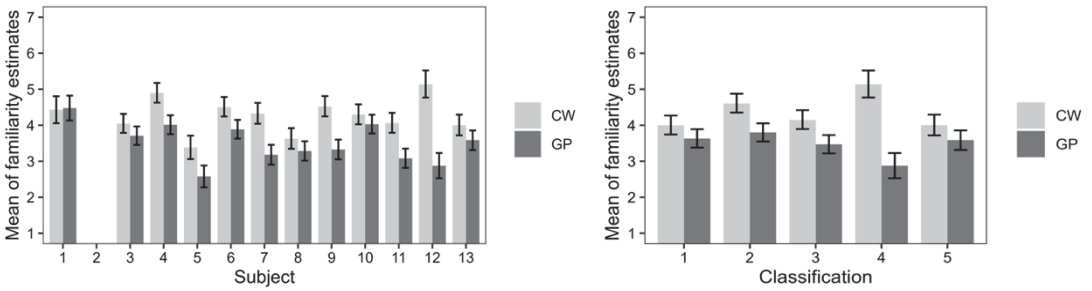

Figure 2. Mean of Familiarity Estimates for Each Subject / Classification

Additionally, when assessing the average familiarity of the keyword list for each subject and classification of the National Examination, it was observed that in most subjects and classifications, those with the qualification of certified care workers had higher familiarity estimates, as illustrated in Figure 2. The error bars in this figure represent a 95% confidence interval. Notably, the keyword list does not include the term corresponding to subject 2.

5. Discussion

Technical terms often have limited occurrence, and their importance cannot be determined based solely on frequency in general corpora. The 300 keywords extracted from the National Examination Corpus have a relatively low frequency in the BCCWJ. Notably, approximately 70% of these terms appear less than 100 times in the BCCWJ, which has a corpus size of 100 million words. Some terms with low frequency, such as “heat shock” (ヒートショック), maintain high familiarity among both the CW group and the GP group, a phenomenon noted by Tanaka-Ishii and Terada (2011).

Williams and Morris (2004) find variations in the effects of familiarity ratings in situations with low-frequency words. Furthermore, when dealing with words of both high and low frequency, the

processing time remained consistent as long as the words maintained a moderate level of familiarity. These findings align with previous studies indicating that rated familiarity differs markedly among low-frequency words (Connine et al., 1990).

Our study also reveals a significant difference in word familiarity ratings between the CW group and the GP group, highlighting a vocabulary gap between expert and non-experts. This gap could be due to varied levels of language exposure, given that the CW group would encounter technical terms more frequently in their professional environment, thereby solidifying their familiarity.

The National Examination is a critical credential for foreign care workers aspiring to work in Japan. Foreign care workers must overcome language barriers in order to provide effective care. Our study identified a discrepancy in word familiarity between certified care workers and the general public, especially in regard to classification 4 (medical care) and subject 12 (understanding disability). This gap highlights a disparity in the recognition and understanding of specific terms within the nursing care field, particularly those related to medical care and understanding disabilities. For foreign care workers, these gaps pose challenges to their integration into the professional environment.

Both word frequency and word familiarity can vary depending on the corpus used for analysis and the background of the individual's estimating familiarity. Word familiarity is subjective and depends on the experiences, knowledge, and professions of those assessing it. It is crucial to obtain familiarity ratings from a sample of individuals that represents the field under examination.

Word length could also affect word familiarity. In our study, we found that both groups showed almost no correlation between word length and word familiarity. Consequently, we observed that many long words appear to be words with both groups are highly familiar. This finding is in contrast to the results of Yokokawa's (2016) study, which focused on English words and found that participants tended to be less familiar with longer words in English (Yokokawa 2016, p.88). The relationship between word length and word familiarity can vary depending on the specific characteristics of the words being studied.

In comparison with the *Reiwa Edition Japanese Word Familiarity Database*, we observed that certain terms, such as "sound side" (健側), "standing position" (立位), "pressure ulcer" (褥瘡), "contracture"(拘縮), and "bed bath" (清拭) were highly familiar to the CW group but unfamiliar to the general public, categorizing them as low-familiarity words. These terms appear to be part of a specialized set of vocabulary, and individuals' familiarity with them depends on those individuals' background knowledge and expertise.

Terms familiar to the CW group but unfamiliar to the general public were identified as having more importance as technical terms. This suggests that, within the realm of technical terms, there is a distinction between terms targeted at the general public and those intended for professionals. This finding can guide educational initiatives for both professionals and the public. Additionally, this understanding can inform communication strategies, ensuring that information shared with the public is clear, accessible, and avoids using unnecessary technical terms.

