Lexical Collocations in a Sample Corpus of Nursing Research Articles (SCNRA)

คำปรากฏร่วมในคลังข้อมูลตัวอย่างภาษาในงานวิจัยตีพิมพ์ด้านพยาบาลศาสตร์

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ABSTRACT

This corpus-based study was conducted in an attempt to facilitate the teaching and learning of English as a Foreign Language (EFL) and English as a Second Language (ESL) as well as English for Specific Purposes (ESP) by exploring lexical collocations in a Sample Corpus of Nursing Research Articles (SCNRA). The SCNRA, with a corpus size of over 1.25 million running words, was compiled from 300 research articles from 10 nursing journals. Under the set criteria, 717 keywords were obtained using the AntConc version 3.4.4. The majority of the keywords were nouns (63.51%), followed by adjectives (21.54%), verbs (13.44%), and adverbs (1.51%) respectively. The keywords then were used as "nodes" to find their "collocates" which generated 2,148 pairs of lexical collocations with 14 combination types, where six combination types were in accordance with the set framework adapted from Benson et al.'s (2010). The majority of them were Noun + Noun (41.39%), Adjective + Noun (28.4%), and Noun + Verb (11.17%) respectively. The lists of the keywords and the collocations produced are provided.

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บทคัดย่อ

งานวิจัยนี้เป็นการศึกษาแบบอิงคลังข้อมูลภาษา (Corpus-based study) โดยมีวัตถุประสงค์เพื่อรวบรวมคำศัพท์เฉพาะ (Keywords) และคำปรากฏร่วม (Collocations) เพื่อเอื้ออำนวยต่อการเรียนการสอนภาษาอังกฤษในฐานะภาษาต่างประเทศและภาษาอังกฤษในฐานะภาษาที่สองรวมไปถึงภาษาอังกฤษเพื่อวัตถุประสงค์เฉพาะโดยการศึกษาการปรากฏร่วมที่เกิดระหว่างคำเนื้อหา (Lexical collocations) ในคลังข้อมูลตัวอย่างภาษาในงานวิจัยตีพิมพ์ด้านพยาบาลศาสตร์ (Sample Corpus of Nursing Research Articles - SCNRA) โดยคลังข้อมูลตัวอย่างภาษาดังกล่าวมีขนาดกว่า 1.25 ล้านคำ ซึ่งรวบรวมจากงานวิจัยตีพิมพ์จำนวน 300 เรื่อง จาก 10 วารสารวิชาการด้านพยาบาลศาสตร์ ภายใต้เกณฑ์ที่กำหนดไว้พบว่ามีคำศัพท์เฉพาะ (Keywords) จำนวน 717 คำ ซึ่งรวบรวมได้จากคลังข้อมูลตัวอย่างภาษาที่สร้างขึ้นโดยใช้โปรแกรม AntConc เวอร์ชั่น 3.4.4 เป็นเครื่องมือในการประมวลข้อมูลวิเคราะห์และคัดกรองคำศัพท์เฉพาะเหล่านี้ ซึ่งโดยส่วนใหญ่พบว่าเป็นคำนาม (63.51%) รองลงมาเป็นคำคุณศัพท์ (21.54%) ตามมาด้วยคำกริยา (13.44%) และคำวิเศษณ์เป็นลำดับสุดท้าย (1.51%) คำศัพท์เฉพาะเหล่านี้ถูกนำไปใช้เพื่อเป็นคำหลัก (Nodes) ในการหาคำปรากฏร่วม (Collocates) ซึ่งพบว่ามีจำนวน 2,148 คู่และประกอบด้วย 14 ชนิดของการปรากฏร่วม โดยมี 6 ชนิดที่ตรงตามรูปแบบของการปรากฏร่วมที่ตั้งไว้ (Set framework) ซึ่งดัดแปลงมาจากรูปแบบของ Benson (2010) และคณะ โดยชนิดของการปรากฏร่วมสามลำดับแรกที่พบคือการปรากฏร่วมระหว่าง คำนาม + คำนาม (41.39%) คำคุณศัพท์ + คำนาม (28.4%) และคำนาม + คำวิเศษณ์ (11.17%) ตามลำดับ คำศัพท์เฉพาะและคำปรากฏร่วมที่สำคัญที่พบจากการศึกษานี้มีการรวบรวมไว้ในภาคผนวกเพื่อเป็นประโยชน์ต่อการนำไปประยุกต์ใช้ในการเรียนการสอนและการอ้างอิงต่อไป

Introduction

Collocation is believed to be an important key to fluency. However, collocation has been a huge barrier for EFL/ESL learners to achieve a native-like fluency (Hill (2000). A number of studies on collocations have shown that even high-level learners seem to face problems in using and developing second language (L2) collocational knowledge (Arnaud & Savignon, 1997; Farrokh, 2012; Nesselhauf, 2005). According to the hierarchy of mistakes created by McCretton and Rider (1993), collocations are found to be the most frequent mistakes made by L2 learners (James, 1998; Miščin, 2013). Besides, collocational mismatches are common among L2 learners (Martin, 1984). This is because they hardly encounter a word or combination of words to enable them to determine its range or narrow the item down to its more fixed partnerships resulted from the inadequate exposure to the language. This difficulty particularly occurs with those semantic opaque combinations when the combination of words leads to the change of the original meaning (Carter, 1998; Nation, 2001), or with specific field of the discourse such as engineering or nursing.

Although collocation has become a topic of study by scholars since the late 1950s, the study of collocations generally has not been extensively conducted. Most studies have been conducted on collocations in general English (Gledhill, 2000; Granger & Bestgen, 2014; Namvar, Mohd Nor, Ibrahim, & Mustafa, 2012; Wang & Good, 2007; Webb, Newton, & Chang 2013) and only a few on scientific and professional fields (Menon & Mukundan, 2012; Miščin, 2013; Mudraya, 2006; Takač & Miščin, 2013; Ward, 2009).

