Syntactic Structures and Rhetorical Functions of Electrical Engineering, Psychiatry, and Linguistics Research Article Titles in English and Persian: A Cross-linguistic and Cross-disciplinary Study

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Abstract

A research article (RA) title is the first and foremost feature that attracts the reader's attention, the feature from which she/he may decide whether the whole article is worth reading. The present study attempted to investigate syntactic structures and rhetorical functions of RA titles written in English and Persian and published in journals in three disciplines of Electrical Engineering, Psychiatry, and Linguistics. To this end, 750 English and 750 Persian RAs were randomly selected from reputable English and Persian journals in these fields and syntactic structures of their titles were analyzed based on Dietz's (1995) taxonomy. The results revealed that, despite some similarities, there were some cross-linguistic and cross-disciplinary differences in title structures. The differences were found in title components and title length and style. Generally, English titles were shorter in length than Persian ones. Psychiatry titles were the longest, whereas Linguistics ones were the shortest. Although the majority of titles were single-unit ones, English authors used multiple-unit titles more than Persian ones. Multiple-unit titles were also employed the most in Linguistics RAs. No significant difference was found regarding combinations of multiple-unit titles in the two languages; however, topic-description combinations were the most frequent in Electrical Engineering and Linguistics titles, whereas topic-method ones were the most popular in Psychiatry titles. Moreover, the post-modified nominal group construction was the most frequent syntactic structure across single-unit titles. Such

findings can contribute to the developments of English for Specific Purposes and provide some information about Persian and English RA titles structures in different disciplines.

During the last three decades, titles and their characteristics in different genres (e.g. dissertations, research articles, review papers, etc.) have attracted the majority of researchers' attention (Jalilifar, Hayati, & Namdari, 2012). Genre-based analysis has been mainly derived from discourse analysis and extensively used in the field of English for Specific Purposes (ESP) (Bhatia, 2008; Dudley-Evans, 1994; Swales, 1990). Jalilifar (2010a) argues that ESP researchers conduct studies on different genres to identify and analyze their structures and genre analysts attempt to relate textual findings to features of the discourse community within which a genre is produced. However, among various genres, the research article (RA), as Peacock (2002) asserts, has received a great deal of attention by genre analysts mainly due to its importance for the circulation of academic knowledge. Researchers, therefore, have examined structures of different sections of RAs such as abstracts, introductions, methods, and so on. Titles, like other RA sections, have received attention particularly because of being identity labels of texts (Jalilifar, 2010a). Although titles are the smallest element of any RAs, they are one the most important parts of any RAs which play a crucial role in creating identity for any academic texts, indicating RAs' main contents, and convincing the readers to read the whole texts (Cheng, Kuo, & Kuo, 2012; Jamali & Nikzad, 2011; Salager-Meyer & Ariza, 2013). Moattarian and Alibabaee (2015) succinctly claim that the better a title of a text is, the more easily readers can decide to read the whole text. As a large number of RAs are published every year in every scientific discipline and they compete with each other to be read, titles have also an important role to play in the marketing of the article (Jamali & Nikzad, 2011). Day (1994) believes that titles are first impressions and they have

to be well presented since first impressions are strong ones. In addition, titles, as Soler (2007) points out, help searchers scan in libraries, catalogues, periodical indexes, references, databases, and tables of contents of edited books, reports, and proceedings. Accordingly, search engines search on the basis of keywords and they will fail to find a relevant article if the title does not contain those particular keywords (Moore, 2010).

Basically, Yitzhaki (1994) argues that titles aim to draw readers' attention to a paper and to mirror its content from a short glimpse, thus allowing readers to decide whether the paper deserves further reading. To this end, titles ought to attract as well as inform the reader as much as possible in only a few words. Swales and Feak (1994) claim that when a title represents the scope of the research, introduces the topic of the research, and is self-explanatory, its informativeness and attractiveness will increase. Having these qualities together, however, makes composing a title more challenging (Kane, 2000); consequently, Manten and Greenhalgh (1977) argue that many novices fail to choose an appropriate title for their RAs. On the other hand, Jalilifar (2010b) maintains that the problem of composing a title may be worse for graduate students because there are not enough guidelines for writing a title, and so students might generalize the suggestions to write titles for their own papers. Furthermore, considering the huge task of writing a RA, graduate students might overlook title writing or take it for granted.

Additionally, this problem will become even much worse if the author has to compose a title in a language other than her native language. Since a large number of RAs are written in languages other than English and due to the different nature of various languages, writing a RA in English would be a challenging task for nonnative scientists (Kanoksilapatham, 2007). For instance, the majority of foreign authors, including Iranians, need to write their academic RAs in English if they wish to publish their works in internationally reputable and even local journals. Talebinezhad, Arbabi, Taki, and Akhlaghi (2012) hold that academic writing is increasingly becoming a topic of much concern and

importance today. They opine that composing a RA appears to be a way to disseminate the scientific achievements, to criticize the other's works and more importantly to become a member of a discourse community; thus, it is important to know how to write an article to be accepted for publication in leading journals. To this end, linguists (e.g., Bhatia, 1993; Swales, 1990) have offered some conventions, constructions and guidelines to achieve a unified structural function in English RAs (Talebinezhad et al., 2012). Particularly, when novice authors intend to compose RAs whether in English or their native languages, one topic worth considering is their titles. It seems to be necessary to provide novices with information about how to compose the first and foremost section of RAs (i.e. titles) both in English and their native languages. This may help English as a Second/Foreign Language (ESL/EFL) learners as well as ESP students improve their writing ability in this area.

