NOMINALIZATION IN APPLIED LINGUISTICS AND MEDICINE: THE CASE OF TEXTBOOK INTRODUCTIONS AND BOOK REVIEWS

ALIREZA JALILIFAR
Shahid Chamran University of Ahvaz, Iran
ar.jalilifar@gmail.com

SEYEDEH ELHAM ELHAMBAKHSH
Shahid Chamran University of Ahvaz, Iran
e.elhambakhsh@gmail.com

PETER R. WHITE
University of New South Wales, Australia
prr.white@unsw.edu.au

Abstract
Drawing on Systemic Functional Linguistics, this study explored variational use of nominalization in 600 textbook introductions and 200 book reviews in applied linguistics and medicine. The nominalized expressions were identified in the texts, the frequencies of the nominalization types were counted, and eventually a chi-square test was administered. Analysis of nominalization patterns across the different informational/promotional moves revealed divergent patterns in the two disciplines but insignificant differences across the genres in focus. The density of nominalizations was acknowledged in the applied linguistics introductions and book reviews. However, functional variations in the use of nominalizations were found only in the introductions. As for the proportion of nominalization to grammatical metaphor, results demonstrated a lower tendency towards nominalizing scientific information in the medicine corpus. Further research is needed to see how nominalization is exploited in other genres and other disciplines.

Keywords: book reviews, introduction, nominalization, systemic functional linguistics

1. Introduction

Over the last three decades, English for Specific Purposes (ESP) researchers have employed genre analysis extensively to examine a variety of academic genres including abstracts, presentations, lectures, theses, dissertations and textbooks and their related discourses (e.g., Bhatia, 1997, 2004; Bunton, 2002; Dudley-Evans, 1986; Hopkins and Dudley-Evans, 1988; Hyland, 2004; Hyon, 1996; Martin, Christie, and Rothery, 1987; Nwogu, 1997; Paltridge, 1997; Samraj, 2005; Swales, 2004; Thompson, 1994). While several studies have focused on

disciplinary writing (e.g., Brett, 1994; Holmes, 1997; Kuteeva, 2013; McCloskey, 1986; Peck MacDonald, 1990, 1992), other studies have explored particular sections of the research article (RA) or its overall structure cross-linguistically (see e.g., Coffin, Curry, Goodman, Hewings, Lillis and Swann, 2003; Hyland, 2009; Marefat and Mohammadzadeh, 2013; Martin, 2003). Many of the above academic genres begin by an introduction section wherein authors lay down their points of argument.

Introductory genres, which are conventionally used to introduce academic research articles and textbooks and their various manifestations, distinctly named as *introduction, foreword, preface, acknowledgement* and, occasionally, *trajectory*, *preamble* or *prologue*, have received prime attention in recent years (e.g., Abdollahzadeh and Salarvand, 2013; Bhatia, 1997; Jalilifar and Golkar Moosavi, 2016; Kuhi, 2008; Sorayyaei Azar, 2012; Zepetnek, 2010). Research into academic introduction sections of textbooks has not been prolific. Bhatia (1997) presented *book introductions* and *book prefaces* as different categories of *academic introductions,* arguing that the former fulfills an informative function while the latter fulfills both a promotional and an informative one. He finally acknowledged that one other purpose of all *academic introductions,* as an example of an interested genre, seems to be promoting the work, which even sometimes takes precedence over the original purpose (i.e., introducing the work).

Book reviews (as another focus of this study), on the contrary, are considered as a sub-genre (Bhatia, 1993: 21) or a member of the family of *review genres* (Giannoni, 2009). In terms of communicative purposes, review genres vary along a continuum extending from the most promotional (arguably blurbs (Bhatia, 2004; Cacchiani, 2007; Gesuato, 2004)) to the most critical (e.g., expert reviews). In book reviews, the purpose switches from endorsement to criticism, as the reviewer is a (supposedly neutral) third party acting as a gatekeeper on behalf of the academic community (Giannoni, 2009: 19). Book reviews, as examples of a disinterested genre, are defined as *promotional* (Bhatia, 1997, 2002; Lorés-Sanz, 2012) and *evaluative* (e.g., Gea Valor, 2000-2001; Groom, 2009; Hyland, 2004; Lorés-Sanz, 2012; Römer, 2005, 2008; Shaw, 2004, 2009; Tse and Hyland, 2009; Vassileva, 2010) and are meant to act as *critical windows* which open to the novelties and advances of a given discipline, and, in that sense, they may well contribute to the construction and development of disciplinary knowledge.