It is evident that the study of collocations in the field of nursing, particularly in nursing research articles, is still rare. A nursing academic word list recently created by Yang (2015) is a study devoted to the field of nursing in terms of lexical approach. Since nursing is one of the professions that have been increasingly internationalized along with other health related professions, it is important for nursing students as well as nursing professionals to foster their competence in the use of English language before entering into their professional arena. One step to prepare them for reaching such goal, apart from other skills in English and beyond the knowledge of grammar and vocabulary, is the knowledge of collocations.

Apart from the lack of research on collocations in the field of nursing, nursing students - similar to students of other fields - also have inadequate knowledge and lack of awareness of collocations (Farrokh, 2012; Nesselhauf, 2005). Thus the present study attempts to fill up these aforementioned gaps by building a Sample Corpus of Nursing Research Articles (SCNRA) in order to identify and classify keywords in the SCNRA as well as to identify and classify lexical collocations in the SCNRA using keywords extracted as 'nodes' to find their 'collocates'. Since lexical collocations are the co-occurrence of two content words which closest to single word vocabulary, the focus of this study is on this type of collocation. The keywords and the collocations produced from the study should directly benefit the teaching and learning of vocabulary and collocations in the field of nursing, particularly in English for Academic Purposes (EAP) and English for Specific Purposes (ESP). The research questions of the present study, therefore, are:

(1) What are the keywords in the SCNRA based on the frequency of occurrence at ≥ 50 and the keyness value at ≥ 20? What is the proportion according to their parts of speech? and

(2) What are the lexical collocations of those keywords in the SCNRA? What is the proportion according to each type of combinations?

Literature Review

Carter (1998) categorizes words into two groups: grammatical and lexical words. Grammatical words are those known as 'functional words', functors', or 'empty words'. They do not represent meanings. These grammatical words include pronouns, articles, auxiliary verbs, prepositions, and conjunctions. Lexical words, on the other hand, are those known as 'full words' or 'content words'. They carry meanings or information contents. This group of words includes the nouns, adjectives, verbs, and adverbs. Lexical items are groups of words that go together such as multi-word verbs, phrasal verbs, and idioms. They are sometimes called "vocabulary items" or simply "items". The term is useful and fairly natural hold-all term which captures and helps to overcome instabilities in the term 'word'.

Nation (2001) points out that knowing vocabulary involves knowing the other words they typically co-occur with. For example, *'fast food'* cannot be replaced by *'speedy food'* or *'quick food'*. This means formulaic language is as well important as individual words (Schmitt, 2010). Therefore, collocation is the only one relationship that relates to the appropriate interpretation and productive use of vocabulary (Nation, 2001). Thus, vocabulary and its extension play an important role in the acquisition of a language.

Definitions of collocation

There are various definitions of collocation given by a number of scholars (Bennett, 2010; Carter, 1998; Cheng, 2012; Firth, 1957; Hill, 2000; Hoey, 1991; Lewis, 2002; Nation, 2001; Nattinger & DeCarrico, 1992; Paltridge, 2006; Schmitt, 2000). The similarities among them are mainly the combinations of two or more words. The varieties among them are those additional details given such as the co-occurrence happens repeatedly, naturally, predictably, structurally or syntagmatically, statistically, and selectively. However, it may be concluded that collocation is the co-occurrence of words which is predictable as they have tendency to occur together and are naturally co-selected by native speakers. Lexical collocation in the present study then refers to the co-occurrence of two lexical words found in the SCNRA which tend to occur naturally with statistical significance in terms of their association.

Types of collocation

According to Bahns (1993) and Schmitt (2000), there are two basic types of collocations: syntactic/grammatical collocations and semantic/lexical collocations. The former are those collocations where a dominant word co-occurs with a grammatical word. The examples are *abide by, access to,* and *acquainted with.* The latter, however, usually are those collocations which emerged from two equal words such as Noun + Verb, (*e.g., ball bounces*), Verb + Noun (*e.g., spend money*), and Adjective + Noun (*e.g., cheerful expression*). In the BBI Combinatory Dictionary of English, Benson, Benson, and Ilson (2010) view collocations as "fixed, identifiable, non-idiomatic phrases and constructions" (p. xix). Similar to Bahns (1993) and Schmitt (2000), they categorize collocations into two major groups: grammatical and lexical collocations.

In the present study, the researchers follow the classification suggested by Benson et al. (2010) as they provide clear distinctions between the two groups of collocations. For lexical collocations, they cover all major combinations of the parts of speech. However, the types of combinations are reduced from seven to six by merging Benson et al.'s L1 and L2 and making a change in L5 from Noun + *of* Noun to simply Noun + Noun to better suit for the study as its focus is on the lexical

collocations which arise from the combinations of content words. The original and adapted versions are shown in Table 1 below.

Table 1. Lexical Collocations: Benson et al. (2010) and Adapted in Comparison

Types	Combinations by Benson et al. (2010)	Types	Combinations adapted
L1	Verb + Noun		
L2	Verb + Noun	L1	Verb + Noun
L3	Adjective + Noun	L2	Adjective + Noun
L4	Noun + Verb	L3	Noun + Verb
L5	Noun + of Noun	L4	Noun + Noun
L6	Adverb + Adjective	L5	Adverb + Adjective
L7	Verb + Adverb	L6	Verb + Adverb

Previous studies on collocation

A number of research studies have confirmed that collocation knowledge plays a crucial role in effective use of a language of all skills. Collocations play an important role in learners' writing (Eidian, Gorjian, & Aghvami, 2013; Hsu, 2007; Parkinson, 2015; Siyanova-Chanturia, 2015). Collocations knowledge influences learners' reading comprehension (Sadighi & Sahragard, 2013; Tekingül, 2013). Knowledge of collocations directly affects learners' speaking proficiency (Attar & Allami, 2013; Hsu & Chiu, 2008; Mohajeri & Ketabi, 2013). Listening comprehension also needs collocation knowledge (Hsu & Hsu, 2007).