Although composing a RA title appears to be simple at first glance; Nagano (2015) claims that developing an appropriate and effective title is more important and challenging than it may appear at first glance. Dudley-Evans (1984) believes in a prescriptive approach to teaching titles to nonnative speakers of English, by examining in-depth the various aspects of titles. Besides, those foreigners who particularly wish to understand and/or produce Persian RA titles should pay attention to different aspects governing titles in Persian. There would be some similarities and differences between Persian and other languages like English with respect to the characteristics of RA titles. Jalilifar (2010b) asserts that one way through which title writing can be enhanced is by analyzing RA titles of reputable journals, published as they are under strict requirements and after careful scrutiny. This would make them a reliable source for student researchers.

At the same time, ESP research has also indicated significant differences among disciplines in terms of the way in which their academic writing is constructed. Such differences can be found behind various linguistic and rhetorical features used by researchers from different disciplines (see, for example, Soler, 2007). Therefore, cross-

disciplinary studies are needed to examine existing similarities and differences of disciplines' language and cross the boundaries of disciplinary research in ESP studies (Moattarian & Alibabaee, 2015). RA titles, in particular, as Nagano (2015) states, are influenced by the discipline of the research being reported. Nagano believes that just as disciplinary conventions place constraints on the construction of different sections of RAs such as abstracts and introductions, they also provide a set of options for title design.

Among various aspects of RA titles, syntactic structures play a significant role to effectively present the distinctive content of the RAs; hence, it is essential for novice writers to know the syntactic structures of good titles (Cheng et al., 2012). In other words, according to Jamali and Nikzad (2011), there would be several factors affecting the impact of an article, including the significance and availability of the journal in which it is published, publication type, its subject, its author(s), its length and so forth. The title of an article is also one of these factors and there might be a relationship between title contents and syntactic structures and subsequent article citations and downloads. Such importance has made researchers investigate syntactic structures of titles in detail.

A number of studies, as Cheng et al. (2012) introduced, have been so far conducted to examine titles syntactically focusing on the title length (e.g., Anthony, 2001; Haggan, 2004; Yitzhaki, 1994, 2002), structural constructions of titles (e.g., Haggan, 2004; Wang & Bai, 2007), titles in different genres (e.g., Hamp-Lyons, 1987; Soler, 2007), titles in different disciplines (e.g., Buxton & Meadows, 1977; Moattarian & Alibabaee, 2015; Nagano, 2015), and titles in different languages (e.g., Soler, 2007). Since the present study focuses on syntactic structures of only RA titles across different disciplines and languages, now it reviews only some relevant works, among others, as follows.

Researchers who adopted cross-disciplinary approaches to investigate syntactic structures of RA titles reported some differences in their structures from different disciplines. Buxton and Meadows (1977) were among first researchers who studied the structures of RA titles from

different disciplines. They found some differences in RA titles from natural and social sciences. Elsewhere, Nagano (2015) attempted to identify the structures of RA titles published in prestigious journals in different disciplines. The results showed that compared with the soft sciences, the hard sciences tended towards titles with more words, fewer multi-unit titles, more titles consisting of noun phrases, a higher substantive word rate, and lower use of 'the' to start a title unit. In their study, Moattarian and Alibabaee (2015) investigated syntactic structures used in RA titles in three disciplines of Applied Linguistics, Dentistry, and Civil Engineering and found that although there were some similarities in title structures, there were some discipline specific differences in title components, length, and style. These differences reflected the academic conventions of title construction in different disciplines.

On the other hand, despite some cross-linguistic studies on different sections of RAs such as abstracts (e.g., Busch-Lauer, 1995), there is still a paucity of research adopting cross-linguistic approaches to investigate similarities and differences of RA titles from two or more languages. Soler (2007), among few examples, studied the structural construction of titles in English and Spanish in RAs and review papers in the biological and social sciences. Findings showed the prevalence of nominal-group titles as a linguistic strategy of scientific discourse rather than as a disciplinary, generic or language characteristic; the frequency of full-sentence construction in RA titles of the biological sciences; the predominance of RA compound titles in the social sciences, and more flexibility of Spanish in the use of punctuation marks for the division of this title type; and statistically significant differences in the length of RA titles in terms of discipline and language.

Particularly, according to Marefat and Mohammadzadeh (2013), there have also been a relatively few researchers who have come across cross-linguistic studies involving different RA sections in English and Persian. Although some researchers have examined RA sections such as abstracts written in English and Persian (e.g., Marefat &

Mohammadzadeh, 2013), to the best of the authors' knowledge, there has been no research comparing syntactic structures of RA titles in English and Persian.

As seen above, a plethora of research has been conducted to investigate various sections of RAs from different aspects, such as syntactic features, across different disciplines and/or different languages? However, despite the primary role of RA titles playing for scientific researchers to decide whether to read the full article or put it aside, there still seems to be little, if any, cross-disciplinary and cross-linguistic research on the syntactic structures of RA titles written in English and Persian in different disciplines.

Taking the above-discussed issues into consideration, the researchers found out that cross-disciplinary and cross-linguistic research on syntactic structures and rhetorical functions of RA titles needs to be expanded. To do so, the present study aims to investigate major similarities and differences of syntactic structures and rhetorical functions of RA titles written in English and Persian and published in internationally and locally prestigious journals in the three different disciplines of Electrical Engineering, Psychiatry, and Linguistics as hard, medical, and soft sciences. Furthermore, the researchers hope that the findings of this study can make novices trying to compose RAs, Persian students aiming to publish their RAs in leading journals, and foreigners wishing to comprehend and/or produce RAs in Persian aware of syntactic differences and similarities in Electric Engineering, Psychiatry, and Linguistics RA titles written in English and Persian. ESP instructors presenting academic writing course can also use the findings of the study to provide students with syllabi and materials containing useful guidelines for helping them compose their own appropriate RA titles.

