A Comparison of Moves and Language Use in the Abstracts of Laboratory Animal science Review Articles and Cell Biology Research Articles

Chaniporn Bhoomanee & Songsri Soranastaporn

Mahidol University, Thailand

Abstract

The aims of this study were to compare (1) the frequency of moves, (2) move sequencing pattern, and (3) language use in terms of tenses, verbs, voice, and types of sentence in three high-frequency moves found in the abstracts of both laboratory animal science review articles (LARA) and cell biology research articles (CBRA). The corpus consisted of 100 abstracts: 50 LARA and 50 CBRA abstracts published between 2012 and 2014 by the *Institute for Laboratory Animal Research Journal (ILAR)* and the *Journal of Cell Biology (JCB)*, selected by stratified random sampling and simple random sampling. The framework of Taddio et al. (1994), which consists of eight moves: purpose, research design, setting, subjects, intervention, measurement, results, and conclusion, was used to analyze the data. The results reveal that (1) three high-frequency moves occurred the most frequently in both types of abstracts. (2) Ten move sequencing patterns occurred in the LARA abstracts, and move sequencing six patterns occurred in the CBRA abstracts. (3) The most frequently used language forms were: the present tense, finite verbs, the active voice, and two types of sentence occurred in the moves presenting background, purpose, and conclusions: simple sentences and complex sentences.

Keywords: move analysis, review article, research article, abstract, laboratory animal, cell biology

1 Introduction

Nowadays it is very important for scholars in the field of science to publish articles in English. Publication of scientific articles in English allows for widespread dissemination of the information and the exchange of information among scientists around the world, both native speakers and non-native speakers (Paltridge & Starfield, 2014). Researchers publish articles in both journals and conference proceedings and their abstracts in conference program books in order to make their information known to the public (Martin-Martin & Burgess, 2004). Moreover, researchers write the different types of article, primarily research articles and review articles. The *research article* is an essay which reports the results of original research, assesses its contribution to the body of knowledge in a given field, and consists of introduction, methodology, results, and discussion sections (Lester & Lester, 2007). In contrast, the *review article* is both a summary and an evaluation of other writers' articles, and it evaluates fundamental concepts, issues, and problems that define the field; it consists of a topic, an introduction, a body, and a conclusion (Taylor, 2011; Rethlefsen, Murad, & Livingston, 2014). Besides the above-mentioned sections, researchers need to submit an English abstract for publication in any journal or proceedings because the abstract is a crucial part of academic articles (Swales & Feak, 2009; McMillan, 2012).

The English abstract is an essential part of an article; it is similar to a brief summary of the whole article; it helps readers decide whether to read the entire article or not, and English abstracts often determine the acceptance or rejection of an article in conferences and academic publications because both conference organizers and journals consider the abstract first (Swales, 1990; Lorés, 2004; Lester & Lester, 2007). The abstract usually summarizes the main points of the article; of the typical abstract contains 100-250 words in which the principle elements and research findings can be found (Cross & Oppenheim, 2006; Swales & Feak, 2009). Especially in the field of science, researchers have used abstracts to disseminate knowledge about their own research results and to follow the progress of current discoveries in science (Taddio et al., 1994; Hartley, 2002). Consequently, the English abstract is a significant part of articles in the field of science; authors of abstracts should be skilled in academic writing and use suitable language forms to their writing (McMillan & Schumacher, 2001; Soranastaporn, 2013).

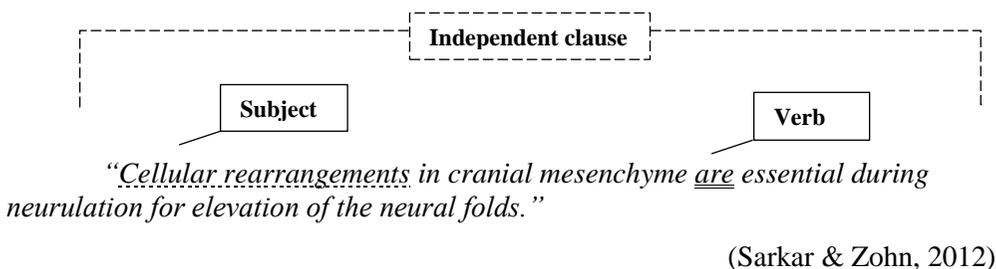## 1.1 Language Use in Abstracts

The study of language use in abstracts is one field of inquiry in the genre analysis of research writing. One important area of inquiry is the use of verb tense. Swales and Feak (1994) analyzed research articles and found that the introduction and discussion sections used the present tense, while the past tense was used in the methodology and results sections. Soranastaporn (2013) noted that in general the purpose, methodology and results sections of abstracts are written in the past tense; however, the results can be written in the present form because the results of the

research come from the event or facts in the field of science (American Psychological Association, 2010). Moreover, McMillion (2012) gives examples of purpose sentences using simple for of the present, past, and future tenses. Swales and Feak (2012) explain that use of present or past verbs in purpose statements varies according to on the situation. In this study, the researchers analyzed only verbs, tenses, voice, and mood.
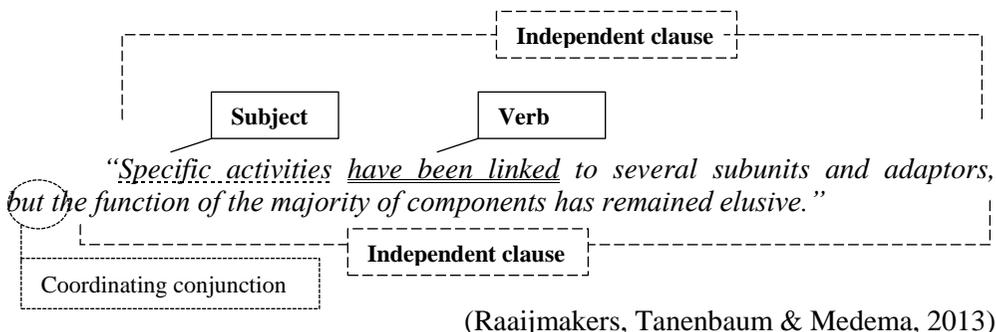
In English, verbs can be divided into two main types: finite verbs and non-finite verbs. A finite verb is a verb that has a subject (expressed or implied) and can function as the root on which an independent clause hangs, and finite verbs are the locus of grammatical information about gender, person, number, tense, aspect, mood, and voice (Tallerman, 2005). A non-finite verb does not change its form to agree with the person(s) and number of subjects (Azar, 2006). Tense is used to show when an action happened (Azar, 2006). Linguistically, the active voice is used in English when authors generally want to emphasize the performer (Tallerman, 2005). In contrast, the passive voice is clearly more complex than the active by virtue of containing extra elements: auxiliary verbs and prepositions introducing the performer of the action (Huddleston & Pullum, 2005). Mood is the grammatical category associated with the semantic dimension of modality (Huddleston & Pullum, 2005).

In writing their abstracts or articles, researchers have to construct English sentences of the following four types: simple sentences, compound sentences, complex sentences, and compound-complex sentences (Celce-Murcia & Larsen-Freeman, 1983; Swales & Feak, 2012; Soranastaporn, 2013).
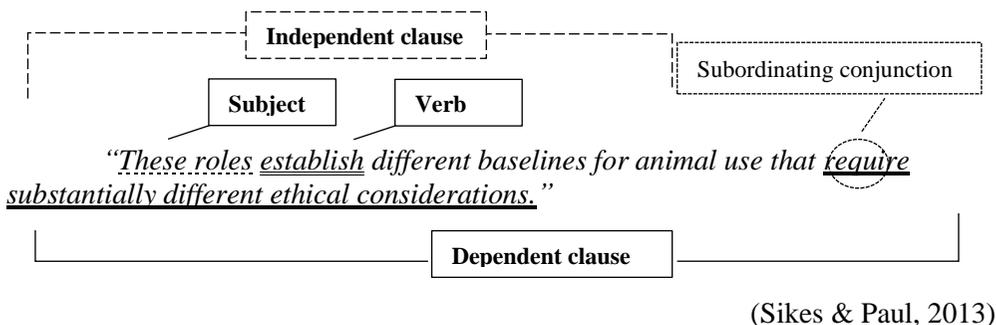
1. A simple sentence includes one independent clause.