An individual's familiarity with a word can significantly influence that individual's cognitive processing speed and the accuracy with which the word recognized. Gernsbacher (1984) argues that "more familiar words can be recognized faster and more accurately than less familiar words" (p. 256). Persky and Robinson (2017) further argue that experts distinguish themselves not merely by possessing more knowledge than novices, but also by employing more effective strategies for accessing and utilizing valuable knowledge. Through examining the specific terms with which experts are familiar, we can gain insights into the particular areas of knowledge in which experts excel.

Recognizing this distinction of word familiarity facilitates the categorization of technical terms into semi-technical words, sub-technical words, and highly technical words. Semi-technical words could be terms that have relevance in nursing care but can also be understood and used in other contexts, bridging everyday language and more specialized language. For instance, the word "hydration" (水分補給) , "ageing society" (高齢社会) , and "dietary fiber" (食物繊維) might be considered semi-

technical – it is relevant in nursing care contexts, but also appears in daily conversations and is widely understood.

Sub-technical words are likely words that have a general technical application across various disciplines but become more specific within the context of nursing care.

Highly technical words are specialized terms exclusive to nursing care. Only those within the profession or with advanced knowledge of the subject would understand them. These words are characterized by their low familiarity to both CW group and GP group, such as the word “wellbeing” (ウェルビーイング). Such insights can refine pedagogical strategies for more effective instruction in nursing care technical terms.

Our initial focus on terms familiar to experts was intended to identify terms that professionals could readily apply within their work environment. However, this process may not have sufficiently considered the learner’s perspective -an aspect that is indeed crucial for a well-rounded learning experience. The vocabulary learning needs of novice and expert learners are different. Novice learners should initially focus on semi-technical words, which are crucial for building a foundational understanding of the nursing care field. Expert learners, on the other hand, require more specialized and technical terms that are specific to their field. Such vocabulary, often less familiar to the general public but more familiar to experts, is essential in gaining an in-depth understanding and participating in professional communication. The goal for expert learners is to push the boundaries of their knowledge, which includes learning highly specialized terms that may be new even to them. In summary, novice learners benefit from an introduction to semi-technical terms that lead to more specialized areas, while experts should focus on deepening and expanding their existing knowledge base with specialized vocabulary.

When teaching vocabulary, the questions of which words to teach and in what order to teach them are a major concern for language teachers. As Hyland and Tse (2007) pointed that Language teachers need to identify students’ target language needs as clearly as possible and to address these needs to the best of their ability. Recognizing the varying levels of technicalness in terms can be instrumental in teaching. Language instructors may be familiar with semi-technical terms, finding them easier to teach, but may not have a complete knowledge of highly technical terms. Therefore, collaboration with experts is vital. Japanese language teachers could sequence vocabulary teaching starting with semi-technical words that students may be familiar with, moving to sub-technical words, and finally to highly technical terms. This process allows for the building of scaffolds in learning. Facing too many unfamiliar words can be discouraging for learners. When teaching new words, a balanced of exposure to words of low familiarity is useful in learning motivation. Identifying words that are highly familiar to experts but not to the general public helps streamline educational and training efforts. By focusing on these high-impact terms, educational programs can potentially bridge the knowledge gap more efficiently, which is vital in sectors with acute skill shortages.

Categorizing terms based on word familiarity benefits the educational process and can also have a direct impact on the quality of care in the nursing profession. By refining pedagogical strategies with such insights, educators can produce more competent, confident, and effective nursing professionals. It is also the case that familiarity with words frequently used in a society or group promotes social cohesion, enabling people to join discussions, exchange anecdotes, and partake in group events. Word familiarity can be a significant part of one’s social identity. Being able to understand and use the technical terms of one’s community fosters a sense of belonging.

6. Conclusions

The nursing care sector in Japan, crucial in supporting elderly people, is facing a severe manpower shortage. The field of nursing care is closely related to the medical and nursing sectors and involves

the use of many complex technical and medical terms. Having a good knowledge of nursing care technical terms is crucial not only for foreign care workers but also for Japanese caregivers and care recipients.

Tongpoon -Patanasorn (2018) highlight previous studies that have identified technical terms using five distinct methods. These are: technical dictionaries, use of context clues, keyword analysis, rating scales, and hybrid methods. Our study implements the hybrid methods, combining keyword analysis and a familiarity rating survey.