In Thailand, studies on collocations have been conducted by some scholars. Khittikote (2011) investigated the ability to use verb-noun collocations for business purposes of Thai EFL learners. The results revealed that the respondents performed better on the receptive test than the productive one. Yumanee and Phoocharoensil (2013) studied collocational errors produced by Thai EFL students. They found that mother tongue-transfer was the main factor of errors, while other factors found were the use of synonymy strategy, the creative invention and the strategy of analogy, the paraphrasing strategy, and low collocational knowledge. Suwitchanphan and Phoocharoensil (2014) explored learners' use of adjective-noun collocations. The results showed that the regular program students (69.33%) scored higher than the English program students on the Gap-filling test and used more adjective + noun collocations (279 tokens) than did the English program students (211 tokens) on the Descriptive Written Task. Usen and Musigrungsi (2015) examined the effectiveness of teaching collocations to grade 6 students using 12 lesson plans and a collocation test. The results indicated

the significant increase of both the test scores and the vocabulary retention rate, particularly in the verb-noun collocations.

In terms of lexical collocations, there have been some studies conducted to investigate lexical collocations in various sources of literature. Ackermann and Chen (2013) built a corpus of 28 academic disciplines from journal articles and textbook chapters in order to develop the Academic Collocation List (ACL). The corpus comprises 25.6 million words produced 2,468 entries of lexical collocations with the majority combination being Adjective + Noun (N = 1,773), Verb + Noun (N = 310), Adverb + Adjective (N = 124) respectively. Molavi, Koosha, and Hosseini (2014) examined lexical collocations used in three EFL textbooks: Interchange, American Headway, and American File. The results revealed that the majority of the lexical collocation found being Verb + Noun (N = 225) and Adjective + Noun (N = 92) from the total number of 362. Borucinsky and Kegalj (2015) investigated collocations in marine engineering English which found that Verb + Noun and Adjective + Noun were the dominant combinations of collocations. Similarly, Demir (2017) explored the use of lexical collocations in English language teaching articles among Anglophobic and Turkish writers. It revealed that articles written by native speakers of English used greater number of lexical collocations. Among the total number of 1,548 lexical collocations used, the majority of them being Adjective + Noun (N = 718), Verb + Noun (N = 194), Adverb + Adjective (N = 156), Noun + Noun (N = 130) respectively. In Thailand, Thongvitit and Thumawongsa (2017) investigated the use of collocations in the abstracts of research articles in the field of liberal arts and humanities written by Thai EFL writers. They found that the majority of lexical collocations used were Adjective + Noun (N = 337), Verb + Noun (N = 161), and Noun + Verb (N = 39) respectively.

Methodology

Research instruments

Nursing journals and nursing research articles

300 research articles were compiled from 10 academic journals in the field of nursing accessible via Suranaree University of Technology's Library Resources. The 10 journals were purposefully selected based on the specialized areas offered by the Institute of Nursing at SUT and the information gained from a questionnaire on learning English and nursing journals sent out to nursing students. 30 research articles with the IMRD format as commonly used in quantitative and experiment-based research (Englander, 2014) and the length of at least 3,000 words were selected from the latest issues of each selected journals. These journals included Journal of Epidemiology & Community Health,

International Journal of Mental Health Nursing, Journal of Nursing Management, Nursing Inquiry, Journal of Family Nursing, Clinical Nursing Research, Journal of Clinical Nursing, Journal of Pediatric Oncology Nursing, Journal of Psychiatric and Mental Health Nursing, and International Journal of Nursing Practice.

A corpus analysis tool

The AntConc version 3.4.4 (Anthony, 2014), developed by Laurence Anthony, a professor in the Faculty of Science and Engineering at Waseda University, Japan, was used. The Ant Conc is a computer-based freeware corpus analysis toolkit for concordancing and text analysis. This makes it economical and practical for anyone working with a corpus. The AntConc is also equipped with features for extracting keywords and collocations that serve the purpose of the present study.

Procedures

Identifying keywords

The keyness value and the frequency of occurrence were used as criteria for determining the keywords in the SCNRA. According to Baker (2006), the higher the keyness score, the stronger the keyness of that word. The frequency of occurrence indicates how common the word is in the corpus. For the present study, the frequency of occurrence at ≥ 50 and the keyness value at ≥ 20 were applied.

In terms of keyness value, the British National Corpus (BNC) was used as the reference corpus as it is one of the largest corpora of general English and commonly used as a reference corpus in corpus-based studies as well as the word list is readily available online. With the BNC as the reference corpus, when the corpus tool processes for keywords in the SCNRA, all the running words in the SCNRA are compared with those words listed in the reference corpus, the BNC. The comparison of words from the two corpora results in the keyness value of the keywords found in the SCNRA. The higher the keyness value a word has means the higher uniqueness it belongs to the SCNRA.

Identifying collocations

The keywords earlier extracted were then used as 'nodes' to further identify their collocation pairs. The criteria for identifying the collocations in this study are as the followings:

1) The range of the collocates was within the 3 word span on the right of the node. This is to explore collocates that occur after the nodes within this range of word span since this range is not too close and not too far for each pair to co-occur.

2) Only the lexical collocations were selected.

3) The association strength of each pair was measured on the basis of Mutual Information (MI) with the MI score set for the present study was ≥ 5.

4) The frequency of occurrence of the pair was ≥ 10. In case of a pair co-occurs less than 10 times but has MI value ≥ 5, the collocate with the highest occurrence and MI value would be chosen.

5) In case of no collocates with the number of occurrence ≥ 10 and the MI value ≥ 5, the reduction of the criteria could be applied.