To reach this goal, the present study addresses the following research question:

RQ: Is there any difference in the syntactic structures and rhetorical functions of RA titles written in English and Persian and published in

reputable journals in the three different disciplines of Electrical Engineering, Psychiatry, and Linguistics?

Method

The Corpus

The present study was a descriptive corpus study focusing on both English and Persian RAs in three fields of Electrical Engineering, Psychiatry, and Linguistics. The reason behind such selection was that these disciplines are situated on a continuum between the two extremes of soft and hard sciences, just as Hyland (2000) believes in a continuum rather than a dichotomy of being hard or soft sciences.

The corpus of the study consisted of 1500 RA titles randomly selected from English and Persian journals in the three disciplines: 250 English RAs from *Computers and Electrical Engineering*, 250 Persian RAs from *Journal of Iranian Association of Electrical and Electronics Engineers* in Electrical Engineering, 250 English RAs from *The Canadian Journal of Psychiatry*, 250 Persian RAs from *Iranian Journal of Psychiatry and Clinical Psychology* in Psychiatry, 250 English RAs from *Language,* and 250 Persian RAs from *The Language Related Research* in Linguistics. It has to be noted that the mentioned English journals in the three disciplines were selected mainly due to the fact that they are internationally prestigious, authoritative and reputable journals, based on their impact factors (i.e., 0.817, 2.551, & 1.886, respectively), and indexed in high credit websites such as Elsevier and Sage. Furthermore, the selected Persian journals are also indexed in Islamic World Science Citation Center (ISC). As a consequence, RAs published in these journals can appropriately represent the status quo of English and Persian ones in these disciplines. In order to mitigate the effect of changes which might be due to the change of language use during the time, all selected articles were published in a five-year period (2010-2015).

Instruments and Procedures

This corpus-based study attempted to analyze syntactic structures of RA titles from the three different disciplines of Electrical Engineering, Psychiatry, and Linguistics written in English and Persian and published in reputable journals between 2010 and 2015. This study employed a framework proposed by Dietz (1995, as cited in Busch-Lauer, 2000) to analyze the following syntactic features of RA titles:

  1) title length (number of words)
  2) title style (single-unit or multiple-unit)
  3) title unit structure (syntactic structure)

This taxonomy not only focuses on different title components, but also on title length and different title styles; as a result, it enabled the researchers to have a more detailed look at functional and rhetorical aspects of using different syntactic structures in titles.

Title length. The length of titles was measured in number of words. Words were considered as strings of letters preceded and followed by spaces or punctuation marks; therefore, capitalized abbreviations and hyphenated compounds were considered as a single word. For instance, the title *Bandwidth-efficient cooperative MIMO relaying schemes* was regarded as a five word title. Microsoft Word was used to count words in each title to measure the length of titles written in English and Persian in the three disciplines.

Title style. The constituent parts of titles were considered to recognize the title style. Titles can be made of a single unit, two, or more units. Syntactic structures of the titles were considered to analyze the components of titles. Specifically, the instances of each structure were identified and counted. Since syntactic structures in each constituent part of a multiple-unit title can be different, single-unit and multiple-unit titles were analyzed separately. So, in the results section, the numerical analysis of the data was carried out in two separate sections of single-unit and multiple-unit titles. To closely investigate the rhetorical relationship between the constituent elements of the multiple-unit tittles, this study also employed Anthony's (2001) classification of compound

constructions. Anthony classified compound constructions into the following five major types:

a) Name-description titles introduce a name in the first unit and describe it in the second one (e.g., _DeFFS: Duplication-eliminated flash file system_).

b) Description-name titles firstly give a description and then its name.

c) Topic-Description titles present the main topic in the first part and the specific description in the second one (e.g., _Wait Time Impact of Co-Located Primary Care Mental Health Services: The Effect of Adding Collaborative Care in Northern Ontario_).

d) Topic-Scope titles introduce the main topic in the first part and the scope of the study such as the nature and number of subject of study in the second one (e.g., _Predicting syntax: Processing dative constructions in American and Australian varieties of English_).

e) Topic-Method titles display the main topic in the first unit and the research methodology used in the study in the second one (e.g., _Sexual Orientation and Gender Identity in Youth Suicide Victims: An Exploratory Study_).

Title unit structure. Single-unit titles can be classified as nominal, verbal, prepositional, and adjectival/adverbial syntactic constructions.
a) Nominal structure

Halliday (1994, 1998) maintains that the authors can pack more lexical content in a nominal title, which mainly depends on using modifiers. The heads in nominal titles usually function to inform readers of the general focus of study and they often need further specification (Wang & Bai, 2007). The four following titles are good examples of different kinds of nominal constructions in this study:

Pragmatics and grammar (unmodified)

Modified self-shrinking generator (Pre-modified)

A usage-based theory of grammatical status and grammaticalization (Post-modified)

Regional and Individual Influences on Use of Mental Health Services in Canada (Pre- & post- modified)

b) Verbal structure

Verb phrase titles are divided into two major categories: the V-ing phrase titles and full-sentence titles illustrated in the following examples, respectively:

> *Exploring a 'Pragmatic Ambiguity' of Negation*
> *Is an icon iconic?*

c) Prepositional structure

A prepositional title starts with a preposition which is followed by its grammatical object (e.g., *On the grammar of a Senegalese drum language*).

Results and Discussion

Title Length. The first and common question asked by novices is probably about the number of words in the title. Table 1 indicates the number of title words (NoW), the number of titles (NoT), and the average number of words per title (ANoW) in English and Persian in the fields of Electrical Engineering (EE), Psychiatry (P), and Linguistics (L).