Valuable works on book reviews and introductory genres have brought an insight into their macro-structures and linguistic analyses. These studies, however, vary in their foci from disciplinary and cross-disciplinary variations to cross-linguistic differences of these genres and their micro-structure features. Given the variations of the introductory sections of textbooks and the importance attached to them as well as their seemingly close relationship with book reviews in presentation of an overview of the textbooks, the absence of more comparative research on micro-linguistic features in this regard is especially prominent. The fact that book reviews and most of the introductory sections of academic textbooks share at least one communicative purpose, that is to introduce the book in focus,

seemingly causes a considerable overlap, but some of them are sometimes appropriated by publishers to promote their product (Jalilifar and Golkar Moosavi, 2016).

It has been demonstrated that whereas textbook introductory sections seem to chiefly reinforce the positive aspects of the book, book reviews attend to both merits and demerits, looking at the book in focus with a critical mind from the outside (Alcaraz Ariza, 2010; Diani, 2007; Hyland, 2004; Hyland and Diani, 2009; Lindholm-Romantschuk, 1998; Motta-Roth, 1998; Salager-Meyer and Alcaraz Ariza, 2004). Given these functional differences, our assumption is that these aspects might partly transpire in the nominalizations used. Authors may experience confusion if they are not fully aware of genre tendencies and linguistic characteristics.

The inspiration for a comparative study of textbook introductions and book reviews comes from the need to determine how far the nominalization patterns are distinct in two disparate disciplines of applied linguistics and medicine, representing soft and hard sciences. There is, therefore, a pedagogical rationale for extending the analysis of the academic texts into a comparative study of nominalization use across two disciplines. The study hypothesizes that differences in nominalization use might become even more explicit when disciplinary tendencies also intervene, especially when the disciplines appear to be far from one another.

2. Theoretical framework of the study

This study is grounded in Halliday's (1994) systemic functional linguistics (SFL). SFL interprets language as interrelated sets of options for making meanings and seeks to provide a clear relationship between functions and grammatical systems (Halliday, 1994). Systemists focus on "how the grammar of a language serves as a resource for making and exchanging meanings" (Lock, 1996: 3). That is, SFL is concerned with the grammatical patterns and lexical items used in texts, as well as choices of those items. The grammatical domain of language is considered an important area of inquiry, an offshoot of which is studied under grammatical metaphor (Halliday, 1994). Grammatical metaphor is defined as "a substitution of one grammatical class, or one grammatical structure by another" (Halliday and Martin, 2005: 87). Specialized technical discourse cannot be created without deploying grammatical metaphor (Martin, 1990). In the area of grammatical metaphor, for any given semantic configuration, there will be some realization in the lexicogrammar—some wording—that can be considered congruent or unmarked; there may also be various others that are in some respect incongruent, "transferred" or "metaphorical" (Halliday,1994: 342).

In SFL, nominalization is connected to grammatical metaphor used to indicate a process or an attribute. Halliday and Matthiessen (1999) categorize grammatical metaphor into 13 types of which four types are classified as nominalizations, in

terms of semantic shifts involved in transforming the congruent into the incongruent form (i.e., adjective > noun, verb > noun, conjunction > noun, and preposition (al phrase) > noun).

As an aspect of complexity in written language (Halliday and Matthiessen, 2004; Heyvaert, 2003), nominalization is used for embedding as much information into a few words as possible. A nominalized structure like *I have found a lot of appreciation and greater acceptance abroad,* for instance, is thus viewed as the metaphorical counterpart of the clause *The scholars abroad have greatly appreciated and accepted the book*. In order to fully grasp the meaning of nominalization as an additional dimension of meaning, the identification and the analysis of both the metaphorical and the congruent realizations are essential (Halliday, 1994; Heyvaert, 2003).