Results and Discussion

Keywords in the SCNRA

Under the set criteria, 717 keywords were extracted from the SCNRA. Most of the keywords generated have surprisingly high keyness value. The keyword with the highest keyness value is *'nurses'* with the keyness value at 34,638.35, while the lowest keyness value is *'understandings'* with the keyness value at 197.98, which is still high.

Each of the 717 keywords then was used as the node to identify their collocates. After the process of identifying collocates of the keywords has been completed, it was possible to categorize the keywords according to their parts of speech as shown in Table 2 below.

Table 2. Keywords generated from SCNRA according to their parts of speech

No.	Parts of speech	No. of keywords	Percentage
1	Noun	463	63.51
2	Verb	98	13.44
3	Adjective	157	21.54
4	Adverb	11	1.51
	Total	**729**	**100**

It is noticeable from Table 2 above that the total number of the keywords has increased from 717 to 729. This is because along the process of identifying collocation pairs, it has been found that some of the keywords functioned more than one part of speech. Keywords such as *'use'* and *'need'* were found functioning as nouns and verbs as well. Another reason is that there are also some compound words emerged from the original single keywords such as 'customer' becomes 'customer-oriented', 'evidence' becomes 'evidence-based'.

Among these keywords, the majority of them are the nouns (N = 463), accounted for 63.51 percent. The adjectives (N = 157) come second accounted for 21.54 percent. The verbs (N = 98) are 13.44 percent. The smallest number among them is the adverbs (N = 11), only 1.51 percent. The full list of these keywords categorized according to their parts of speech is shown in **Appendix A.**

The prevalent number of content words such as nouns, adjectives, and verbs in the keywords seems to be common in all corpora. This finding can also be found in the studies conducted by scholars in the field such as Coxhead's (2000) Academic Word List; Mudraya's (2006) one hundred most frequent word families in the Student Engineering Word List; Wang, Liang, and Ge's (2008) Medical Word List; Ward's (2009) Basic Engineering List generated from his Engineering Corpus; and Yang's (2015) Nursing Academic Word List.

The commonness of the nouns, adjectives and verbs in the corpora also reflects in a number of studies exploring the use of collocation pairs of these keyword types such as the verb-noun collocations in relation to the language proficiency and the knowledge of the verb-noun collocations in EFL learners (Ebrahimi-Bazzaz, Samad, bin Ismail, & Noordin, 2012); the nouns and their collocates (Miščin, 2013); the use of adjective-noun collocations in comparison between learners in the regular and English programs (Suwitchanphan & Phoocharoensil, 2014); and the use of noun-noun collocations in learners' academic writing (Parkinson, 2015). Therefore, it is interesting to find out the collocation pairs of the keywords generated in the present study.

When comparing the 120 most frequent keywords from the SCNRA with the 120 most frequent academic word families in the Nursing Research Articles Corpus (NRAC) provided by Yang (2015), it is found that 36 words (29.17%) from the two corpora are matched. These matched keywords are presented in Table 3 below.

Table 3. Matched keywords in the 120 most frequent of the SCNRA and the NRAC

approach	assessment	cancer	caregivers	clinical
conducted	data	diagnosis	factors	focus
individual	intervention/s	interview/s	items	medical
medication	mental	outcomes	participants	perceived
physical	positive	previous	process	professional/s
research	role	scores	significant	specific
status	symptoms			

It may not seem very high match in terms of number and percentage despite the compatible size of the two corpora, 1,253,992 words for the SCNRA and 1,006,934 words for the NRAC. The possible cause for this may stem from the range of nursing journals selected for each corpus. That is the SCNRA comprised 10 nursing journals, while the NRAC was built from nursing journals of 21 subject areas which could have more diversity of words used in the research articles.

With a considerable number of matched keywords in these two sample corpora, it implies that these keywords are commonly used in research articles in the field of nursing. Therefore, it should be useful for nursing students as well as nursing practitioners to know these words. This also indicates the pedagogical importance in that the EAP and ESP instructors in the field of nursing could emphasize these words and raise students' awareness of these commonly found words in research articles of their field.

Lexical collocations in the SCNRA

The process of identifying the lexical collocations commenced once the keywords from the SCNRA had been identified. The summary of the findings is shown in Table 4 below.

Table 4. Number of Lexical Collocations in SCNRA according to Types of combination

No.	Combination Types	No. of collocation pairs	(%)
1	Noun + Noun	889	41.39
2	Adjective + Noun	610	28.40
3	Noun + Verb	240	11.17
4	Verb + Noun	128	5.96
5	Noun + Adjective	84	3.91
6	Adjective + Adjective	82	3.82
7	Verb + Adjective	34	1.58
8	Verb + Verb	24	1.12
9	Adjective + Verb	13	0.61
10	Adverb + Verb	12	0.56
11	Adverb + Adjective	11	0.51
12	Verb + Adverb	10	0.47
13	Adverb + Noun	7	0.33
14	Noun + Adverb	4	0.19
	Total	**2148**	**100**

Table 4 above shows that there are 2,148 collocation pairs generated from the keywords earlier extracted. The majority of the collocation pairs is the 'Noun + Noun' combinations with 889 pairs (41.39%). The 'Adjective + Noun' combination comes second with 610 pairs (28.4%). The 'Noun + Verb' combination comes third with 240 collocation pairs (11.17%). The 'Noun + Adverb' generates the least number of combinations at four pairs (0.19%). Examples of collocation pairs of each combination type are shown in Table 5 below.