Table 1

Title Length across Different Disciplines and Languages

	English				Persian			
	EE[1]	P[2]	L[3]	Total	EE	P	L	Total
NoW[4]	2517	3513	2405	8435	3764	3032	2986	9782
NoT[5]	250	250	250	750	250	250	250	750
ANoW[6]	10.06	14.05	9.62	11.24	15.05	12.12	11.94	13.04

1. Electrical Engineering   2. Psychiatry
3. Linguistics   4. the number of title words
5. the number of titles   6. the average number of words per title

As illustrated in Table 1, English Electrical Engineering RA titles were noticeably shorter than their Persian counterparts. In fact, there were 2517 words in English titles and, on average, there were 10.06 words in each title, whereas there were 3764 words in Persian titles and,

on average, there were 15.05 words in each title. The range of average number of words in two languages was 4.99.

Moreover, English Linguistics RA titles were shorter than Persian ones; in fact, there were 2405 words in English titles and, on average, there were 9.62 words in each title, whereas there were 2986 words in Persian titles and, on average, there were 11.94 words in each title. The range of average number of words in two languages was 2.32.

On the other hand, English Psychiatry RA titles were longer than ones. There were 3513 words in English titles and, on average, there were 14.05 words in each title, whereas there were 3032 words in Persian titles and, on average, there were 12.12 words in each title. The range of average number of words in two languages was 1.93.

Since the titles were not very long, on average, English titles were made of 11.24 and Persian ones 13.04 words, it can be argued that these differences between two languages, especially in Electrical Engineering (4.99 words), should be taken into serious consideration. In other words, it can be inferred that title length could be regarded as a cross-linguistic feature. On average, Persian titles were longer than English ones except in Psychiatry titles. The range of average number of words in two languages from the three disciplines was 1.84.

At the same time, from cross-disciplinary perspective, English titles in Linguistics were the shortest in length compared to those of Electrical Engineering and Psychiatry. The range of average number of words in three disciplines was 4.43. Persian titles in Linguistics were also the shortest in length compared to the titles in other two disciplines. The range of average number of words in the three disciplines was 3.11. These differences among the discipline title lengths should be considered and they revealed that title length could be seen as a cross-disciplinary distinct feature.

This finding corroborates Swales and Feak's (1994) and Moattarian and Alibabaee's (2015), reporting that title length is dependent on the discipline and it is considered as a disciplinary feature. In addition, this lends support to Soler's (2007) and Nagano's (2015) findings, revealing

that titles of hard sciences tended to be longer than those of soft sciences. One reason behind this fact is that Psychiatry authors, for example, need to specify their general topics as well as research elements such as their scope and methodology in their titles (e.g., *A Population-Based Study of Antipsychotic Prescription Trends in Children and Adolescents in British Columbia, from 1996 to 2011*) more than Linguistics authors. Goodman (2000) claims that there is evidence that doctors sometimes make clinical decisions from the titles of journal articles. Many linguistics titles, however, include little, if any, information about research methodology (e.g., *The structure of lexical meaning: Why semantics really matters*?). That would be a reason why Linguistics titles were the shortest but Psychiatry titles were the longest.

Title style. Another concern of the present study was to measure the number of units each title was made up of. Titles can be single-unit or multiple-unit titles. If the whole title is presented in only one part, it is a single-unit title, whereas if the title is presented in more than one unit linked by an appropriate punctuation mark, it is a multiple-unit title. The most frequently used form of multiple-unit titles is two unit titles linked by a colon (e.g., *Syntactic variation: The dialects of Italy*).

The distribution of English and Persian titles across the disciplines in two different styles is presented in Table 2. As shown in Table 2, single-unit titles (S) were used much more frequently than multiple-unit titles (M) in both English and Persian Electrical Engineering RAs, accounting for 95.2% and 98.4% of the total titles (T), respectively. At the same time, it can be seen that multiple-unit titles were employed more in English Electrical Engineering RAs than in Persian ones, making up 4.8% and 1.6%, respectively. However this difference was not big enough to consider seriously.

Similarly, the distribution of English and Persian Psychiatry titles in two different styles suggested that single-unit titles were used much more frequently than multiple-unit titles in both English and Persian, amounting to 61.2% and 82.8%, respectively. However, multiple-unit titles were more common in English Psychiatry RAs than in Persian ones, making up 38.8% and 17.2%, respectively.

This finding is in harmony with Moattarian and Alibabaee's (2015) and Nagano's (2015), revealing that the most frequent title style used by

authors is a single-unit title. However, such finding is in contradiction with Haggan's (2004), who reported that multiple-unit titles are the common style of titles.

On the other hand, English authors employed multiple-unit titles more frequently than single-unit ones in Linguistics RAs, accounting for 57.2% and 42.8%, respectively. However, their Persian counterparts used single-unit titles more than multiple-unit ones, accounting for 68.8% and 31.2%, respectively.

Table 2

Title Style across Different Disciplines and Languages

			Single-unit titles	Multiple-unit titles	Total titles
Electrical Engineering	English	f	238	12	250
		%	95.2	4.8	100
	Persian	f	246	4	250
		%	98.4	1.6	100
	Total	f	484	16	500
		%	96.8	3.2	100
Psychiatry	English	f	153	97	250
		%	61.2	38.8	100
	Persian	f	207	43	250
		%	82.8	17.2	100
	Total	f	360	140	500
		%	72	28	100
Linguistics	English	f	107	143	250
		%	42.8	57.2	100
	Persian	f	172	78	250
		%	68.8	31.2	100
	Total	f	279	221	500
		%	55.8	44.2	100

1. single-unit titles   2. multiple-unit titles   3. total titles

The difference in the frequency of multiple-unit titles between the two languages may be partially attributed to the issue that English authors try to provide more detailed information and prefer to narrow down the scope of the study in titles (e.g., *Are Antipsychotic Prescribing Patterns Different in Older and Younger Adults?: A Survey of 1357*

Psychiatric Inpatients in Toronto). It was found that most Persian titles were less detailed, informative, and narrow than English ones (e.g., *Predictors of Obsessive-compulsive Symptoms in Students).* Using single-unit titles and being less detailed could cause Persian title to be also shorter in length than their English counterparts.