Independent clause

Subject

Verb

"Cellular rearrangements in cranial mesenchyme are essential during neurulation for elevation of the neural folds."
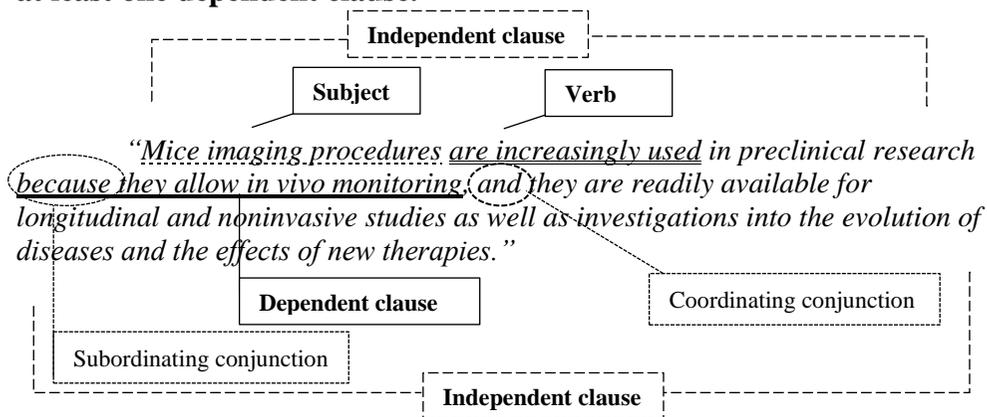
(Sarkar & Zohn, 2012)

2. A compound sentence has two independent clauses which are joined by a coordinating conjunction (such as "and," "for" or "but") or a semicolon.

Independent clause

Subject

Verb

"Specific activities have been linked to several subunits and adaptors, but the function of the majority of components has remained elusive."

Independent clause

Coordinating conjunction

(Raaijmakers, Tanenbaum & Medema, 2013)

3. A complex sentence contains one independent clause and one dependent clause which begins with a subordinating conjunction.

Independent clause

Subject

Verb

Subordinating conjunction

"These roles establish different baselines for animal use that require substantially different ethical considerations."

Dependent clause

(Sikes & Paul, 2013)

4. A compound-complex sentence contains two independent clauses and at least one dependent clause.

Independent clause

Subject   Verb

"Mice imaging procedures are increasingly used in preclinical research because they allow in vivo monitoring, and they are readily available for longitudinal and noninvasive studies as well as investigations into the evolution of diseases and the effects of new therapies."

Dependent clause

Coordinating conjunction

Subordinating conjunction

Independent clause

(Gargiulo et al., 2012)

Even if researchers are able to use appropriate language and write each type of sentence correctly, it is not enough to write research abstracts because researchers also need to know how to organize research information. That is to say, researchers have to be aware of the nature, patterns, and the informational organization of the abstract genre in any particular field; these are constitute the *moves.* Prospective writes need to analyze those moves in order to help them write abstracts faster and more easily.

1.2 Move Analysis

Moves in research articles refer to a section of a text that performs a specific communicative function, and the move pattern is the rhetorical structure of each part of a genre (Swales, 2004; Biber, Connor, & Upton, 2007). The main objective of move analysis is to define and explain the role of each move as a component of rhetorical structure of a particular part in a genre (Swales, 1990). Moves can be divided into two types: conventional moves and optional moves. Conventional moves are the moves that occur frequently more than other moves, while optional moves are any moves which do not occur frequently in a given genre (Biber, Connor, & Upton, 2007). In addition, Kanoksilapatham (2007) proposed that any moves that occur in at least 60% of articles in a corpus can be considered conventional moves, while any moves occurring in less than 60% of the articles can be considered optional moves. According to Swales, the study of moves has become important in the field of linguistics. Swales (1981) started to analyze the introduction section of research articles and proposed the CARs Model, a model which now includes three main sections: establishing a territory, establishing a niche, and occupying the niche, and he further developed a model for the patterns in the introduction section in 1990 and 2004. Since that time linguistic researchers have used move analysis to study various sections of research articles, such as the introduction (Antony, 1999; Lewin et al.,

2001), the methods section (Bloor, 1999), the results (Brett, 1994; Williams, 1999), and the discussion (Hopkins & Dudley-Evans, 1988). Moreover, researchers have analyzed the moves in abstracts in various fields. For example, Bhatia (1993) proposed that the general abstracts consist of four moves. Taddio et al. (1994) found that medical abstracts consisted of eight moves. Santos (1996) found that linguistic abstracts consisted of five moves. Thus, the abstracts in each field comprise different moves, as shown in Table 1.

Table 1 Move Patterns in Abstracts as Found by Bhatia (1993), Taddio et al. (1994), and Santos (1996)

Move	Bhatia (1993)	Taddio et al. (1994)	Santos (1996)
1	introducing purpose	purpose	situating the research
2	describing methodology	research design	Presenting the research
3	summarizing results	settings	describing the methodology
4	presenting conclusions	subject	summarizing the results
5		intervention	discussing the research
6		measurement	
7		results	
8		conclusion	

Different researchers have used one or another of these move analysis models to analyze abstracts. The model of Taddio et al. (1994) was chosen as the framework to analyze the data in this study because this model provides more details about the moves than do the others; in addition, this model was developed for and has been used in the field of science. Previous move analyses of abstracts have been conducted in various fields such as conversation biology and wildlife behavior (Samraj, 2005), linguistics and educational technology (Pho, 2008), science (Oneplee & Soranastaporn, 2008), social science (Kafes, 2012), civil engineering (Kanoksilapatham, 2013), and laboratory animal science (Bhoomanee & Soranastaporn, 2015, 2016). These previous studies are summarized in Table 2.

Table 2 Move Analyses of Abstracts of Research Articles in Various Fields

Framework	Author (Year)	Number of Abstracts	Field	Results
Bhatia (1993)	Samraj (2005)	12	Conservation Biology and Wildlife Behavior	Purpose Methods Results Conclusion
Santos (1996)	Pho (2008)	30	Linguistics and Education Technology	Linguistics M1 Situating the research M2 resenting the research M3 Describing the methodology M4 Summarizing the results M5 Discussion the research Educational Technology M2 Presenting the research M3 Describing the methodology M4 Summarizing the results
	Oneplee & Soranastaporn (2008)	100	Science	Background information Purpose Methods Results Conclusion
Swales approach (1990, 2004)	Kafes (2012)	138	Social Science	Introduction Purpose Methods Results Conclusion
	Kanoksilapatham (2013)	60	Civil Engineering	Background Purposes Methodology Results Discussion
Taddio et al. (1994)	Bhoomanee and Soranastaporn (2015)	50	Laboratory animal science	Background Purpose Research design Settings Subjects Interventions Measurement Results Conclusion
	Bhoomanee and Soranastaporn (2016)	50	Laboratory animal science	♦Most abstracts were structured by beginning with the background, followed purpose and other moves, and ending with conclusion (MB-M1-other moves-M8). ♦Most abstracts used the present tense, finite verbs, active voice, and simple sentences.

Researchers need to study further the moves and language use in the fields of laboratory animal science and cell biology. Moreover, reviewing review of the literature shows a gap in the knowledge about abstracts in this field. Although researchers have analyzed moves of other abstracts (Bhatia, 1993; Taddio et al. 1994; Santos, 1996; Hyland, 2000; Lorés, 2004), none has compared laboratory animal science and cell biology abstracts. In an interview, the director of the National Laboratory Animal Center, Mahidol University, Thailand, on March 20, 2015, noted that laboratory animal science researchers face problems in using English, especially in writing scientific articles in English (Bhoomanee & Soranastaporn, 2015, 2016). Thus, the researchers decided to compare the cell biology abstract genre with the laboratory animal science abstract genre because the researchers were interesting in exploring the differences in the organization of abstracts across disciplines. The researchers searched for previous move analyses of abstracts in the fields of laboratory animal science and cell biology through the e-database of Mahidol University on May 1, 2015 by typing the keywords: "move analysis", "research article", "review article", "laboratory animal", and "cell biology". The result showed that there were no move analyses of abstracts in either field. In short, this study will respond to the needs of researchers and provide new knowledge in the fields of both linguistics and science.