Table 5. Examples of Lexical Collocations extracted from SCNRA

Nodes	Collocates	Examples
Noun	Noun	care provider/s, health care, nurses (*and*) physicians, patients (*and, and their*) families, children (*with, diagnosed with*) cancer
	Verb	study (*was*) conducted, patients (*were*) admitted, children (*were, had been*) diagnosed, information (*was, could be*) provided
	Adjective	patients (*with*) stable, children (*with, diagnosed with*) chronic, use (*of*) antipsychotic, risk (*of, of developing*) adverse
	Adverb	parents (*of, of children*) newly, responses (*including, ranging from*) strongly
Adjective	Noun	mental (*ill, and physical*) health, social support, important role, clinical (*nursing*) practice, different types
	Adjective	social cognitive, physical (*and*) psychological, high (*and*) low, medical (*and, to a*) surgical, positive (*and*) negative
	Verb	important (*to*) note, significant (*difference was*) noted, ethical (*approval was*) obtained
Verb	Noun	reported feeling, associated (*with, with higher*) suicide, provided (*with, with adequate*) information, compared (*with, with other*) women
	Adjective	reported (*a, to be*) moderate, need (*to be*) aware, associated (*with, with a*) higher, provide (*a*) safe, considered (*an, a particularly*) important
	Verb	use (*to*) measure, need (*to*) develop, stated (*they, that they*) know
	Adverb	described above, showed (*no*) statistically, viewed positively
Adverb	Verb	significantly associated, specifically designed, positively related
	Adjective	significantly (*associated with*) higher, statistically significant
	Noun	significantly (*higher, higher pain*) scores, approximately (-) minutes

Altogether, there are 14 combination types of lexical collocations found in the SCNRA under this investigation. This means that there are more combination types than the set framework of the present study adapted from that of Benson et al.'s (2010). Therefore, the findings shown in Table 4 above can be categorized into two groups: lexical collocations with combination types according to the set framework (combination types numbers 1, 2, 3, 4, 11, and 12) and lexical collocations with combination types not according to the set framework (combination types numbers 5, 6, 7, 8. 9, 10, 13, and 14). The summary of the two groups is shown in Table 6 below.

Table 6. Lexical Collocations According to Framework and Not according to Framework

Combination Types	No. of collocation pairs	(%)
According to Framework	1888	87.90
Not According to Framework	260	12.10
Total	**2148**	**100**

Table 6 above reveals that over 87 percent of the lexical collocations extracted from the SCNRA are in accordance with the set framework, while the lexical collocations with combination types that are not in accordance with the set framework are just over 12 percent. This shows that although there are more combination types that are not in accordance with the set framework, the numbers of collocation pairs from this group of collocations are far less than that of the set framework combination types.

When considering the combination types according to the framework of the study which has been adapted from that of Benson et al.'s (2010), it is found that the majority of the collocations are under the set framework. This high in number and percentage of the combination types which are in accordance with the set framework confirms that the combination types found from the present study are common combination types of collocations. Thus, they should also be useful for nursing students and nursing professionals to know and be aware of. For the collocations which are not according to the set framework, there are eight combination types of 260 collocation pairs. These uncommon combination types of collocations generated might be because the set criteria for identifying collocations where the collocates are identified within the range of 3 word-span on the right side (3R) of each node. Such wider word-span leads to more combination types to occur. In other words, with the set word-span in the present study, it allows more combination types to occur. Among them, there are uncommon combination types which are not commonly found and not recommended by scholars and researchers from previous studies in the field. This may be the reason they were excluded in the combination types suggested by Hill (2000), and Benson et al. (2010), except the Adverb + Verb combination that is found suggested by Hill (2000). This can be concluded that those uncommon combination types could be ignored since they do not commonly occur. However, the awareness of their existence is stilled valued.

It is also noticeable that the noun nodes are more likely to co-occur with noun collocates with some possibility to co-occur with verb collocates. The adjective nodes are more common to take noun collocates with a high chance to co-occur with other adjectives and some chance to co-occur with verb collocates. The verb nodes have higher possibility of co-occurrence with noun and adjective collocates and may co-occur with other verbs. The adverb nodes, although found in small number of collocation pairs, have slightly equal possibility to co-occur with noun, adjective, and verb collocates.

When comparing the findings with the previous studies such as those of which conducted by Ackermann and Chen's (2013) the Academic Collocation List (ACL), Molavi et al.'s (2014) lexical collocations in EFL textbooks, Borucinsky and Kegalj's (2015) collocations in marine engineering English, Demir's (2017) lexical collocations in English language teaching articles, and Thongvitit and

Thumawongsa's (2017) collocations in the abstracts of research articles in the field of liberal arts and humanities written by Thai EFL writers, it is interesting that the majority of combinations found being either Adjective + Noun or Verb + Noun, while the Noun + Noun combinations are prominent in the present study. This could be a unique characteristic of lexical collocations found in the area of nursing.

Additionally, the previous studies on lexical collocations have shown that the interests of the researchers were on these prominent combinations, namely Adjective + Noun (Suwitchanphan & Phoocharoensil, 2014), and Verb + Noun (Khittikote, 2011; Usen & Musigrungsi, 2015). In terms of the errors made by Thai EFL learners, low collocational knowledge was one of the factors as suggested by Yumanee and Phoocharoensil (2013).

When ranking the lexical collocations according to the frequency of occurrence, it is evident that the majority of the 200 most frequent collocations are in Adjective + Noun and Noun + Noun combinations. Therefore, it should be useful to compile the list of most frequent collocations of these two combinations. The list of 100 most frequent collocations of these two combination types are shown in **Appendix B** and **Appendix C** respectively.

Apart from classification based on types of combination, it is noticeable that the lexical collocations found from the SCNRA can also be categorized into two main groups: nursing specific collocations and general academic collocations. The categorization of these two groups has been arranged in reference to a rating scale for finding technical words designed by Chung and Nation (2003). The examples of these two groups of collocations are shown below in Table 7 and Table 8 respectively.