Another difference between multiple-unit titles in these two languages was related to how two or more units were separated. Analyzing punctuation marks used in Linguistics titles, for example, revealed that although both English and Persian authors employed the colon to link units of titles the most, the latter used a variety of punctuation marks. In fact, Persian Linguistics units of titles were linked by colons (60.25%), parentheses (25.64%), semi colons (10.25%), and commas (3.84%), whereas English ones were linked by colons (97.90%), commas (1.39%), and parentheses (0.69%). Jalilifar (2010b) and Salager-Meyer & Ariza's (2013) findings are in line with this finding that colons were the most used marks as the linking device. However, most of the multiple-unit titles came in two units in which the first unit provided general information about the study, while the second shared more details about the scope and methodology of the study. This is in consistency with Nagano's (2015) finding that most multiple-unit titles were composed of two units.

At the same time, from cross-disciplinary perspective, there was a significant difference between the three disciplines with respect to title style. Only a few titles in Electrical Engineering made use of a multiple-unit style (3.2%), whereas 28% of Psychiatry title were multiple-unit ones. Multiple-unit titles were used by Linguistics authors the most (44.2%). This difference indicated that title style could play a distinguishing role among the disciplines RAs and that structural variation could be probably caused by discipline influences.

This lends credence to Cheng et al. (2012), Hartley (2007), Jalilifar (2010b), and Jalilifar, Hayati, and Mayahi's (2010) findings that multiple-unit titles are more common in the disciplines of humanities, in general, and in Linguistics, in particular, than any other grammatical construction.

However, this finding contradicts those of Haggan (2004) and Soler (2007), suggesting that only one third of the Linguistics titles in their corpora used this structure.

The reason why multiple-unit titles were more frequently used by Linguistics and Psychiatry authors is probably that this structure allows them to indicate the relationships among a number of key elements such as participants, data sources, scope, and methods. They have to consider all of the elements in their titles; thus, in addition to general topics introduced in the first part, they bring specific aspects of research in the second part (e.g., *The role of lexical frequency in syntactic variability: Variable subject personal pronoun expression in Spanish*).

Rhetorical Combinations of Multiple-unit Titles

An important aspect of multiple-unit titles is the rhetorical relationship between the constituent elements of such titles. Table 3 displays these rhetorical combinations, Name-description (ND), Description-name (DN), Topic-scope (TS), Topic-method (TM), and Topic-description (TD), of multiple-unit titles from the disciplines in two languages.

Table 3

Rhetorical Functions in Multiple-unit Titles across Different Disciplines and Languages

			ND[1]	DN[2]	TS[3]	TM[4]	TD[5]	T[6]
Electrical Engineering	**English**	**f**	3	0	0	2	7	12
		%	25	0	0	16.6	58.3	100
	Persian	**f**	1	0	0	1	2	4
		%	25	0	0	25	50	100
	Total	**f**	4	0	0	3	9	16
		%	25	0	0	18.7	56.2	100
Psychiatry	**English**	**f**	0	0	15	43	39	97
		%	0	0	15.4	44.3	40.2	100
	Persian	**f**	0	0	5	24	14	43
		%	0	0	11.6	55.8	32.5	100
	Total	**f**	0	0	20	67	53	140
		%	0	0	14.2	47.8	37.8	100

			ND[1]	DN[2]	TS[3]	TM[4]	TD[5]	T[6]
Linguistics	**English**	**f**	1	0	38	8	96	143
		%	0.6	0	26.5	5.5	67.1	100
	Persian	**f**	0	0	7	35	36	78
		%	0	0	8.9	44.8	46.1	100
	Total	**f**	1	0	45	41	132	221
		%	0.4	0	20.3	18.5	59.7	100

1. name-description titles 2. description-name titles 3. topic-scope titles
4. topic-method titles   5. topic-description titles 6. total multiple-unit titles

As Table 3 illustrates, despite minor differences, there were similarities between English and Persian Electrical Engineering titles regarding their rhetorical combinations. Topic-description combinations were employed by both English and Persian authors the most, accounting for 58.3% and 50% of the total multiple-unit titles, respectively, whereas description-name and topic-scope were never used by them.

There were also similarities between the rhetorical combinations of English and Persian Psychiatry titles, in spite of minor differences. In fact, both English and Persian Psychiatry researchers used topic-method combinations the most, amounting to 44.3% and 55.8%, respectively. However, they never used name-description and description-name combinations in their titles.

In addition, both English and Persian Linguistics authors tended to use topic-description combinations the most, making up 67.1% and 46.1%, respectively. However, Persian authors used more topic-method combinations than English ones did, amounting to 44.8% and 5.5%, respectively. On the other side, English authors took precedence over Persian ones in use of topic-scope combinations (26.5% vs. 8.9%).

Considering the constituent parts of multiple-unit titles in the two languages suggested that rhetorical combinations used by both English and Persian authors, despite minor differences, were almost similar. However, they varied across the disciplines. While topic-description combinations were used in Electrical Engineering and Linguistics titles the most (56.2% and 59.7%, respectively), topic-method combinations were used in Psychiatry titles the most (47.8%). At the same time,

Electrical Engineering authors never employed description-name and topic-scope combinations, Psychiatry authors never utilized name-description and name-description combinations, and Linguistics authors never used description-name and used name-description combinations the least (0.4%).

Such a finding corroborates that of Moattarian and Alibabaee's (2015), finding that medical titles used topic-method frequently but never used name-description and description-name styles. Moreover, it supports Cheng et al.'s (2012) finding that topic-description combination was popular in Linguistics titles. However, this can be in conflict with Anthony's (2001) finding that topic-description combination titles had a low frequency in computer science as a hard science.