2 Objective of the Study

The aim of this study was to compare the frequency of moves, move sequencing, and language use for three high-frequency moves in terms of verbs, tense, voice, and types of sentence in abstracts in two fields: laboratory animal science and cell biology.

3 Methods

3.1 Source of the Corpus

The corpus for this study consists of journal articles from the Institute for Laboratory Animal Research Journal (ILAR) and the Journal of Cell Biology (JCB) for the period 2012-2014. Four criteria were used in selecting the corpus. Firstly, neither journal appears on Beall's list (list of predatory journals). Secondly, the impact factor for the ILAR Journal is 2.393 (Reuters, 2014), and the impact factor for the JCB Journal is 9.834. In addition, between 2010 and 2014, the values for the ILAR and JCB journals were high (Q1) (Reuters, 2014). Finally, both journals are peer-reviewed. Thus, the ILAR and JCB journals are reliable sources for the data in the corpus.

3.2 Selection of the Corpus

To select the sample of corpus, this study used two techniques: stratified random sampling and simple random sampling.

Stratified Random Sampling: As the number of articles published each year was not equal, stratified random sampling was used to determine the number of articles to be selected for each year, as shown in Table 3.

Table 3 Size of the *ILAR* and *JCB* Corpora

Year	*ILAR*		*JCB*	
	N	*n*	*N*	*n*
2012	40	20	180	17
2013	19	10	177	17
2014	39	20	163	16
Total	**98**	**50**	**520**	**50**

Simple Random Sampling: The articles for each year were selected by simple random sampling. The corpus for this study comprises 696 sentences, containing 16,443 words, as shown in Table 4.

Table 4 Details of the *ILAR* and *JCB* Corpora

Year	*ILAR*		*JCB*	
	n		*n*	
	Sentences	**Words**	**Sentences**	**Words**
2012	109	2,830	126	2,550
2013	69	1,801	120	2,681
2014	156	3,829	116	2,752
Total	**334**	**8,460**	**362**	**7,983**

3.3 Research Instruments

3.3.1 Microsoft Word: The researcher used Microsoft Word to copy the content of the abstracts from the PDF files which were downloaded from http://ilarjournal.oxfordjournals.org/ and http://jcb.rupress.org/, after that the content of the abstracts was pasted into Word files in order to prepare each sentence and count the total number of words in each abstract, as shown in Figure 1.
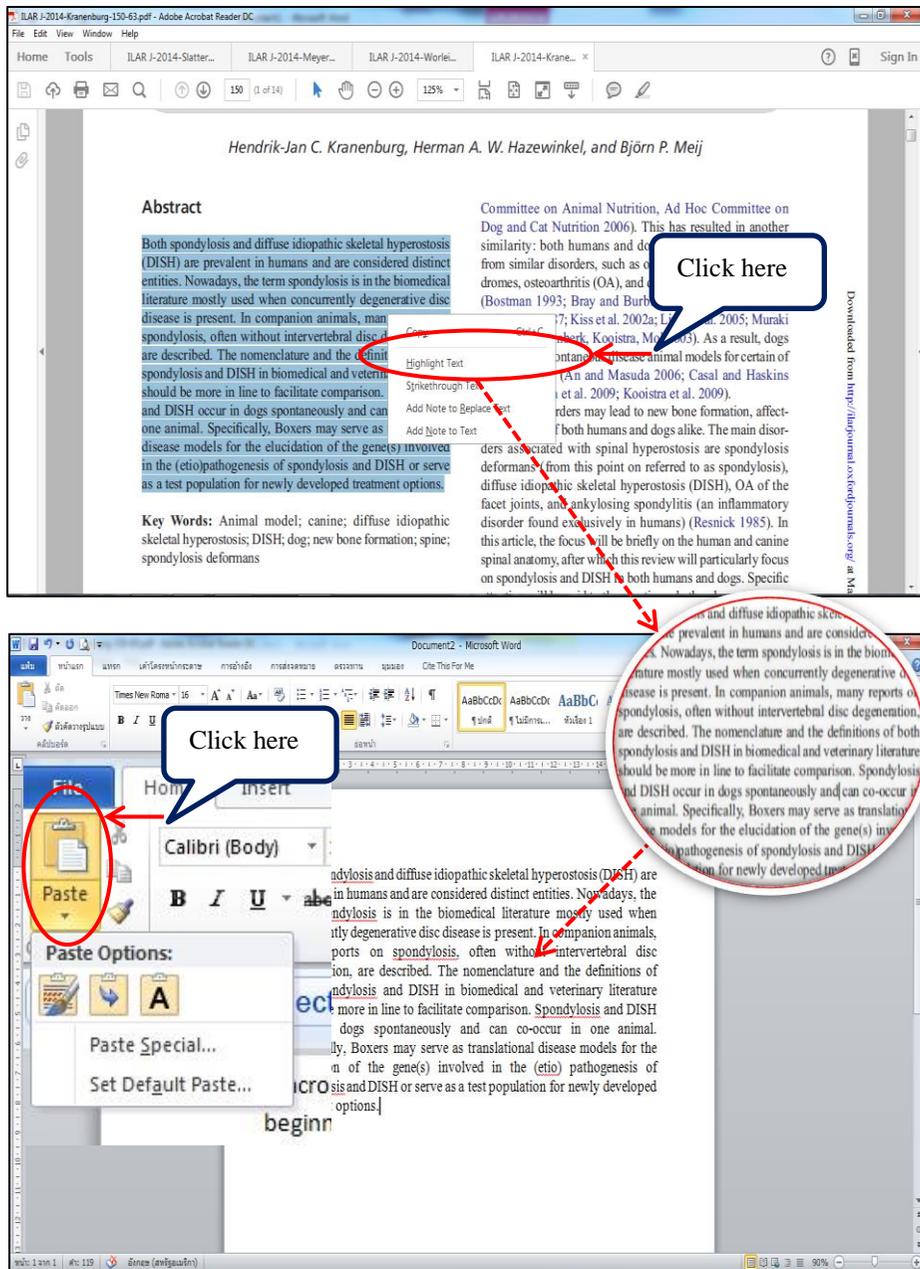
Figure 1 Use of Microsoft Word

3.3.2 Microsoft Excel: The researcher used Microsoft Excel to record the data by creating a table for the analysis of each sentence in the abstracts; this consists of a record of the forms of the move, the move sequence, and the number of sentences, as shown in Figure 2.

1. Data Analysis and Determining the Number of Sentences

2. Record for Move Frequency

3. Record for the Move Sequence Patterns

Figure 2 Use of Microsoft Excel

3.4 Data Analysis

1. Data Analysis Procedures

Data were analyzed manually by six people: the researcher, three raters, and two English teachers. The researcher posted an advertisement for inter-raters on Facebook. Qualifications were: (1) One native-speaker with at least a bachelor's degree in the field of science. (2) Two raters studying for a master's degree who have studied move analysis. Before the raters analyzed the moves, the researcher explained the purpose of the study and the concepts of genre and move analysis to the raters. The principal researcher and three raters were trained to analyze the moves of abstracts based on the framework of Taddio et al. (1994) by professional researcher. After trainees demonstrated their ability to accurately analyze the moves found in abstracts, they then analyzed individually and independently the moves in the 100 abstracts in the corpus.