The use of nominalization in scientific discourse has been the subject of a wide array of studies in recent years, for example, the historical origins of nominalization in scientific discourse (Banks, 2005), the realization of grammatical metaphor in modern prose fiction (Farahani and Hadidi, 2008), the contribution of verb-based nominalization to cohesion in 892 pages of history texts (Susinskiene, 2009), nominalization in the writing of undergraduate students (Baratta, 2010), and the role of nominalization in the English medical papers produced by native English speakers and Chinese writers (Wenyan, 2012). Other studies on nominalization in scientific discourse (e.g., Banks, 2003; Baratta, 2010; Halliday and Matthiessen, 1999, 2004; Ho, 2010; Jalilifar, Alipoor and Parsa, 2014; Martin, 1993; Sušinskienė, 2009, 2010; Wenyan, 2012) have also stressed the crucial role played by nominalization in the skillful orchestration of academic discourse. In fact, considering the frequency and usage of different types of nominalization, research on nominalization indicates variation in abstracts and in research articles (Holtz, 2009), in British newspaper editorials (Sušinskienė, 2010), in essay writings of undergraduate students (Baratta, 2010), in request e-mails (Ho, 2010), in business letters (Văn, 2011), in the discussion sections of medical research articles (Wenyan, 2012). Yet, we doubt how nominalization is realized in textbooks introductions and book reviews across disciplines. In other words, it is not clear how nominalization use is related to typological similarities and differences between medicine and applied linguistics as examples of hard and soft applied sciences. Nevertheless, the realization between discipline specificity, text scientificity, and nominalization has yet to be adequately examined. Furthermore, an understanding of the functional role and textual consequences of grammatical metaphor is essential for a full understanding of the meaning of any text.

Notwithstanding the aforesaid studies on nominalization from various angles, further research is required to find out disciplinary and genre specificity in the use of nominalization. Thus, this study seeks to investigate the variational use of nominalization in applied linguistics and medicine textbook introductions, prefaces, forewords and in book reviews. The analysis of these texts involves four steps: The first step of analysis identifies the frequency of nominalized

expressions and grammatical metaphors in each text. In the second step, different types of semantic shifts in the process of nominalization are determined. In the third step, the density of nominalization is examined. In th fourth step, the proportion of nominalization to grammatical metaphor in each genre is calculateded and the grammatical patterns of nominalization deployment are also illustrated in detail. Accordingly, the following questions stand out:

1. What are the grammatical functions of nominal expressions and their relative distributions in the sample English textbooks introduction sections and book reviews in applied linguistics and medicine, and how do the functions and their relative frequency of deployment compare?
2. What types of semantic shifts (i.e. quality, process, circumstance and relator) in the process of nominalization are frequently used in English applied linguistics and medicine textbooks introduction sections and book reviews, and how do the types and their relative frequencies compare?
3. Is there any significant difference in the density of nominalization use between English textbooks introduction sections and book reviews in applied linguistics and medicine?
4. What are the grammatical patterns of nominalization deployment and their relative distributions in the sample English textbooks introduction sections and book reviews in applied linguistics and medicine, and how do the patterns and their relative frequency of deployment compare?

3. Method

3.1. Selection of the disciplines

Following the experience of scientometricians and external experts, Glanzel and Schubert (2003) propose a two-level hierarchical classification scheme for three main discipline areas: *Sciences*, *Social Sciences*, and *Humanities*. Their two-level scheme includes 12 first-level fields and 60 second-level subfields of the Sciences, as well as three major fields and seven subfields for the Social Sciences and Humanities. Coffin, et al (2003) added one more major area—*applied versus pure disciplines*--and provided some representative examples for these four main discipline areas.

Acknowledging the complexity of demarcating disciplines, the present analysis rested on the most convenient way of grouping disciplines into four main areas: *Sciences*, *Social Sciences*, *Humanities/Arts*, and *Applied Disciplines* (Coffin, et al., 2003; Glanzel and Schubert, 2003). Figure 1 demonstrates a revision of Hyland's (2006) continuum, adding the hard applied seciences, which include disciplines such as medicine.

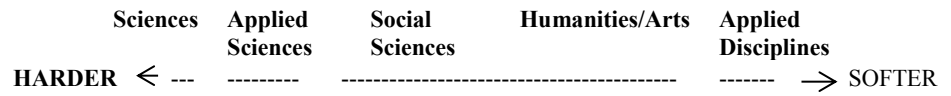

Figure 1. Continuum of disciplines (*Revised*)

Selection of the disciplines was motivated by the need to build a corpus representative of textbook introductions and book reviews in applied linguistics (closer to the soft end of the continuum) and medicine (closer to the hard end of the continuum). The motivation for selecting these disciplines as middle areas of science was to investigate representatives of two applied disciplines related to two major branches of science which can possess both similarities (due to the softer nature of applied disciplines) and differences (since each has a different tendency towards soft or hard sciences).