The high frequency of topic-description by both English and Persian Electrical Engineering and Linguistics authors is attributed to the fact that they often need to introduce their main research topics accompanied by explanations about how they are addressed in their studies (e.g., *Verb phrase ellipsis: The view from information structure*). The popularity of topic-method between English and Persian Psychiatry authors is also because of their preference for introducing their general topics first and then the way through psychiatric phenomena are investigated (e.g., *Characterizing Suicide in Toronto: An Observational Study and Cluster Analysis*).

A difference among the disciplines regarding rhetorical combinations of their titles is that Psychiatry and Linguistics authors tended to use topic-scope combinations (14.5% and 20.3%, respectively), whereas Electrical Engineering authors never used them. This difference might be related to the fact that Psychiatry needs to study phenomena individually and particularly from different perspectives to find the solutions of psychiatric problems. Sometimes, it needs an interdisciplinary view to consider social, cultural factors affecting a phenomenon. Therefore, to have precise titles, Psychiatry authors need to mention the scope of the study in their titles (e.g., *Pathways to Forensic Mental Health Care in Toronto: A Comparison of European, African*

Caribbean, and other Ethnoracial Groups in Toronto). Likewise, Linguists need to study a particular aspect of a particular language in a particular context; thus, they have to clearly specify such particularity in their titles (e.g., *The Interplay of Internal and External Factors in Grammatical Change: First-person Plural Pronouns in French*).

Last but not least difference is that Electrical Engineering authors employed name-description combinations (25%), whereas Psychiatry authors never and Linguistics authors rarely used them. Since Electrical Engineering research sometimes offers an innovative device, model, formula, etc., coined with a new name, it has to be presented in the first unit accompanied by a description in the second one (e.g., *LLACA: An adaptive localized clustering algorithm for wireless ad hoc networks*). This finding confirms Anthony's (2001), who reported that this title style is a discipline specific which characterizes the nature of research in hard sciences.

On the whole, examining title styles of different disciplines leads to the conclusion that most of these styles may be discipline-specific. Such a finding lends credence to Cheng et al's. (2012) and Moattarian and Alibabaee's (2015), suggesting that titles of different disciplines possess distinct rhetorical combinations realized through a specific structure for a specific community.

Syntactic Structures of Single-unit Titles

Interestingly, Table 4 indicates that the most frequently used syntactic structure in single-unit titles by both English and Persian authors across disciplines was the nominal group construction (N). Verbal (V) and prepositional (P) structures were rarely used. No incidence of adjectival/adverbial structures was found.

Table 4

Syntactic Structures of Single-unit Titles across Different Disciplines and Languages

			N[1]	V[2]	P[3]	T[4]
Electrical Engineering	**English**	**f**	217	16	5	238
		%	91.1	6.7	2.1	100
	Persian	**f**	246	0	0	246
		%	100	0	0	100
	Total	**f**	463	16	5	484
		%	95.6	3.3	1.03	100
Psychiatry	**English**	**f**	120	33	0	153
		%	78.4	21.5	0	100
	Persian	**f**	200	7	0	207
		%	96.6	3.3	0	100
	Total	**f**	320	40	0	360
		%	88.8	11.1	0	100
Linguistics	**English**	**f**	92	10	5	107
		%	85.9	9.3	4.6	100
	Persian	**f**	171	0	1	172
		%	99.4	0	0.5	100
	Total	**f**	263	10	6	279
		%	94.2	3.5	2.1	100

1. nominal titles   2. verbal titles
3. prepositional titles   4. total single-unit titles

As shown above, the most popular syntactic structure used in Electrical Engineering RAs titles both in English and Persian was the nominal structure, making up 91.1% and 100% of the total single-unit titles, respectively. No incidence of other structures was found in Persian titles, whereas verbal and prepositional structures were used by English authors, accounting for 6.7% and 2.1%, respectively. Similarly, the nominal structure was also used by both English and Persian Psychiatry authors the most (78.4% and 96.6%, respectively). However, no instance of prepositional and adjectival/adverbial structures in English and Persian titles was found. Moreover, English authors used the verbal structure more than Persian authors did (21.5% and 3.3%, respectively). English and Persian Linguistics authors also tended to employ the nominal structure the most, accounting for 85.98% and 99.41%, respectively.

However, Persian authors lagged behind English authors in use of verbal and prepositional structures (0% vs. 9.3% and 0.5% vs. 4.6%, respectively).

These findings support those studies reporting a very high percentage of nominal titles in RAs (e.g., Busch-Lauer, 2000; Cheng et al., 2012; Haggan, 2004; Jalilifar, 2010b; Moattarian & Alibabaee, 2015; Nagano, 2015; Soler, 2007; Salager-Meyer & Ariza, 2013; Wang & Bai, 2007). Such popularity is partially attributed to the fact that nominal constructions allow researchers to succinctly name general issues of RAs and make more informative and attractive titles in the shortest possible way. In a similar vein, from the functional-systemic view offered by Halliday (1994; 1998), nominalization helps writers provide a lot of information in a nominal group structure and create cohesion as well. That is why nominal titles are used frequently in academic writing.

From cross-linguistic perspective, Persian authors employed nominal structures more than English authors, whereas the latter used verbal and prepositional structures more than the former. One reason is that while some English authors tend to begin their titles with gerunds (e.g., _Teaching introductory graduate syntax_), Persian authors rarely use gerunds at the beginning of titles, but rather they use nominal groups. Besides, they scarcely prefer to have full sentences in their titles, whereas English authors sometimes use this structure (e.g., _What is really wrong with universal grammar?_). Another reason is that they seldom begin their titles with prepositions, whereas some English authors do (e.g., _Toward a Taxonomy of Projective Content_).