2. Selection and Training of Raters

The raters submitted the results of their move analysis to the researchers. Later, the researcher compared the results. If the results were unclear or if the raters had not agreed on a same move, the researcher held a meeting with the raters to discuss in order to reach a unanimous conclusion. In addition, the researcher consulted a native-speaking professor her advisor in the field of linguistics when considering unclear results.

3. Determining Move Frequency and Move Sequence

The researcher analyzed the results in order to determine move frequency, move sequencing in abstracts in laboratory animal science and cell biology research articles. Then the move sequences were classified into groups according to patterns of move sequences, and the examples of each pattern were counted and recorded on the forms of move frequency and move sequence.

4. Analyzing Language Uses

The researcher analyzed the language uses: verb, tenses, voices and types of sentences in moves in the abstracts of laboratory animal review articles and cell biology research articles. Then the researcher summarized the language uses by using frequency and percentage.

5. Statistical Devices

The researcher used descriptive statistics (frequency and percentage) to analyze the data.

6. Reliability of the Analysis

The three inter-raters were asked to identify moves in the abstracts. One rater was a native-speaker with a master's degree in the field of science and a former research assistant at the University of Sydney. Two raters were peer-reviewers who have studied move analysis at the master's degree level at Mahidol University. Inter-rater reliability was calculated by using Fleiss's kappa. In this study, the value of Fleiss's kappa was 0.8034, and based on the criteria of McHugh (2012), the agreement value for the inter-raters was strong.

4 Results

4.1 Comparison of the Frequency of Moves in the ILAR and JCB Corpora

The results reveal that the number of moves occurring in the ILAR corpus differed from that found in the JCB corpus. Nine moves were found in the ILAR corpus: background (MB), purpose (M1), research design (M2), setting (M3), subjects (M4), intervention (M5), measurement (M6), results (M7), and conclusion (M8) (Bhoomanee & Soranastaporn, 2015). In contrast, seven moves were found in the JCB corpus: background (MB), purpose (M1), research design (M2), subjects (M4), intervention (M5), results (M7), and conclusion (M8). The frequency of moves is shown in Figure 3.
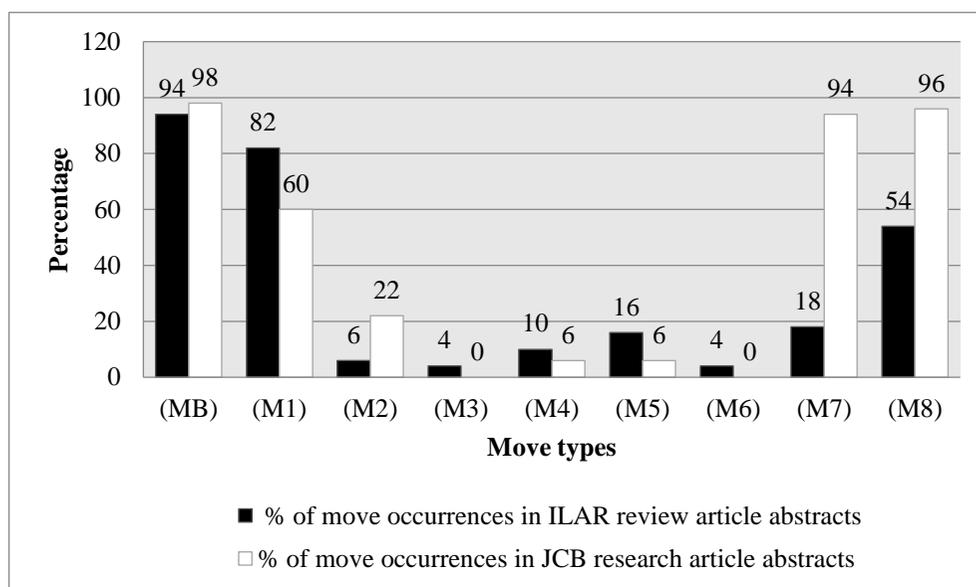
Figure 3 Comparison of the Frequency of Moves in the ILAR and JCB Corpora

The results displayed in Figure 3 are discussed in two sections: high-frequency moves and low-frequency moves.

Comparison of High-Frequency Moves in the ILAR and JCB Corpora: Three high-frequency moves were found in both corpora background (MB), purpose (M1), and conclusion (M8). Results (M7) also occurred with high frequency in the JCB corpus. Firstly, background (MB) occurred with high frequency in the abstracts. Background is a move not found in the framework of Taddio et al. (1994). In this study, the background move provides background information for the articles, in which the authors mention the importance of the study, the origin of the study, the scope of the study, as well as knowledge related to laboratory animal and cell biology.

41

Secondly, purpose (M1) occurred more than 60% of the time in the abstracts in both corpora. Finally, conclusion (M8) also occurred more than 50% of the time in the abstracts in both corpora.

Comparison of Low-Frequency Moves in the ILAR and JCB Corpora: six low-frequency moves were found in the ILAR corpus: research design (M2), setting (M3), subjects (M4), intervention (M5), measurement (M6), and results (M7) (Bhoomanee & Soranastaporn, 2015). In contrast, three low-frequency moves were found in the JCB corpus: research design (M2), subjects (M4), and intervention (M5); neither setting (M3) nor measurement (M6) was found in this corpus.

In addition, the same high-frequency moves were found in both corpora: background (MB), purpose (M1), and conclusion (M8). Details about the words and sentences in abstracts and the three moves (background, purpose, and conclusion) shown in Table 5.

Table 5 Number of Words and Sentences in the Abstracts, Background; Occurrence of Purpose, and Conclusion in Pattern 1 of the ILAR and JCB Corpora

	ILAR								JCB							
	Abstracts		MB		M1		M8		Abstracts		MB		M1		M8	
	n	M	n	M	n	M	n	M	n	M	n	M	n	M	n	M
Words	4363	161.6	2481	91.9	1005	37.2	481	40.1	4093	157.4	994	38.2	624	24	730	28.1
Sentences	169	6.3	108	4	35	1.3	19	1.6	188	7.2	51	2	29	1.1	30	1.2

* MB = move background,   M1 = move purpose,   M8 = move conclusion

As can be seen in Table 5, in the ILAR corpus, the abstracts contained about six or seven sentences, but the abstracts in the JCB corpus included about seven or eight sentences. The background move in the abstracts in the ILAR corpus comprised about four sentences, but the background move in the abstracts in the JCB corpus included about two sentences. The purpose move in the abstracts in the ILAR corpus included one or two sentences, as did the purpose move in the abstracts in the JCB corpus. The conclusion move in the abstracts in the ILAR corpus included one or two sentences as did the conclusion move in the abstracts in the JCB corpus.

In short, both abstracts of laboratory animal science review articles and cell biology research articles contained the same high-frequency moves: background, purpose, and conclusion, while other moves were found in the abstracts with low-frequency.

4.2 Comparison of the Sequencing of Moves in the ILAR and JCB Corpora

This study found ten patterns for the sequencing of moves in the abstracts of laboratory animal science review articles, while there were move sequencing six patterns in the abstracts of cell biology research articles. The details for the sequencing of moves are presented in Table 6.

Table 6 Sequence of Moves in Abstracts in Laboratory Animal Science Review Articles and Cell Biology Research Articles

ILAR			JCB		
Patterns for the Sequencing of Moves	*f*	*%*	Patterns for the Sequencing of Moves	*f*	*%*
Pattern 1 MB-M1 other moves and M8	27	54	MB-M1 other moves and M8	26	52
Pattern 2 MB-M8 other moves and M8	7	14	MB-M7 other moves and M8	15	30
Pattern 3 MB-M5 other moves and M8	4	8	MB-M2 other moves and M8	5	10
Pattern 4 MB-M4 other moves and M1	3	6	MB-M4 other moves and M8	2	4
Pattern 5 MB-M3 other moves and M1	2	4	MB-M5 other moves and M8	1	2
Pattern 6 MB-M2 other moves and M8	2	4	M1-M7-M8	1	2
Pattern 7 MB-M7 other moves and M8	1	2			
Pattern 8 M1-M8	2	4			
Pattern 9 M1-MB-M8	1	2			
Pattern 10 M1-M4-M8	1	2			
Total	**50**	**100**		**50**	**100**

*MB = background (New move)

As can be seen in Table 6, Pattern 1 (MB-M1 and other moves) was found the most frequently in both corpora, occurring in more than 50% of all abstracts. That is, Pattern 1 in the ILAR corpus was found in 27 review article abstracts (Bhoomanee & Soranastaporn, 2016). In contrast, Pattern 1 was found in 26 research article abstracts in the JCB. The sequence pattern from MB (background) to M1 (purpose), or Pattern 1 was a noticeable feature of the abstracts. More details on Pattern 1 are shown in Table 7.