In this study, we investigated the word familiarity of vocabulary specific to the nursing care field. Specifically, our focus was on the keywords of the nursing care corpus, examining the difference in word familiarity between nursing care professionals and the general public. The approach balances objective frequency data with subjective familiarity ratings, leveraging both to pinpoint key terms that are crucial for professionals in the field but potentially unfamiliar to the general public.

In undertaking this study, we aimed to identify specialized vocabulary with higher learning priorities. This research suggests that words that are highly familiar to experts could be important as specialized vocabulary. Therefore, it is recommended to prioritize learning these terms.

Bayesian estimation can yield less biased estimates compared to the conventional maximum likelihood method even with small sample sizes (McNeish & Stapleton, 2016). Therefore, by adopting this method in the study, it was possible to estimate familiarity precisely even with a limited number of survey participants. Furthermore, Bayesian methods, grounded in the likelihood principle (Birnbaum, 1962), offer precise estimates, in contrast to traditional frequentist methods, even when incorporating new data sequentially with the existing dataset (Kruschke, 2014). Thus, the data reported herein can be seamlessly and coherently integrated into additional data in the future to obtain more precise estimates. Rather than conducting large-scale surveys, it is expected that this approach could be applied to estimate the familiarity of specialized terms in other fields.

This research estimated visual word familiarity. Beyond this, there is a need to investigate auditory word familiarity and combined visual-auditory word familiarity (Amano, S., Kondo, T., & Kakehi, K. 1995). Additionally, besides the keywords included in the National Examination that we studied; a future task is to examine the semi-specialized vocabulary in the intermediary zone held by the care recipients. We collected word familiarity data from both skilled and unskilled native Japanese speakers. However, we would anticipate differences in word familiarity between native Japanese speakers and Japanese learners. The findings related to the familiarity of terms listed in Appendix 2, such as “barrier-free” (バリアフリー), “daycare service” (デイケア), and “heat shock” (ヒートショック), which are Japanese English loanwords, present a unique challenge for learners of Japanese as a second language. Our study's findings indicate that these terms, while common in the lexicon of native Japanese speakers, may not be as readily understood by second language learners. In future research, studies targeting both native Japanese speakers and learners of Japanese as a second language would be useful to clarify the differences between the two groups.

The present study has several limitations. The first is that the size of the corpus was small. Although our focus on a limited number of keywords from the National Examination Corpus is helpful to efficiently identify specialized Japanese in the nursing care field, it may pose potential limitations in terms of the breadth of data analyzed. Second, the sample size, though carefully determined based on prior power analysis, was also small and may not fully represent the diverse perspectives of care professionals and the general public. In future work, we plan to expand the corpus and incorporate a larger and more diverse sample to provide a more comprehensive analysis of the specialized Japanese used in the nursing care field. Conducting further research with a larger sample size is essential to enhancing the potential for generalization in regard to our results.

Acknowledgments

This study was supported by the Japanese Council of Senior Citizens Welfare Service (2022).

References

Aitchison, J. (2012). *Words in the Mind: An Introduction to the Mental Lexicon (4th ed.)*. Oxford, UK: Black-well.

Amano, S., & Kondo, T. (1998). Estimation of mental lexicon size with word familiarity database. *Proceedings of ICSLP, 5*, 2119-2122.

Amano, S., & Kondo, T. (1999). *Lexical Properties of Japanese, Vol. 1. Word Familiarity. NTT Database Series*. Tokyo: Sanseido.

Amano, S., Kondo, T., & Kakehi, K. (1995). Modality dependency of familiarity ratings of Japanese words. *Perception & Psychophysics, 57*(5), 598-603.

Asahara, M. (2019). Word familiarity rate estimation using a Bayesian linear mixed model. *Proceedings of the First Workshop on Aggregating and Analysing Crowdsourced Annotations for NLP,* 6-14.

Asahara, M. (2020). Bayesian linear mixed model ni yoru tango sinmitudo suitei to isou joho fuyo [Word familiarity rate and register type estimation using a Bayesian linear mixed model]. *Journal of Natural Language Processing Volume, 27*(1), 133-150.

Ballot, C., Mathey, S., & Robert, C. (2022). Age-related evaluations of imageability and subjective frequency for 1286 neutral and emotional French words: ratings by young, middle-aged, and older adults. *Behavior Research Methods*, *54*(1),196-215.

Balota, D. A. (2012). The role of meaning in word recognition. In Balota, D. A., Flores d'Arcais, G. B., & Rayner, K. (Eds.), *Comprehension Processes in Reading* (pp. 9-32). Hillsdale: Routledge.