3.2. Selection of the textbook introductions

Three hundred English textbook introductions (100 samples from each variation of introduction, i.e., introduction, foreword, and preface) in each discipline were selected to allow comparisons across hard and soft applied sciences (a total of 600 samples). Textbook selection was to meet the following criteria:

i. The choice of textbooks was motivated by the need to control such variables as writer experience and expertise. The major criterion in selection was to include textbooks which were widely used in the syllabuses of applied linguistics and medicine courses in Iranian universities. Hence, a number of informants in each discipline were asked to recommend textbooks available in hard copies or those retrievable from downloadable databases that they considered as essential in their own field at two levels of BS/BA and PhD.

ii. To ensure the validity of analysis, textbooks written in English by English speaking authors were preferred.

iii. The selected corpus represented a span of 10 years (i.e., textbooks published in 2006-2016). The assumption was that a genre might change and evolve in response to changes in the communicative goals, as well as to "particular rhetorical needs" of the discourse community that regularly uses it (Abdollahzadeh, 2013: 424).

3.3. Selection of the book reviews

With regard to the selection of book reviews, initially, a list of applied linguistics and medicine journals publishing English language papers in the two disciplines was compiled. The major criteria guiding the identification of journals, from which book reviews in the corpus were taken, were reputation, accessibility, representativeness and dominance of the journals based on their impact factors, as

well as the period of publication of the book reviews. The criteria were shared with two independent applied linguistics experts and two independent medicine experts following panel discussions. The preliminary corpus for the pilot phase was drawn from the consented journals. The final corpus, consisting of 200 book reviews (100 from each discipline) was selected on the basis of stratified sampling procedure (see Table 1.). Similar to the introductions, selection of the reviews was restricted to a period of 10 years (2006-2016). Moreover, to qualify for the final corpus, all the book reviews had to be approximately 1000 words on average, to control length.

Table 1. Selected Journals in Medicine and Applied Linguistics

Applied Linguistics Journals	No. of BRs	Medicine Journals	No. of BRs
English for Academic Purposes	20	British Medical Journal	20
Second Language Writing	20	Annals of Otology, Rhinology and Laryngology	20
Language Teaching	20	Annals of Medicine and Surgery	20
Writing and Pedagogy	20	Annals of Emergency Medication	20
Studies in Second Language Acquisition	20	Asian Pacific Journal of Tropical Medicine	20
	167533		130335

3.4. Procedure

Prior to analyzing the data, the unit of analysis was assigned to be the clause complex. Clause complexes show "how the flow of events is construed in the development of text at the level of semantics" (Halliday and Matthiessen, 2004: 63). Eggins (2004) defines clause complex (i.e., parataxis and hypotaxis) as a "grammatical and semantic unit formed when two or more clauses are linked together in certain systematic and meaningful way" (p. 255). The clauses were coded in each text and the texts were coded in each genre, for instance, Bp. Med. #029 means text 029 which is a book preface in medicine. BI., BF., BR., and AL. stand for book introduction, book foreword, book review, and applied linguistics respectively.

One tricky and controversial category of nominals is gerunds. This study opts for consideration of gerunds denoting actions rather than situations as examples of verb > noun nominalization. Following Simon-Vandenbergen, Taverniers and Ravelli (2003: 82-83), this study assumed that as long as the gerund form can be

preceded by a premodifier, such as that of a possessive pronoun, it can be categorized as a nominal. However, in case the gerund only denotes modality, tense or process rather than action, it cannot be counted as nominalization.