Comparing syntactic structures of titles across disciplines, on the other hand, it was indicated that Electrical Engineering and Linguistics authors took precedence over Psychiatry counterparts in the use of nominal structures (95.6%, 94.2%, & 88.8%, respectively). However, verbal structures were more popular among Psychiatry authors than Electrical Engineering and Linguistics ones (11.1%, 3.3%, & 3.5%, respectively). One reason behind such a difference among the disciplines is that Psychiatry authors tend to use full sentences especially questions

in their titles (e.g., *Does Early Emotional Distress Predict Later Child Involvement in Gambling?*) more than the other two disciplines.

Nominal Structures

Table 5 illustrates the frequency of Unmodified (U), Pre-modified (PR), Post-modified (PO), and Pre- and Post-modified (PP) constructions in nominal titles of disciplines in languages.

Table 5

Nominal Structures of Single-unit Titles across Different Disciplines and Languages

			U[1]	PR[2]	PO[3]	PP[4]	T[5]
Electrical Engineering	**English**	**f**	0	39	157	21	217
		%	0	17.9	72.3	9.6	100
	Persian	**f**	0	36	202	8	246
		%	0	14.6	82.1	3.2	100
	Total	**f**	0	75	359	29	463
		%	0	16.1	77.5	6.2	100
Psychiatry	**English**	**f**	1	12	70	37	120
		%	0.8	10	58.3	30.8	100
	Persian	**f**	2	19	162	17	200
		%	1	9.5	81	8.5	100
	Total	**f**	3	31	232	54	320
		%	0.9	9.6	72.5	16.8	100
Linguistics	**English**	**f**	8	16	65	3	92
		%	8.6	17.3	70.6	3.2	100
	Persian	**f**	3	21	141	6	171
		%	1.7	12.2	82.4	3.5	100
	Total	**f**	11	37	206	9	263
		%	4.1	14	78.3	3.4	100

1. unmodified titles   2. pre-modified titles   3. post-modified titles
4. pre- and post-modified titles   5. total nominal titles

Both English and Persian Electrical Engineering authors used post-modifiers the most (72.3% and 82.1%, respectively). Likewise, English and Persian Psychiatry authors employed post-modifiers the most (58.3% and 81%, respectively). They were also used the most by both English and Persian Linguistics authors (70.6% and 82.4%, respectively).

However, there were only a few instances of unmodified constructions in English and Persian titles generally.

Such findings confirm those of other studies (e.g., Jalilifar, 2010b; Moattarian & Alibabaee, 2015), reporting that post-modifiers were used more frequently than other nominal constructions. The structures of post-modifiers in the present corpus revealed that most of them were prepositional constructions, in line with Cheng et al.'s (2012) finding. One reason of such popularity of post-modifiers through the use of prepositional phrases is that this is one of the best possible ways of presenting information in an economical way. Haggan (2004) regards it as one of the academic writing features. Findings also provide further confirmation for Moattarian and Alibabaee's (2015), reporting that unmodified nominal constructions were used the least. Since the majority of the titles were nominal, the authors had to use modifiers to make these titles as informative as possible. Unmodified titles were too short and broad to provide readers with enough information (e.g., _Pragmatics and grammar_).

Comparing nominal constructions of titles in the two languages revealed that despite some differences, both English and Persian authors used post-modifiers the most, followed by pre-modifiers and pre- and post- modifiers, to compose nominal titles. In addition, both of them rarely used unmodified nominal constructions. It might be concluded that the patterns of nominal groups of titles are not a distinctive feature between titles in English and Persian.

On the other side, the three disciplines of Electrical Engineering, Psychiatry, and Linguistics authors employed post-modifiers the most, accounting for 77.5%, 72.5%, and 78.2%, respectively. Pre-modifiers, however, were the second most frequently used by Electrical Engineering and Linguistics authors (16.1% and 14%, respectively), whereas, pre- and post- modifiers were the second by Psychiatry authors (16..8%). In addition, unmodified titles were used by Electrical Engineering and Psychiatry authors the least (0% and 0.9% respectively), whereas pre- and post- modifiers were used by Linguistics authors the least (3.4%).

Verbal Structures

The second most frequent syntactic structures used by both English and Persian authors were verbal. The V-ing phrase (V) and full-sentence (F) titles constitute all of the verbal structures. Table 6 shows that all the verbal constructions in English Electrical Engineering titles were only V-ing phrases, and no title using verbal structures was found in Persian ones. It also indicates that 69.9% of verbal titles in English Psychiatry RAs were full-sentence titles, whereas 30.3% were V-ing phrases. However, V-ing phrases were more frequent than full sentences in Persian ones, making up 85.7% and 14.2%, respectively. In particular, there were 65.2% declarative sentences and 34.7% questions in all English full-sentence titles, whereas no incidence of questions was found in Persian ones and there was only one declarative sentence. The verbs in all full-sentence titles were in the present tense reflecting the authors' confidence in what they are reporting stands true for all time rather than for particular period of time (Haggan, 2004).

Furthermore, full-sentence titles were employed more than V-ing phrases by English Linguistics authors (60% and 40%, respectively), whereas no verbal structures were used by their Persian counterparts. Such finding contradicts that of Cheng et al. (2012), revealing that V-ing phrases were more popular than full sentences in Linguistics titles.