Birnbaum, A. (1962). On the foundations of statistical inference. *Journal of the American Statistical Association, 57*(298), 269-306.

Brysbaert, M., Mandera, P., & Keuleers, E. (2018). The word frequency effect in word processing: An updated review. *Current Directions in Psychological Science, 27*(1), 45-50.

Chen, S. (2014). Taiwanzin nihongo gakusyuusya wo taisyou to si ta: nihongo tango sinmitudo de-ta-be-su no koutiku [Database structures on Japanese word familiarity of Japanese learners in Taiwan] *Studies in Comparative Culture, 111*, 167-179.

Coltheart, M. (1981). The MRC psycholinguistic database. *The Quarterly Journal of Experimental Psychology Section A, 33*(4), 497-505.

Connine, C. M., Mullennix, J., Shernoff, E., & Yelen, J. (1990). Word familiarity and frequency in visual and auditory word recognition. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 16*(6), 1084-1096.

Cordier, F., & Le Ny, J. F. (2005). Evidence for several components of word familiarity. *Behavior Research Methods, 37*(3), 528-537.

Deli, R. M., Mustafa, R., & Sarbini-Zin, M. (2014). Word familiarity in Sarawak Malay dialect: assessing vocabulary of the young. *Iman, 2*(1), 45-51.

Divjak, D. (2019). *Frequency in Language Memory, Attention and Learning.* Cambridge: Cambridge University Press.

Dunning, T. (1993). Accurate methods for the statistics of surprise and coincidence. *Computational Linguistics, 19*(1), 61-74.

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*(2),

175-191.

Fujita, S., & Kobayashi, T. (2022). Reiwa ban tango sinmitudo ni moto zuku daikibo goi suu suitei tyousa - Web koukai ban no riyou rogu bunseki - (A large scale web-based study of Japanese vocabulary size estimation test - based on word familiarity database, *Reiwa edition* -). *Proceedings of the 36th Annual Conference of the Japanese Society for Artificial Intelligence*, 4N1-GS-3-03, 1-4.

Fujita, S., Kobayashi, T., Yamada, S., Sugawara, S., Arai, T., & Arai, N. (2020). Syou・tyuu・koukousei no goi suu tyousa oyobi tango sinmitudo to no kankei bunseki [Vocabulary size of elementary, junior high and high School students and analysis of relationship with word familiarity]. *Proceedings of the 26th Annual Meeting of the Association for Natural Language Processing*, 355-358.

Gernsbacher, M. A. (1984). Resolving 20 years of inconsistent interactions between lexical familiarity and orthography, concreteness, and polysemy. *Journal of Experimental Psychology: General, 113*(2), 256-281.

Hashimoto, B. J., & Egbert, J. (2019). More than frequency? Exploring predictors of word difficulty for second language learners. *Language Learning, 69*(4), 839-872.

Hoff, P. D. (2009). *A First Course in Bayesian Statistical Methods (Vol. 580)*. New York: Springer.

Hyland, K., & Tse, P. (2007). Is there an “academic vocabulary”?. *TESOL Quarterly, 41*(2), 235-253.

Johns, J. L., & Wilke, K. H. (2018). High-frequency words: some ways to teach and help students practice and learn them. *Texas Journal of Literacy Education, 6*(1), 3-13.

Kawamura, Y., & Kitamura, T. (2008). Bunsho no nani do hantei no tame no tango shimmitsudo chiekka no kaihatsu [Development of a vocabulary level checker based on word familiarity]. *Journal of Japanese Language Education Methods, 15*(2), 24-25.

Kreuz, R. J. (1987). The subjective familiarity of English homophones. *Memory & Cognition, 15*(2), 154-168.

Kruschke, K. J. (2014). *Doing Bayesian Data Analysis: A Tutorial with R, JAGS, and Stan (2nd ed.).* Burlington, MA: Academic Press.

Kuperman, V., & Van Dyke, J. A. (2013). Reassessing word frequency as a determinant of word recognition for skilled and unskilled readers. *Journal of Experimental Psychology: Human Perception and Performance, 39*(3), 802-823.

Laufer, B. (1997). What's in a word that makes it hard or easy? Some intralexical factors that affect the learning of words. In Schmitt, N., & McCarthy, M. (Eds.), *Vocabulary: Description, Acquisition and Pedagogy* (pp. 140-155). Cambridge: Cambridge University Press.