Table 7. Nursing specific collocations

No.	Nodes	Collocates	No.	Nodes	Collocates
1	mental	(*ill, and physical*) health	26	risk	factor/s
2	health	care	27	pediatric	oncology
3	family	member/s	28	nursing	staff
4	health	service/s	29	patients	(*and, and their*) families
5	physical	(*ill, and mental*) health	30	parents	(*of, and their*) children
6	nursing	home/s	31	critical	care
7	mental	illness/es	32	health	problems
8	care	provider/s	33	health	status

Table 7. Nursing specific collocations (con.)

No.	Nodes	Collocates	No.	Nodes	Collocates
9	service	user/s	34	patient	safety
10	palliative	(*and supportive*) care	35	health	outcomes
11	family	caregiver/s	36	health	literacy
12	social	support	37	acute	(*psychiatric, and primary*) care
13	physical	activity	38	intensive	(*follow-up, support and*) care
14	health	(*care*) provider/s	39	illness	belief/s
15	quality	(*of, of nursing*) care	40	childhood	cancer
16	mental	(*health*) service/s	41	chronic	(*disease*) condition/s
17	nursing	practice	42	psychological	distress
18	quality	(*of*) life	43	primary	(*family*) caregiver/s
19	patient	education	44	medication	administration
20	chronic	(*physical, conditions for*) illness/es	45	care	settings
21	risk	assessment	46	health	system/s
22	registered	nurse/s	47	health	issues
23	nurse	manager/s	48	depressive	symptoms
24	nursing	student/s	49	patient	satisfaction
25	clinical	(*nursing*) practice	50	anxiety	(*and*) depression

Table 8. General academic collocations

No.	Nodes	Collocates	No.	Nodes	Collocates
1	present	study	26	assessment	tool/s
2	data	collection	27	mean	age
3	focus	group/s	28	qualitative	(*research*) study/ies
4	previous	studies	29	control	group/s
5	significant	difference/s	30	research	question/s
6	higher	(*mean, and lower*) score/s	31	review	board/s
7	high	level/s	32	internal	consistency
8	mean	score/s	33	strongly	agree
9	sample	size/s	34	age	group/s
10	data	(*were*) collected	35	response	rate/s
11	age	(*of -, ranged between -*) years	36	age	(*and*) gender

Table 8. General academic collocations (con.)

No.	Nodes	Collocates	No.	Nodes	Collocates
12	higher	level/s	37	demographic	(*and socioeconomic*) characteristics
13	aged	(*under* -) years	38	everyday	life/ves
14	statistically	significant	39	each	(*questionnaire*) item
15	previous	research	40	work	environment/s
16	total	(*mean, health literacy*) score/s	41	aim	(*of this*) study
17	current	study	42	descriptive	statistics
18	study	(*was*) conducted	43	knowledge	(*and*) skill/s
19	research	team	44	marital	status
20	data	analysis	45	team	members
21	informed	consent	46	institutional	review
22	score/s	indicate/ed/ing	47	institutional	(*review*) board/s
23	systematic	review/s	48	content	analysis
24	inclusion	(*and exclusion*) criteria	49	limitation/s	(*of the*) study
25	participate	(*in the*) study	50	participants	(*were*) asked

Once the two groups of collocations have been clearly classified, in terms of pedagogical implications, this can greatly benefit both the learners and the teachers. With the clearer target collocations, the teachers should be able to design lessons with a clearer purpose by focusing on each group separately. Therefore, this should be easier for the learners to notice and recognize the collocations of the two groups.

Conclusion and recommendations

As it is crucial for professional nurses to be efficient in English for either professional advancement or further study, this corpus-based study has attempted to facilitate the learning and teaching of EFL/ESL as well as ESP in the field of nursing by filling the gap that prevent effective and natural use of English. The keywords and the lexical collocations extracted from the SCNRA are believed to be useful for nursing students and nursing professionals as well as EFL/ESL and ESP teaching and learning as these keywords and collocations could well facilitate their academic and professional advancement. By extracting keywords and collocations from materials used in the particular field of study and classifying them and incorporate these keywords and collocations into the lessons such as by means of content-based or corpus-based instructions, this should make it clearer and easier for the learners to notice and be aware of the keywords and collocations.

As the present study has focused on keywords and lexical collocations from research articles, further research could be conducted by extending the focus on grammatical collocations as well as a variety of other materials such as textbooks, magazines, news' columns, and the like. For research articles, it could also be conducted by examining the individual parts of the IMRD format and comparing the results gained from those different parts for the similarities and differences.

APPENDIX A

List of Keywords According to Parts of Speech

NOUNS

ability	constructs	identity	parent	sessions
access	consumers	illness	parent-child	setting
accessing	content	illnesses	parenting	settings
actions	context	impact	parents	severity
activities	control	impacts	participant	sex
activity	conversations	impairment	participants	sharing
addressing	coping	implementation	participation	shift
adherence	correlation	implementing	pathway	shifts
adjustment	correlations	importance	patient	siblings
administration	couples	improving	patients	simulation
admission	crisis	inclusion	perception	situations
adolescent	criteria	indicators	perceptions	skills
adolescents	culture	individuals	person	sleep
adults	data	induction	person-centeredness	smokers
age	decisions	influence	perspective	smoking
aggression	de-escalation	influenza	perspectives	spirituality
aim	delirium	information	physician	spouses
alcohol	delivery	inhaler	physicians	staff
analyses	dementia	initiating	placement	staffing
analysis	depression	inpatient	population	statistics
anxiety	descriptions	insight	populations	status
approach	deterioration	instrument	practice	stigma
approaches	diabetes	interaction	practices	strategies
articles	diagnoses	interactions	practitioners	strengths
aspects	diagnosis	internet	predictor	stress
assessing	differences	intervention	predictors	stressors
assessment	difficulties	interventions	prevalence	students
association	dimensions	interview	prevention	studies
associations	disabilities	interviewer	problems	study
attitudes	disability	interviews	procedures	subgroup
authors	discharge	investigator	process	subgroups
awareness	discourse	involvement	processes	subscale
barriers	discourses	issues	prognosis	subscales