Table 7 Pattern1 MB-M1 Other Moves and M8 of Abstracts in Laboratory Animal science Review Articles and Cell Biology Research Articles

	ILAR			JCB		
Pattern	**Sequence of Moves**	*f*	*%*	**Sequence of Moves**	*f*	*%*
1	MB-M1	12	24	MB-M1-M7-M8 (1)	10	20
2	MB-M1-M8 (1)	3	6	MB-M1/7-M7-M8 (2)	6	12
3	MB-M1-M7-M8 (2)	2	4	MB-M1/4-M7-M8 (3)	1	2
4	MB-M1/8 (3)	1	2	MB-M1/2-M7-M8 (4)	1	2
5	MB-M1-MB	1	2	MB-M1/5-M7-M8 (5)	1	2
6	MB-M1-M5	1	2	MB-M1-M5-M2-M8 (6)	1	2
7	MB-M1/2-M8 (4)	1	2	MB-M1-M7-M2/1/8 (7)	1	2
8	MB-M1-M8-M1	1	2	MB-M1-M4-M7-M8 (8)	1	2
9	MB-M1-MB-M8 (5)	1	2	MB-M1/7/4-M7-M8 (9)	1	2
10	MB-M1-MB-M7-M1-M8 (6)	1	2	MB-M1/2-M7-M7/8-M8 (10)	1	2
11	MB-M1/2-M6-M7-M8 (7)	1	2	MB-M1/7-M7-M2/7-M8 (11)	1	2
12	MB-M1-MB-M7-M8 (8)	1	2	MB-M1/7-M7-M2/7-M7-M8 (12)	1	2
13	MB-M1-M5-M7-M1-M8 (9)	1	2			
Total		**27**	**54**		**26**	**52**

* Dotted underlines are the patterns beginning with background (MB), followed by purpose (M1), and ending with conclusion (M8).

As can be seen from Table 7, the sequence of moves in the abstracts of both laboratory animal science review articles and cell biology research articles began with background (MB), followed by purpose (M1), and ending with conclusion (M8) in nine patterns in the ILAR corpus and twelve patterns in the JCB corpus. Examples of the sequencing of moves in the two corpora are presented as follows.

Example 1: Sequence of Moves in the Abstracts of Laboratory Animal Science Review Articles (Pattern 1)

The following abstract from a laboratory animal science review article began with background (MB), followed by purpose (M1) and conclusion (M8).

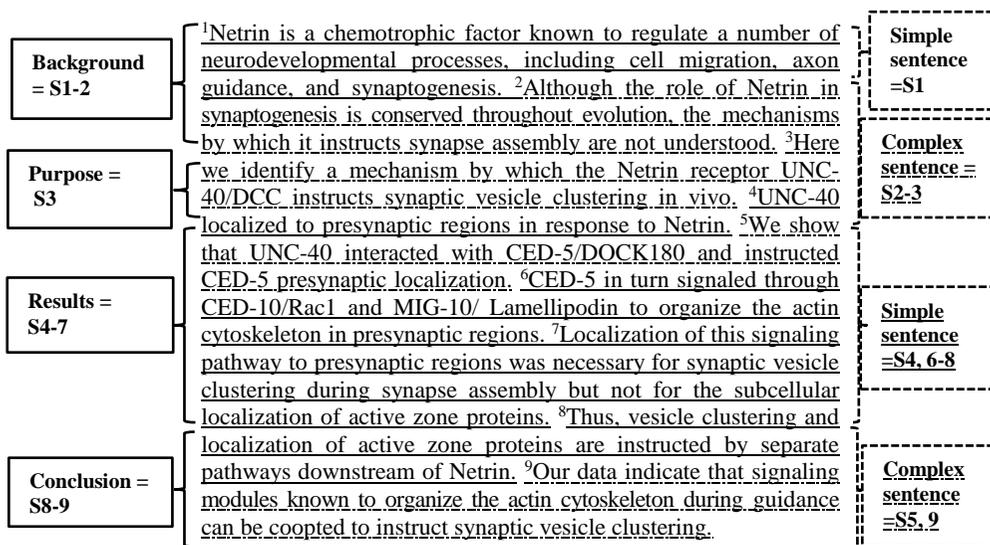|		
Background = S1-3	[1]The strategies for housing zebrafish used in biomedical research have evolved considerably over the past three decades. [2]To keep pace with the rapid expansion and development of the zebrafish model system, the field has generally moved from keeping fish at the level of aquarium hobbyist to that of industrialized, recirculating aquaculture. [3]Numerous commercial system vendors now offer increasingly sophisticated housing systems based on design principles that maximize the number of animals that can be housed in a given space footprint, and they are thus able to support large and diverse research programs. [4]This review is designed to provide managers, lab animal veterinarians, investigators, and other parties responsible for care and use of these animals with a comprehensive overview of the basic operating and design principles of zebrafish housing systems. [5]This information can be used to help plan the construction of new facilities and/or the upgrade and maintenance of existing operations.	**Simple sentence = S1-2**
		Compound-Complex sentence = S3
Purpose = S4		**Simple sentence = S4-5**
Conclusion = S5		

Note: S = sentence   (Lawrence & Mason, 2012)

As can be seen in example 1, the abstract began with the background move (MB), which consists of three sentences, followed by purpose (M1) which comprised one sentence, and ended with conclusion (M8) which had one sentence. Sentence types in this example included simple sentences and compound-complex sentences.

Example 2: Sequence of Moves in Abstracts of Cell Biology Research Articles (Pattern 1)

The following abstract from a cell biology research article began with background (MB), followed by purpose (M1), results (M7) and conclusion (M8).

Background = S1-2	[1]Netrin is a chemotrophic factor known to regulate a number of neurodevelopmental processes, including cell migration, axon guidance, and synaptogenesis. [2]Although the role of Netrin in synaptogenesis is conserved throughout evolution, the mechanisms by which it instructs synapse assembly are not understood.	**Simple sentence =S1**
		Complex sentence = S2-3
Purpose = S3	[3]Here we identify a mechanism by which the Netrin receptor UNC-40/DCC instructs synaptic vesicle clustering in vivo. [4]UNC-40 localized to presynaptic regions in response to Netrin. [5]We show that UNC-40 interacted with CED-5/DOCK180 and instructed CED-5 presynaptic localization. [6]CED-5 in turn signaled through CED-10/Rac1 and MIG-10/ Lamellipodin to organize the actin cytoskeleton in presynaptic regions. [7]Localization of this signaling pathway to presynaptic regions was necessary for synaptic vesicle clustering during synapse assembly but not for the subcellular localization of active zone proteins.	
Results = S4-7		**Simple sentence =S4, 6-8**
Conclusion = S8-9	[8]Thus, vesicle clustering and localization of active zone proteins are instructed by separate pathways downstream of Netrin. [9]Our data indicate that signaling modules known to organize the actin cytoskeleton during guidance can be coopted to instruct synaptic vesicle clustering.	**Complex sentence =S5, 9**

Note: S = sentence   (Stavoe & Colon-Ramos, 2012)

As can be seen from example 2, the abstract began with background (MB) which consisted of two sentences, followed by purpose (M1) which comprised one sentence, results (M7) which included four sentences and ended with conclusion (M8) which had two sentences. Sentence types in this abstract included simple sentences and compound sentences.