Leroy, G., & Kauchak, D. (2014). The effect of word familiarity on actual and perceived text difficulty. *Journal of the American Medical Informatics Association, 21*(e1), e169-e172.

Lewellen, M. J., Goldinger, S, D., Pisoni, D. B., & Greene, B.G. (1993). Lexical familiarity and processing efficiency: Individual differences in naming, lexical decision, and semantic categorization. *Journal of Experimental Psychology: General, 122*(3), 316-330.

Maekawa, K., Yamazaki, M., Ogiso, T., Maruyama, T., Ogura, H., Kashino, W., Yamaguchi, M., Tanaka, M. & Den, Y. (2014). Balanced corpus of contemporary written Japanese. *Language Resources and Evaluation, 48*(2), 345-371.

McNeish, D. M., & Stapleton, L. M. (2016). The effect of small sample size on two-level model estimates: A review and illustration. *Educational Psychology Review, 28*(2), 295-314.

Nakagawa, K., Hashimoto, Y., Sunami, H., Saito, M., Nunoo, K., & Nomura, A. (2018). The kanji learning website for economic partnership agreements (EPA) care worker candidates,” Kaigo-no-Kanji Supporter” (Learning support for kanji vocabulary in the caregiving field). *LSP International Journal, 5*(1), 1-12.

Nation, I. S. P. (2013). *Learning Vocabulary in Another Language (2nd ed.)*. Cambridge: Cambridge University Press.

Parks, C. M., & Yonelinas, A. P. (2015). The importance of unitization for familiarity-based learning. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 41*(3), 881-903.

Persky, A. M., & Robinson, J. D. (2017). Moving from novice to expertise and its implications for instruction. *American Journal of Pharmaceutical Education, 81*(9), 72-80.

Richards, J. C. (1970). A psycholinguistic measure of vocabulary selection. *International Review of Applied Linguistics in Language Teaching, 8*(2), 87-102.

Sato, H., Kasahara, K., Kanasugi, T., & Amano S. (2004). Fundamental vocabulary selection based on word familiarity. *Transactions of the Japanese Society for Artificial Intelligence, 19*(6), 502-510.

Schmitt, N., & Schmitt, D. (2020). *Vocabulary in Language Teaching*. Cambridge: Cambridge University Press.

Sorensen, T., Hohenstein, S., & Vasishth, S. (2016). Bayesian linear mixed models using stan: A tutorial for psychologists, linguists, and cognitive scientists. *Quantitative Methods for Psychology, 12*(3), 175-200.

Su, Y., Li, Y., & Li, H. (2023). Familiarity ratings for 24,325 simplified Chinese words. *Behavior Research Methods, 55*(3), 1496-1509.

Tanaka-Ishii, K., & Terada, H. (2011). Word familiarity and frequency. *Studia Linguistica, 65*(1), 96-116.

Tokuhiro, Y. (2005). Chu jokyu gakushusha no tame no kanji goi no sentaku to sono teiji ho no kenkyu - gakushu shihyo chino settei to gainen chizu sakusei no kokoromi – [Kanji vocabulary for intermediate learners - an index based on familiarity and frequency, and conceptual maps -] *Journal of Japanese Language Education, 127*, 41-50.

Tongpoon-Patanasorn, A. (2018). Developing a frequent technical words list for finance: A hybrid approach. *English for Specific Purposes, 51*, 45-54.

Widdowson, H. G. (1983). Learning Purpose and Language Use. Oxford: Oxford University Press.

Williams, G. (2003). From meaning to words and back: Corpus linguistics and specialised lexicography. *ASp. la revue du GERAS, (39-40)*, 91-106.

Williams, R. S., & Morris, R. K. (2004). Eye movements, word familiarity, and vocabulary acquisition. *European Journal of Cognitive Psychology, 16*(1-2), 312-339.

Yokogawa, H. (Ed.). (2006). *Nihonjin Eigo Gakushusha No Eitango Shimmitsudo Moji Hen [Familiarity Rate of the English Words for Japanese Learners of Written English Word Version]*. Tokyo: Kuroshio Shuppan.