baseline
behavior
behaviors
behaviours
being
beliefs
bias
birth
bullying
burden
burnout
cancer
cardiovascular
care
caregiver
caregivers
caregiving
carer
carers
caring
categories
category
center
centers
cessation
challenges
changes
characteristics
chemotherapy
child
childhood
children
clinic
clinician
clinicians
clinics
disease
disorder
disorders
distress
documentation
domains
duration
dyads
dynamics
dyspnea
education
educators
effectiveness
effects
emergency
emotion-focused
emotions
empathy
empowerment
engagement
environment
errors
ethics
evaluation
evidence
exercise
exhaustion
expectations
experience
experiences
extraversion
facilitating
facilitators
factor
factors
families
item
items
job
knowledge
lack
leadership
learning
leukemia
level
levels
life
lifestyle
limitation/s
literacy
literature
living
loneliness
majority
management
managers
managing
massage
meaning
meaning-making
measures
medication
medications
medicines
members
mentor
mentoring
mentors
mentorship
methods
midwives
model
program
programs
promoting
provider
providers
providing
psychiatry
quality
questionnaire
questionnaires
questions
rationing
receiving
recommendations
recovery
recruitment
reducing
regression
relation
relationship
relationships
reliability
reporting
research
researcher
researchers
residents
resources
respondent
respondents
response
responses
responsibility
restraint
results
review
suicide
support
surgery
survey
survivors
symptom
symptoms
tasks
tattoos
team
teamwork
telehealth
test-retest
thalassemia
theme
themes
therapy
tool
tools
topics
training
trajectory
transcripts
transition
translation
trauma
treatment
treatments
triage
trials
trust
tumor
tumors
uncertainty
understanding
understandings

cluster	family	models	risk	unit
codes	fatigue	morbidity	risk-assessment	units
coding	feedback	mortality	risks	uptake
coefficient/s	feelings	mothers	role	use
cohesion	finding	motivation	roles	users
cohort	findings	narratives	rounding	using
collaboration	focus	need	rounds	utilization
colleagues	focusing	needs	routines	vaccination
collection	follow-up	neighbourhood	safety	vaccine
comfort	framework	networks	sample	validity
community	frequency	neuroticism	sampling	values
communication	functioning	nurse	satisfaction	variable
community	gender	nurses	scale	variables
competence	grandparents	nursing	scales	version
competencies	group	nutrition	schizophrenia	violence
complications	groups	obesity	score/s	visits
components	guidelines	oncology	screening	ward
concerns	health	online	seclusion	wards
condition	hemodialysis	online	segregation	work
confidence	homebirth	onset	self-care	workload
consent	hospital	outcome	self-efficacy	workplace
consequences	hospitalization	outcomes	self-harm	yoga
consistency	hospitals	outpatient	service	
construct	identifying	pain	services	

VERBS

access	decrease	explored	living	recruited
address	demonstrated	expressed	manage	reduce
addressed	describe	facilitate	measure	reflect
affect	described	facilitated	measured	reported
affected	determine	focuses	need	resulted
analys/zed	develop	found	needed	reviewed
assess	diagnosed	highlighted	noted	selected
assessed	disagree	identified	observed	showed
associated	discussed	identify	obtained	stated
bereaved	engage	impacted	participate	suggest
calculated	enhance	implemented	participated	transcribed

coded	enrolled	improve	perceive	translated
collected	evaluate	improved	performed	undergoing
compared	evaluated	included	promote	understand
completed	examine	indicate/s/d	provide	use
conducted	examined	indicating	provided	used
considered	excluded	influenced	ranged	utilized
consisted	experienced	inform	rated	viewed
contribute	experiencing	informed	received	
correlated	explore	interviewed	receiving	

ADJECTIVES

acute	developmental	increased	palliative	self-administered
adult	different	individual	parental	self-reported
adverse	discursive	influencing	participating	semi/structured
affective	diverse	initial	pediatric	sensory
aged	documented	institutional	perceived	severe
antipsychotic	dyadic	intensive	personal	sexual
appropriate	each	internal	person-centred	shared
additional	educational	interpersonal	physical	significant
behavio(u)ral	effective	interprofessional	physiological	similar
bereaved	eligible	limited	positive	social
biomedical	emotional	logistic	postoperative	sociodemographic
cardiac	engaging	longitudinal	potential	socioeconomic
challenging	ethical	low	preoperative	somatic
chronic	everyday	lower	present	specific
clinical	evidence-based	marital	previous	standardized
cognitive	familial	mean	primary	statistical
collaborative	family-centered	meaningful	prior	stressful
completed	female	medical	problematic	suicidal
consistent	functional	mental	professional	supportive
contextual	geriatric	moderate	psychiatric	surgical
core	greater	multidisciplinary	psychological	systematic
critical	grounded	multiple	psychometric	tactile
cross-sectional	healthy	narrative	psychosocial	tertiary
cultural	helpful	negative	qualitative	thematic
current	high	neonatal	quantitative	theoretical
customer-oriented	higher	nurse-led	quantitative	therapeutic

daily	high-risk	older	randomized	total
decreased	holistic	ongoing	registered	validated
demographic	hospital-based	oral	relational	verbatim
depressive	hospitalized	organis(z)ational	relevant	
descriptive	important	overall	respiratory	
developed	included	paediatric	selected	
ADVERBS				
approximately	culturally	negatively	potentially	specifically
clinically	independently	positively	significantly	statistically
				strongly