To explore language use in moves, the researcher selected three moves based on frequency of occurrence of moves in the sequencing of moves. The steps for the selection of moves for the investigation of language use are shown in Figure 4.
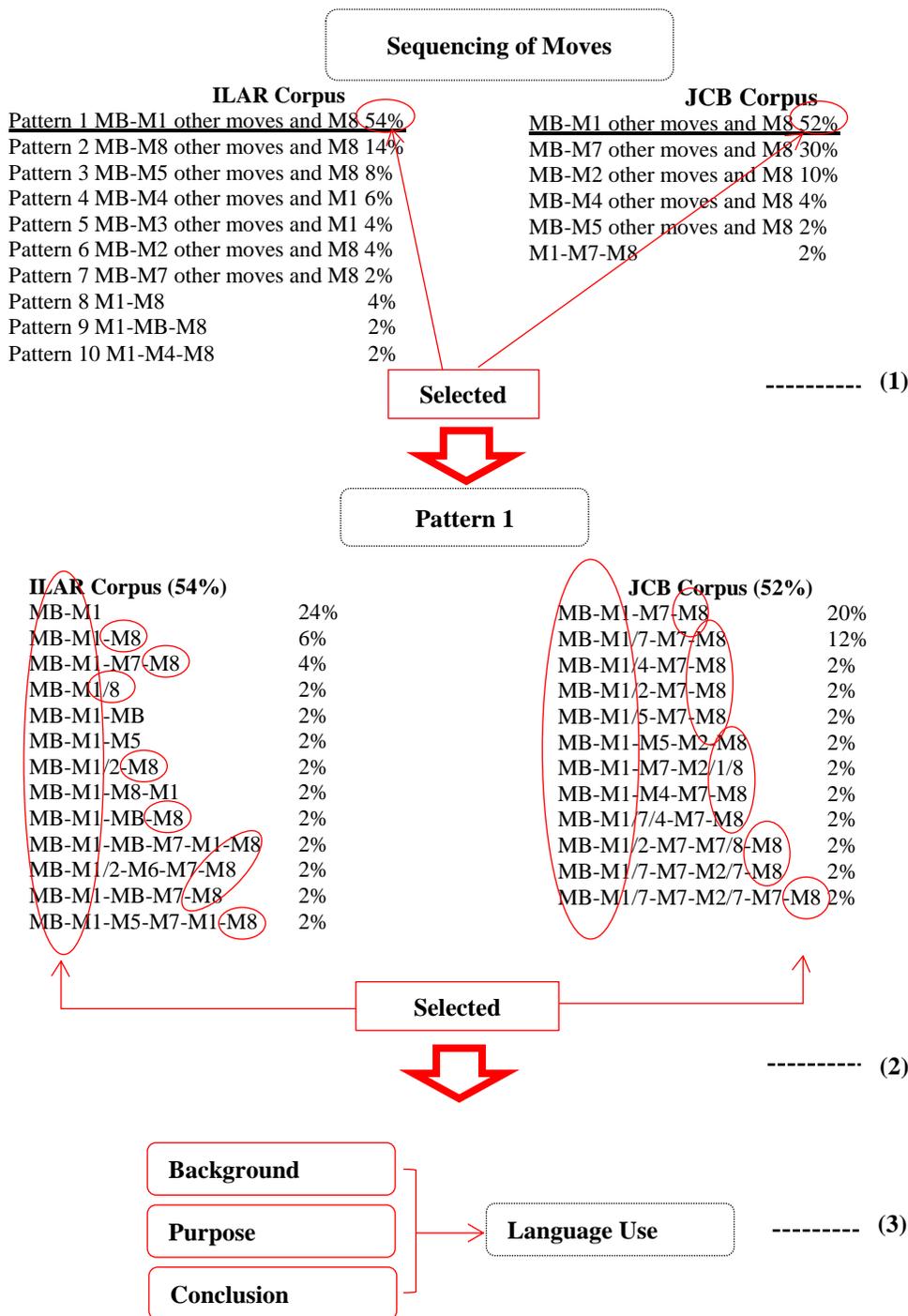
Figure 4 Selection of Moves for Exploring Language Use

As can be seen in Figure 4, Pattern 1 occurred the most frequently in both corpora, and three moves—background (MB), purpose (M1), and conclusion (M8)—occurred frequently in Pattern 1. As a result, these three moves were analyzed in terms of verb choice, tense, voice, and sentence type.

4.3 Comparison of Language Use in the ILAR and JCB Corpora

The researchers analyzed language use in terms of tense, verb, voice, and sentence type in three moves: background, purpose, and conclusion. The details for language use in the three moves are shown in Table 8.

Table 8 Comparison of Language Use for Background, Purpose and Conclusion in the ILAR and JCB Corpora

Language Use	ILAR						JCB					
	Background		Purpose		Conclusion		Background		Purpose		Conclusion	
	f	%	f	%	f	%	f	%	f	%	f	%
Verb												
-Finite	100	92.59	33	94.3	16	84.2	49	96.1	29	100	30	100
-Modal	8	7.41	2	5.7	3	15.8	2	3.9	0	0	0	0
Tense												
-Past	3	2.78	2	5.7	1	5.3	0	0	8	27.6	0	0
-Present	105	97.22	28	80	16	84.2	51	100	21	72.4	30	100
-Future	0	0	5	14.3	2	10.5	0	0	0	0	0	0
Voice												
-Active	86	79.63	28	80	15	78.9	36	70.59	29	100	28	93.3
-Passive	22	20.37	7	20	4	21.1	15	29.41	0	0	2	6.7
Sentence type												
-Simple	69	63.89	24	68.6	10	52.6	28	54.9	13	44.8	15	50
-Compound	10	9.26	0	0	0	0	7	13.7	1	3.5	1	3.3
-Complex	25	23.15	11	31.4	8	42.1	16	31.4	15	51.7	13	43.4
-Compound-Complex	4	3.70	0	0	1	5.3	0	0	0	0	1	3.3

As can be seen in Table 8, the most frequently used language forms in the three moves—background, purpose, and conclusion—were finite verbs, present tense, active voice, and two types of sentence—simple sentences and complex sentences. Examples of the three moves—background, purpose, and conclusion in the abstracts of laboratory animal science review articles and cell biology research articles—are presented as follows.

1. Examples of Background Sentences

1.1 Abstracts in Laboratory Animal Science Review Articles (ILAR Corpus)

Subject — *Simple sentence* — **Verb**

[BILAR1] *The strategies for housing zebrafish used in biomedical research have evolved considerably over the past three decades.*

The sentence [BILAR1] used a finite verb *(have evolved)*, the present perfect tense *(has, have + V₃)*, the active voice, and was a simple sentence *(Subject + Verb)*.

1.2 Abstracts in Cell Biology Research Articles (JCB Corpus)

Subject **Verb** *Simple sentence*

[BJCB1] *Netrin is a chemotrophic factor known to regulate a number of neurodevelopmental processes, including cell migration, axon guidance, and synaptogenesis.*

The sentence [BJCB1] used a finite verb *(is)*, the present tense (V_1), the active voice, and was a simple sentence *(Subject + Verb)*.

2. Example of Purpose Sentences

2.1 Abstracts in Laboratory Animal Science Review Articles (ILAR Corpus)

Subject **Verb** *Simple sentence*

[PILAR1] *This review is designed to provide managers, lab animal veterinarians, investigators, and other parties responsible for care and use of these animals with a comprehensive overview of the basic operating and design principles of zebrafish housing systems.*

The sentence [PILAR1] used a finite verb *(is designed)*, the present tense (V_1), the passive voice $(V_{to\,be} + V_3)$, and was a simple sentence *(Subject + Verb)*.

2.2 Abstracts in Cell Biology Research Articles (JCB Corpus)

Independent clause

Subject **Verb** **Relative pronoun**

[PJCB1] *Here we identify a mechanism by which the Netrin receptor UNC-40/DCC instructs synaptic vesicle clustering in vivo.*

Dependent clause *Complex sentence*

The sentence [PJCB1] used a finite verb *(identify)*, the present tense (V_1), the active voice, and was a complex sentence because the sentence included one independent clause and one dependent clause.