Table 6

Verbal Structures of Single-unit Titles across Different Disciplines and Languages

			F[1]	V[2]	T[3]
Electrical Engineering	English	f	0	16	16
		%	0	100	100
	Persian	f	0	0	0
		%	0	0	0
	Total	f	0	16	16
		%	0	100	100
Psychiatry	English	f	23	10	33
		%	69.6	30.3	100
	Persian	f	1	6	7
		%	14.2	85.7	100
	Total	f	24	16	40

			1	2	3
		%	60	40	100
Linguistics	English	f	6	4	10
		%	60	40	100
	Persian	f	0	0	0
		%	0	0	0
	Total	f	6	4	10
		%	60	40	100

1. full-sentence titles   2. V-ing titles   3. total verbal titles

As seen above, there was a big cross-linguistic difference between English and Persian titles with respect to the use of verbal constructions. Persian authors used full-sentence and V-ing titles less than English ones. There was only one instance of full-sentence title in Persian, whereas 29 of English titles were full-sentence ones. Moreover, Persian authors used 6 V-ing phrases in their titles, but English ones 30.

Comparing verbal structures of titles from different disciplines revealed that Psychiatry and Linguistics RAs were the same in terms of using full-sentence (60%) and V-ing (40%) titles; however, no incidence of full-sentence titles in Electrical Engineering RAs was found and only V-ing phrases constituted all of the verbal titles. Since V-ing phrases are used in titles to emphasize research process or activity in a short way, Electrical Engineering authors prefer to use them to present the main topic and research process simultaneously (e.g., *Improving chip multiprocessor reliability through code replication*).

This finding is in agreement with Cheng et al. (2012), Haggan (2004), Jalilifar (2010b), Jalilifar et al. (2010), Moattarian and Alibabaee (2015), and Soler's (2007), showing that authors do not use full-sentence title very frequently. Reasons would be behind the facts that first researchers often express their claims with caution, but this construction needs them to be certain, explicit, and direct about their findings. Second, they are reluctant to report the results immediately in titles, but rather they discuss them in their texts.

Prepositional Structures

Finally, according to Table 4, prepositional structures were rarely used as the initiating phrase in the titles. Only one instance of prepositional structures in Persian Linguistics, five in English Electrical Engineering, and five in English Linguistics titles were found. No incidence of these constructions was found in English and Persian Psychiatry titles. The low frequency of prepositional titles may be due to the fact that they are not informative enough to use in academic writing. Cheng et al. (2012), Haggan (2004), and Moattarian and Alibabaee's (2015) findings lend strong support to those of this study that prepositional structures, compared to other structures, were the least frequently used by researchers.

Conclusion

This corpus-based study aimed at investigating cross-linguistic and cross-disciplinary differences in RA titles in English and Persian from the three disciplines of Electrical Engineering, Psychiatry, and Linguistics. The findings of the study revealed that, despite some similarities, there were some specifically cross-linguistic and cross-disciplinary differences in RA titles structures. Generally, Persian titles were longer than their English counterparts. Psychiatry titles were the longest, whereas Linguistics ones were the shortest in length. Although the majority of both English and Persian titles were single-unit ones, English authors used multiple-unit titles more than Persian ones. Multiple-unit titles were also the most common in Linguistics RAs. Among various combinations of multiple-unit titles, topic-description ones were the most frequent in Electrical Engineering and Linguistics RAs, but topic-method ones were used the most in Psychiatry RAs. English and Persian authors used such combinations almost similarly. In addition, the most frequently used syntactic structure in single-unit titles across disciplines and languages was the post-modified nominal construction. However, verbal and prepositional titles were found in English more than Persian. Finally, Electrical Engineering and

Linguistics authors took precedence over Psychiatry ones in the use of nominal structures; However, they lagged behind Psychiatry in the use of verbal structures.

The study corroborates other studies' (see, for example, Cheng et al., 2012; Jalilifar, 2010b; Moattarian & Alibabaee, 2015; Nagano, 2015), finding that some syntactic structures are more preferable than others in RA titles from different disciplines in different languages. In other words, some structures may be more appropriate than their alternatives for a specific discipline in a specific language. Such preference clearly reflects language-specific and discipline-specific conventions of the nature of titles. However, it is necessary to consider that other factors, such as journal policies, can also influence title design.

Research on titles, as Jalilifar et al. (2010) assert, is useful since novices face difficulties understanding and/or composing them, and meeting the title requirements of the language, discipline, and genre in which they write. In fact, not only journals consider RA titles very seriously, but also readers decide whether to continue reading the text or put it aside by looking at the titles. Jalilifar (2010b) suggests that, in research writing courses, the syllabus should contain guidelines for title writing through which students experience different structures and learn how to write their own appropriate titles. To do so, genre analysts should focus on cross-linguistic and cross-disciplinary variation in relation to title design. The findings of the current study may shed light on syntactic structures and rhetorical combinations of both English and Persian RA titles in hard, medical, and soft sciences. They can also contribute to the developments of ESP in the way that ESP syllabus designers can develop ESP courses on discipline-specific structures of RA titles, ESP material developers can develop materials focusing on syntactic structures of titles in specific disciplines, and ESP instructors can increase their knowledge of title writing conventions in their specific disciplinary discourse communities and assist their ESP students to read, write, and finally become a member of such communities.

As any similar study, this study had some limitations. Although the study attempted to examine RA titles from as many different disciplines and languages as possible, the corpus of the study was limited in the number of disciplines and journals represented. More comprehensive corpora containing more RAs taken from a wider range of journals in different disciplines are needed to investigate title formulation. Examining 1500 English and Persian RA titles in three disciplines from only six journals made generalizations on title formulation more limited. Another limitation is that the study only investigated one particular section (i.e. titles) of RAs. Structures of other sections of RAs such as abstracts, introductions, methods, and so on should be also examined. In addition, the study was limited to the titles of one particular genre (i.e. RAs) among other genres, such as dissertations. Since some title structures may be genre specific, it seems necessary to investigate titles of other genres too. Hence, further research can be conducted at a larger scale and with a variety of disciplines from different journals in various languages regarding the structures of titles and other sections of RAs and other genres.

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