Appendix

Appendix 1. Top 50 Words of Inter-group Differences in Familiarity

1	2	3	4	5
側臥位 lateral position	関節拘縮 contracture	仰臥位 supine position	見当識 orientation	体位変換 postural change
感情失禁 emotional incontinence	中核症状 core symptom	片麻痺 hemiplegia	自助具 self-help devices	生活歴 socoal history
対麻痺 paraplegia	ケアカンファレンス care conference	経管栄養 tubal feeding	半座位 Fowler's position	日内変動 diurnal variation
チームアプローチ team approach	ユニットケア Unit Care	嚥下障害 dysphagia	構音障害 dysarthria	環境因子 environmental factors
短期記憶 short term memory	部分浴 partial bath	気分障害 mood disorder	早朝覚醒 early morning awakening	常同行動 Stereotyped behavior
感情鈍麻 emotional blunting	福祉用具 welfare equipment	応益負担 benefit-received principle	権利擁護 advocacy for rights	通所介護 day care service
蠕動運動 peristaltic motion	社会資源 social resources	歩行器 walker	予防給付 preventive benefits	中途覚醒 middle-of-the night awakening
ケアプラン care plan	腹臥位 prone position	要介護度 level of care needed	低栄養 undernutrition	身体拘束 medical restraint
補装具 orthotic device	介護給付 nursing care benefit	自己決定 self determination	喉頭蓋 epiglottis	インテーク intake
介護予防 prevention of long-term care	行動障害 behavioral disorder	行動援護 behavioral support	喪失体験 loss experience	要支援者 person requiring support

Appendix 2. Bottom 50 Words of Inter-group Differences in Familiarity

1	2	3	4	5
食物繊維 dietary fiber	ユニバーサルデザイン universal design	知的障害 intellectual disability	発達障害 developmental disability	住宅改修 home renovation
脳波検査 electroencephalography	医療保険 medical insurance	バリアフリー accessible	健康寿命 healthy life expectancy	公的扶助 public assistance
脊髄損傷 spinal cord injury	在宅医療 home medical care	現物給付 in-kind benefits	運動療法 physical therapy	白杖 white cane
視覚障害 visual impairment	ヒートショック heat shock	訪問介護 visiting care	自傷行為 self harm	デイケア daycare service
住宅扶助 housing assistance	骨粗鬆症 osteoporosis	パーソナリティ personality	措置入院 involuntary hospitalization	指文字 sign language
高齢化率 ageing rate	年少人口 young population	心房細動 atrial fibrillation	感染症 infectious diseased	訪問看護 visiting nursing
心理検査 psychological test	ケアハウス care house	運動麻痺 motor paralysis	血糖値 blood glucose level	意識障害 disturbance of consciousness
児童委員 commissioned child welfare volunteer	ロールプレイ role paly	理学療法 physical therapist	高齢社会 ageing society	気管切開 tracheotomy
救護施設 rescue facility	デイサービス day service	水分補給 hydration	帯状疱疹 herpes zoster	睡眠障害 sleep disorder
心疾患 heart disease	聴覚障害 hearing impairment	機能障害 dysfunction	ウェルビーイング well-being	自立訓練 autogenic training

THE AUTHORS

Haihong Huang is a PhD candidate at Graduate School of Human and Environmental Studies of Kyoto University. Her principal research lies in the field of corpus linguistics and Japanese for Specific Purposes. Her research areas include Japanese vocabulary learning, in particular corpus compilation.

Hiroyuki Muto is an Associate Professor at Graduate School of Sustainable System Sciences of Osaka Metropolitan University. He completed a PhD in Human Sciences at Osaka University. His research interests include perceptual / cognitive psychology and Bayesian statistical modeling.

Toshiyuki Kanamaru is an Associate Professor at the Institute for Liberal Arts and Sciences of Kyoto University. He holds a Ph.D. in Human and Environmental Studies from Kyoto University. His research interests include teaching English using cognitive linguistics and natural language processing.

THE AUTHORS' ADDRESSES

First Author
Haihong Huang
PhD Student
Graduate School of Human and Environmental Studies, Kyoto University
Yoshida-nihonmatsu-cho, Sakyo-ku, Kyoto 606-8501, JAPAN
E-mail: huang.haihong.46x@st.kyoto-u.ac.jp

Co-author
Hiroyuki Muto
Associate Professor
Graduate School of Sustainable System Sciences, Osaka Metropolitan University
1-1 Gakuen-cho, Naka-ku, Sakai, Osaka 599-8531, JAPAN.
E-mail: mutopsy@omu.ac.jp

Co-author and Corresponding Author
Toshiyuki Kanamaru
Associate Professor
Institute for Liberal Arts and Sciences, Kyoto University
Yoshida-nihonmatsu-cho, Sakyo-ku, Kyoto 606-8501, JAPAN
E-mail: kanamaru.toshiyuki.4z@kyoto-u.ac.jp

Received: 16 October 2023
Received in Revised Form: 17 November 2023
Accepted: 11 December 2023