3. Example of Conclusion Sentences

3.1 Abstract in Laboratory Animal Science Review Article (ILAR Corpus)

Subject	Verb	*Simple sentence*

[CILAR1] *This information can be used to help plan the construction of new facilities and/or the upgrade and maintenance of existing operations.*

The sentence [CILAR1] used a modal verb *(can be used)*, the present tense, the passive voice *(V$_{to\ be}$ + V$_3$)*, and was a simple sentence *(Subject + Verb)*.

3.2 Abstract in Cell Biology Research Article (JCB Corpus)

Subject	*Simple sentence*	Verb

[CJCB1] *Thus, vesicle clustering and localization of active zone proteins are instructed by separate pathways downstream of Netrin.*

The sentence [CJCB1] used a finite verb *(are instructed)*, the present tense *(V$_1$)*, the passive voice *(V$_{to\ be}$ + V$_3$)*, and was a simple sentence *(Subject + Verb)*.

5 Discussion

The findings are discussed in terms of the frequency of moves, move sequencing, and language use for three high-frequency moves found in both types of abstract.

5.1 Comparison of the Frequency of Moves in the ILAR and JCB Corpora

The findings reveal that the two corpora differ in terms of the conventional moves. Kanoksilapatham (2007) proposed that any moves that occurred at least 60% of the time in a corpus should be considered conventional moves, while any moves that occurred in less than 60% if the corpus should be regarded as optional moves. Both corpora in the present study include the same conventional moves: background and purpose. The move of background and purpose are consistent with the studies of Samraj (2005), Kafes (2012), and Kanoksilapatham (2013). It can be said that both sets of abstracts are in the field of science, and that the authors conducted their research in different settings, so the authors needed to provide background information for the study, information related to the importance of the study, the scope of the study, current knowledge about the topic, and previous research in the field in order to help the readers know what their articles would be about. Purpose is a conventional move; which gives the objectives of the study.

However, the corpora differ in other aspects. The JCB corpus includes the moves of results and conclusion in the abstracts, while the ILAR corpus excludes both moves. This is because the abstracts of research articles describe experimental researches, so the authors have to presents the findings of the research. In contrast, the abstracts in the ILAR corpus are the abstracts of review articles which aim to review previous research, not to conduct research; therefore, the authors did not describe results in the abstracts. The conclusion is a conventional move in the JCB corpus, because these abstracts needed to demonstrate the importance of the study as well as main points of the study. Thus, two corpora have the same conventional moves—background and purpose—while the abstracts of cell biology research articles include other conventional moves: results and conclusion.

5.2 Sequencing of Moves between ILAR Corpus and JCB Corpus

The pattern of MB-M1 plus other moves and M8 (background-purpose-other moves-conclusion) occurred the most frequently in the two corpora, occurring in more than 50% of the abstracts in the entire corpus. This pattern is consistent with the studies of Oneplee and Soranastapron (2008) and Kafes (2012). Possible explanation is that the authors need to prepare the readers to focus on the topics in the abstracts by highlighting the history of the research or providing background information before indicating the purpose of the article. Most abstracts ended with a conclusion in order to summarize the main points of the study. Therefore, readers are able to understand more completely by learning the background to the research, including the importance of the research, before proceeding to the other details. In addition, readers do not have to guess details of articles because the authors provide sufficient essential information in the abstracts.

According to the findings, the pattern of MB-M1 plus other moves and M8 is considered as a preferred sequencing of moves in both corpora. In addition, the background comes first, which differs Taddio et al. (1994)'s framework. It can be said that the framework of Taddio et al. (1994) cannot be used to analyze the abstracts of laboratory animal science review articles and cell biology research articles because the background moves follows the patterns described by Swales (1990, 2004) and Santos (1996). Therefore, the framework of Taddio et al. (1994) should include the background move, which discusses the importance of the study, the origin \ of the study, the scope of the study, as well as provides current knowledge related to the topic. This is because most abstracts in the fields of laboratory animal science and cell biology include background information.

5.3 Comparison of Language Use in the ILAR and JCB Corpora

The results reveal that three moves—background, purpose, and conclusion—in the two corpora frequently used finite verbs, the present tense, the active voice, and simple sentences to form the sentences in the abstracts. The purpose and conclusion also used complex sentences to form the sentences in the abstracts. The linguistic features for each move are discussed as follows.

A Comparison of Language Use in the Background in the ILAR and JCB Corpora: This finding is consistent with the results of Swales and Feak (1994), who found that authors used the present tense to write the introduction, and their study found that few sentences used the passive voice. However, this finding differs the pattern in the framework of Soranastaporn (2013), who found that abstracts usually the past tense. It is possible that authors use a finite verb in the present tense in order to indicate a real event, or current knowledge related to the topic. When using the active voice, authors may want to make a clear statement because active sentences are stronger than passive sentences. Lastly, authors use simple sentences because they may want to present only one main idea in the sentence in order to help the readers understand.

Comparison of Language Use in the Purpose in the ILAR and JCB Corpora: In the book, *Educational research fundamentals for the consumer* by McMillion (2012), purpose sentences can use the present tense, the past tense, or the future tense. That is, two of the tenses mentioned for use in purpose sentences in that book are also consistent with the results for both corpora. Moreover, Swales and Feak (2012) explain that purpose sentences use present or past verbs depending on the situation. However, this study found that purpose sentences used the present tense the most frequently in the abstracts. It is possible that authors want to show that study is new; moreover the authors want to state the objectives strongly and clearly by using finite verbs and the active voice. Finally, the authors wanted to write sentences for their readers by using simple sentences, and the authors used complex sentences in order to give more details to the readers.

Comparison of Language Use in the Conclusion in the ILAR and JCB Corpora: The findings in this study were not consistent with the framework of Soranastaporn (2013), who found that abstracts usually use the past tense. It is possible that authors need to conclude the study and the findings of the current study by using present tense. The authors also used finite verbs to summarize the findings and limitations of the study clearly and emphasized the findings of the study by using the active voice. Lastly, the authors may have wanted to summarize the main points of the study clearly for the readers; therefore, the authors used simple and complex sentences to give more details.

In short, both types of abstracts used the present tense, finite verbs, the active voice, and two types of sentences: simple sentences and complex sentences.

6 Implications of the study

Researchers in the fields of laboratory animal science and cell biology can unpack the text while reading and use the patterns of move as a guideline when they want to write their own articles. Furthermore, researchers can use the linguistic features discussed above to write the abstracts.

7 Conclusion

The purpose of this study was to compare the abstracts of laboratory animal science review articles and cell biology research articles because no research has been conducted on this topic. This study found that: (1) The abstracts of laboratory animal science review articles include two conventional moves—background and purpose, while the abstracts of cell biology research articles contain four conventional moves—background, purpose, results, and conclusion. (2) Most abstracts in both corpora began with the background move, followed by purpose, other moves, and ending with the conclusion (MB-M1 other moves and M8). (3) The sentences in the background, purpose, and conclusion used finite verbs, the present tense, the active voice, and two types of sentences: simple sentences and complex sentences.

8 Recommendations for the further studies

1. Further study should be conducted to determine the linguistic features of all moves in the abstracts in order to see how to use the language in each section of the abstracts.

2. Next study may be conducted into whole articles in the fields of laboratory animal science and cell biology in order to get the whole picture of how the articles are constructed.

References

Anthony, L. (1999). Writing research article introductions in software engineering: how accurate is a standard model?. *IEEE transactions on professional communication, 42*(1), 38-46.

Azar, B. (2006). *Basic English grammar.* White Plains, NY: Pearson Longman.

Bhatia, V. K. (1993). *Analysing genre: Language use in professional settings*. London: Longman.

Bhoomanee, C., & Soranastaporn, S. (2015). A study of move analysis in laboratory animal research article abstracts. In Ratchattranon, W. (Ed.), *7th national and international conference on humanities and social science* (pp. 98-106). Bangkok, Thailand: Kasetsart University.