APPENDIX B

List of 100 Most Frequent Adjective + Noun Collocations found from the SCNRA

No.	Nodes	Collocates	No.	Nodes	Collocates
1	mental	(*ill, and physical*) health	51	tactile	massage
2	physical	(*ill, and physical*) health	52	social	capital
3	mental	illness/es	53	increased	risk
4	present	study	54	pediatric	(*oncology*) patients
5	palliative	(*and supportive*) care	55	mental	(*health*) problems
6	social	support	56	high	school
7	physical	activity	57	evidence-based	practice/s
8	mental	(*health*) service/s	58	oral	care
9	previous	studies	59	qualitative	(*exploratory*) research
10	significant	difference/s	60	lower	(*education, baseline energy*) level/s
11	chronic	(*physical, conditions for*) illness/es	61	intensive	(*care*) unit/s
12	higher	(*mean, and lower*) score/s	62	paediatric	nurses
13	registered	nurse/s	63	adult	(*mental*) health
14	older	adult/s	64	severe	(*level of*) pain
15	high	level/s	65	sensory	room/s
16	older	people	66	significant	correlation/s
17	mean	score/s	67	emotional	exhaustion
18	clinical	(*nursing*) practice	68	low	level/s
19	higher	level/s	69	ethical	approval
20	primary	care	70	semi/structured	interview/s
21	pediatric	oncology	71	educational	(*programs and*) intervention/s
22	aged	(*under* -) years	72	each	participant
23	critical	care	73	parental	presence
24	previous	research	74	educational	(*and income*) level/s
25	total	(*mean, health literacy*) score/s	75	educational	program/s/me/mes
26	current	study	76	social	network/s
27	acute	(*psychiatric, and primary*) care	77	mean	(*age* -) years
28	intensive	(*follow-up, support and*) care	78	affective	commitment
29	chronic	(*disease*) condition/s	79	positive	outcomes
30	psychological	distress	80	emotional	support
31	primary	(*family*) caregiver/s	81	daily	living
32	systematic	review/s	82	cognitive	impairment
33	mean	age	83	thematic	(*content*) analysis
34	qualitative	(*research*) study/ies	84	social	cohesion
35	depressive	symptoms	85	negative	(*health*) effects

No.	Nodes	Collocates	No.	Nodes	Collocates
36	internal	consistency	86	mental	(*health*) crisis/es
37	daily	life/ves	87	mental	(*health*) issues
38	chronic	(*physical, obstructive pulmonary*) disease/s	88	different	types
39	demographic	(*and socioeconomic*) characteristics	89	high	(*response*) rate/s
40	everyday	life/ves	90	medical	records
41	primary	family	91	individual	(*in-depth*) interviews
42	each	(*questionnaire*) item	92	positive	effect/s
43	descriptive	statistics	93	significant	relationship/s
44	marital	status	94	socioeconomic	status
45	psychiatric	nurses	95	emotional	distress
46	institutional	review	96	organisational	culture
47	clinical	setting/s	97	social	worker/s
48	institutional	(*review*) board/s	98	negative	emotions
49	acute	(*care, care hospital*) setting/s	99	educational	attainment
50	surgical	patients	100	mental	(*health*) triage

APPENDIX C

List of 100 Most Frequent Noun + Noun Collocations found from the SCNRA

No.	Nodes	Collocates	No.	Nodes	Collocates
1	health	care	51	age	(*and*) gender
2	family	member/s	52	coping	strategy/ies
3	health	service/s	53	workplace	spirituality
4	nursing	home/s	54	risk	management
5	care	provider/s	55	adolescent	(*mental*) health
6	service	user/s	56	work	environment/s
7	family	caregiver/s	57	aim	(*of this*) study
8	health	(*care*) provider/s	58	health	behaviours
9	data	collection	59	knowledge	(*and*) skill/s
10	quality	(*of, of nursing*) care	60	team	members
11	nursing	practice	61	sleep	(*and appetite*) problem/s
12	job	satisfaction	62	staff	member/s
13	focus	group/s	63	pain	management
14	quality	(*of*) life	64	medication	(*administration*) error/s
15	patient	education	65	caring	behaviors/our/ours
16	risk	assessment	66	children	(*and, and young*) adolescents
17	nurse	manager/s	67	content	analysis
18	sample	size/s	68	limitation/s	(*of the*) study
19	nursing	student/s	69	child	(*with, diagnosed with*) cancer
20	children	(*with, diagnosed with*) cancer	70	leadership	style/s
21	age	(*of -, ranged between -*) years	71	ethics	committee/s
22	risk	factor/s	72	alcohol	consumption
23	nursing	staff	73	risk	taking
24	patients	(*and, and their*) families	74	regression	(*and meditation*) analysis/es
25	parents	(*of, and their*) children	75	screening	tool/s
26	health	problems	76	care	units
27	health	status	77	relationship	quality
28	patient	safety	78	safety	planning
29	research	team	79	medication	adherence
30	data	analysis	80	outpatient	(*heart failure*) clinic/s
31	health	outcomes	81	smoking	cessation
32	health	literacy	82	health	crisis/es
33	providing	(*quality, efficient health*) care	83	research	ethics
34	illness	belief/s	84	nurse	leader/s
35	childhood	cancer	85	risk	(*and, assessment and*) safety

No.	Nodes	Collocates	No.	Nodes	Collocates
36	medication	administration	86	intervention	(*and control*) group/s
37	inclusion	(*and exclusion*) criteria	87	diabetes	(*management*) education
38	assessment	tool/s	88	patient	outcomes
39	care	settings	89	family	(*and, members and*) friends
40	health	system/s	90	nursing	interventions
41	health	issues	91	group	interview/s
42	control	group/s	92	oncology	patients
43	patient	satisfaction	93	symptoms	(*of, such as*) depression
44	research	question/s	94	training	programs/me/mes
45	review	board/s	95	literature	review
46	emergency	department/s	96	consent	form/s
47	age	group/s	97	diagnosis	(*and*) treatment
48	response	rate/s	98	community	setting/s
49	anxiety	(*and*) depression	99	discharge	education
50	family	functioning	100	nurse	staffing

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