Bhoomanee, C., & Soranastaporn, S. (2016). A study of move sequencing and language use of review article abstracts in the laboratory animal field. *Pasaa Paritat Journal, 32.*

Biber, D., Connor, U., & Upton, T. (2007). *Discourse on the move.* Amsterdam: John Benjamins Publishing Co.

Bloor, M. (1999). Variation in the methods sections of research articles across disciplines: The case of fast and slow texts. In P. Thompson (Ed.), *Issues in EAP writing research and instruction.* Reading, UK: University of Reading: CALS, 84-106.

Brett, P. (1994). A genre analysis of the results section of sociology articles. *English for Specific Purposes, 13*(1), 47-59.

Celce-Murcia, M., & Larsen-Freeman, D. (1983). *The grammar book.* Rowley, MA: Newbury House.

Cross, C., & Oppenheim, C. (2006). A genre analysis of scientific abstracts. *Journal of Documentation, 62*(4), 428-446.

Hartley, J. (2002). Do structured abstracts take more space? And does it matter*? Journal of information Science, 28*(5), 417-422.

Hopkins, A., & Dudley-Evans, T. (1988). A genre-based investigation of the discussion sections in articles and dissertations. *English for Specific Purposes, 7,* 113-121.

Huddleston, R., & Pullum, G. (2005). *A student's introduction to English grammar.* Cambridge, UK: Cambridge University Press.

Hyland, K. (2000). *Disciplinary discourse: Social interaction in academic writing*. Singapore: Pearson.

Kafes, H. (2012). Cultural traces on the rhetorical organization of research article abstracts. *International Journal on New Trends in Education and Their Implications, 3*(3), 207-220.

Kanoksilapatham, B. (2007). Rhetorical moves in biochemistry research articles. In D. Biber, U. Connor, & T. Upton (Eds.), *Discourse on the move* (p. 87). Amsterdam: John Benjamins.

Kanoksilapatham, B. (2013). Generic characterization of civil engineering research article abstracts. *The Southeast Asian Journal of English Language Studies, 19*(3), 1-10.

Lester, J., & Lester, J. (2007). *Writing research papers.* New York, NY: Pearson/Longman.

Lewin, B. A., Fine, J., & Young, L. (2001). *Expository discourse: A genre-based approach to social science research texts*. London: Continuum.

Lorés, R. (2004). On RA abstracts: from rhetorical structure to thematic organization. *English for Specific Purposes, 23*(3), 280-302.

Martin-Martin, P., & Burgess, S. (2004). The rhetorical management of academic criticism in research article abstracts. *Text, 24*(2), 171-195.

McHugh, M. (2012). Interrater reliability: the kappa statistic. *Biochemia Medica*, 276-282.

McMillan, J. (2012). *Educational research: Fundamentals for the consumer.* (6th.ed.). Boston, MA: Pearson Education.

McMillan, J. H., & Schumacher, S. (2001). *Research in education: A conceptual introduction* (5th ed.). New York, NY: Longman.

Oneplee, J., & Soranastaporn, S. (2008). *Genre analysis of scientific abstracts: A comparative study between science and nature journals.* 1st Conference of Rajamangara University of Technology Srivijaya. Trang, Thailand: University of Technology Srivijaya.

Paltridge, B., & Starfield, S. (2014). *The handbook of English for specific purposes.* Malaysia. John Wiley&Sons.

Pho, P. (2008). Research article abstracts in applied linguistics and educational technology: A study of linguistic realizations of rhetorical structure and authorial stance. *Discourse Studies, 10,* 231-250.

Rethlefsen, M., Murad, M., & Livingston, E. (2014). Engaging medical librarians to improve the quality of review articles. *JAMA, 312*(10), 999.

Reuters, T. (2014). *Journal citation reports.* Retrieved 1 May 2015, from http://thomsonreuters.com/en/products-services/scholarly-scientific-research/research-management-and-evaluation/journal-citation-reports.html

Samraj, B. 2005. An exploration of a genre set: Research article abstracts and introductions in two disciplines. *English for Specific Purposes, 24*, 14-156.

Santos, D. (1996). The textual organization of research paper abstracts in applied linguistics. *Text, 16*(4), 481-499.

Soranastaporn, S. (2013). *Effective reading and writing English texts*. Bangkok, Wongaugsorn Press.

Swales, J. M. (1981). *Aspects of article introductions.* Birmingham, UK: The University of Aston, Language Studies Unit.

Swales, J.M. (1990). *Genre analysis.* Cambridge: Cambridge University Press.

Swales, J. M. (2004). *Research genres: Explorations and applications.* Cambridge: Cambridge University Press.

Swales, J.M., & Feak, C. (1994). *Academic writing for graduate students: A course for non-native speakers of English.* Ann Arbor, MI: The University of Michigan Press.

Swales, J.M., & Feak, C. (2009). *Abstracts and the writing of abstracts.* Ann Arbor: The University of Michigan Press.

Swales, J.M., & Feak, C. (2012). *Academic writing for graduate students.* Ann Arbor, MI.: University of Michigan Press.

Tallerman, M. (2005). *Understanding syntax*. London: Arnold.

Taddio, A., Pain, T., Fassos, F.F., Boon, H., Iluersich, A. L., & Einarson, T.R. (1994). Quality of nonstructured and structured abstracts of original research articles in British Medicine Journal, The Canadian Medical Association Journal, and the Journal of the American Medical Association. *Canadian Medical Journal, 150*(10), 1611-1615.

Taylor, R.B. (2011). *Medical writing: A guide for clinicians, educators, and researchers*. New York, NY: Springer.

Williams, T. (1999). Results section of medical research articles. *English for Specific Purposes, 18*(4), .366-347

Articles references used in this study

Gargiulo, S., Greco, A., Gramanzini, M., Esposito, S., Affuso, A., Brunetti, A., & Vesce, G. (2012). Mice Anesthesia, Analgesia, and Care, Part I: Anesthetic Considerations in Preclinical Research. *ILAR Journal, 53*(1), E55-E69.

Lawrence, C., & Mason, T. (2012). Zebrafish Housing Systems: A Review of Basic Operating Principles and Considerations for Design and Functionality. *ILAR Journal, 53*(2), 179-191.

Raaijmakers, J., Tanenbaum, M., & Medema, R. (2013). Systematic dissection of dynein regulators in mitosis. *The Journal of Cell Biology, 201*(2), 201-215.

Sarkar, A., & Zohn, I. (2012). Hectd1 regulates intracellular localization and secretion of Hsp90 to control cellular behavior of the cranial mesenchyme. *The Journal of Cell Biology, 196*(6), 789-800.

Sikes, R., & Paul, E. (2013). Fundamental Differences between Wildlife and Biomedical Research. *ILAR Journal, 54*(1), 5-13.

Stavoe, A., & Colon-Ramos, D. (2012). Netrin instructs synaptic vesicle clustering through Rac GTPase, MIG-10, and the actin cytoskeleton. *The Journal of Cell Biology, 197*(1), 75-88.

Acknowledgement

Authors

Songsri Soranastaporn (Ph.D.) is an expert in English for Specific Purposes. She is the Coordinating Editor of the "Association News & Notes" column of Simulation & Gaming Journal, a Sage publication. She is the cofounder (2008) and the secretary general of the Thai Simulation and Gaming Association (ThaiSim), which invites scholars around the world to join its international conference every year (www.thaisim.org). She is the president of the e-Learning Association of Thailand (e-LAT), and the International Conference on Computers in Education (ICCE). See songsrisora.wordpress.com.

E-mail: songsri.ts@gmail.com

Chaniporn Bhoomanee graduated from University of Phayao majoring in English of the Faculty of Liberal Arts. She graduated in Master's degree in Applied Linguistics, Mahidol University. She is interested in corpus linguistics and English for Specific Purpose.

E-mail: chaniporn.bh@gmail.com