In consideration for consistency in the analysis, those nouns which served as technical words in each discipline (e.g., *digestion* in medicine, and *competence* in applied linguistics) were excluded. As a further stage in the analysis, nominalization instances were tagged through querying for suffixes: nouns ending in the suffixes *-ity* and *-ness* were tagged as Type 1 (deriving from adjectives, originally realizing properties); nouns ending in the suffixes *-age* , *-al* , *-(e)ry*, *-sion / -tion*, *-ment*, *-sis*, *-ure*, -ing, and *-th* were tagged as Type 2 (deriving from verbs, originally realizing processes); and nouns not ending in suffixes were tagged through consulting dictionaries to find the related derivation from adjectives, verbs, prepositions, and conjunctions. Prepositional phrases metaphorically realized as nouns were tagged as type 3. Prepositional phrases often concern information about time and place; in other words, they deal with the circumstances of the events or states described in the text, hence called "circumstantial adjuncts" (Bloor and Bloor, 2004: 53). However, when they change into nouns metaphorically, they become the classifier of nominal groups. Consider the following nominalization instances derived from the corpus:

1. ...*fourteenth-century* recognition of the connection between... (BR. Med. #014)
2. Teachers' supervision and assessment of *day-to-day performances* of students… *(BI. AL. #89)*
3. The fourth type, nominalization of conjunction, which is congruently presented by a conjunction, is metaphorically realized by a noun functioning as a participant in the clause. The only pattern manifesting this type of nominalization was as follows:

4. This *Handbook* is aimed at a diverse range of professionals and *for this reason,… (BI. AL. #051)*

5. …*For this reason,* color printing has been used to make… (BR. Med. #037)

In the above examples, the entity *reason* is transferred from the relator *because.* In 3, for example, the element *reason* is the metaphorical realization of the clause *because this Handbook is aimed at….*

Having identified the frequency, type, and density of nominalizations in the texts as well as the proportion of nominalizations to grammatical metaphors, in the next stage of analysis, we extracted the patterns of nominalizations. The basis for extracting these patterns was Halliday's (2004) suggestion that lexical expansion of nominal groups is attributed to pre/post-modification: a class of *things* is specified by nouns; and categorization within the class is typically expressed by one or more functional words organized around it. These functional elements – Deictic, Numerative, Epithet, Classifier, and Qualifier – serve to specify *things* within "different systems of the system network of the nominal

group" (Halliday, 2004: 312). The classes of the words which typically realize these functions are illustrated in Figure 2:

Deictic	Deictic 2	Numerative	Epithet	Classifier	**Thing**	Qualifier
determiner	adjective	numeral	adjective	noun/ adjective	**Noun**	Prepositional phrase/ (in)finite clause

Figure 2. Experiential functions and word classes

After about one month interval, the data were re-examined, and discrepancies on the method of analysis were resolved. Considering coding reliability, the data were cross-checked by a linguist to verify the accuracy of categorization of strategies. Then, to calculate the amount of inter-coder and intra-coder reliabilities, Phi correlation was employed twice. The indices obtained were 0.94 and 0.83, respectively. What follows provides quantitative and qualitative analyses of the materials.

4. Results

To address the first and second questions raised in this study, word count was run and the data were normalized afterwards in order to be consistent in our analysis because the number of clauses in the introductions and book reviews was different. The nominalized expressions were, then, counted. A glance at Table 2 reveals that nominalized expressions in applied linguistics outrun the corresponding expressions in medicine in the respective texts:

Table 2. Nominalized Expressions across Disciplines and Genres

	Applied Linguistics				**Medicine**			
	Tb. Intros.	Tb. Pres.	Tb. Fors.	Br. Arts.	Tb. Inros.	Tb. Pres.	Tb. Fors.	Br. Arts.
	F (%)	F (%)	F (%)	F (%)	F (%)	F (%)	F (%)	F (%)
Nominalized expressions	16008 (8.07)	10431 (8.37)	9367 (9.13)	15796 (9.42)	12783 (6.26)	8971 (8.61)	6891 (6.89)	11321 (8.68)
Grammatical metaphors	17941	12765	11651	20981	14368	11509	8593	18524
Clauses	18310	11769	10976	16867	18735	9873	8441	12958
Total words	198314	124611	102528	167533	203977	104122	99983	130335

Note. Tb. Intros: Textbook Introductions; Tb. Pres.: Textbook Prefaces; Tb. Fors.: Textbook Forewords; Br. Arts.: Book Review Articles.

Table 2 demonstrates the total number of the nominalized expressions in the analyzed texts. These results reveal the proportion of nominalization instances to grammatical metaphors (i.e. 51602 nominals vis-à-vis 63338 grammatical metaphors in applied linguistics, and 39966 nominals vis-à-vis 52994 grammatical metaphors in medicine). The dominance of nominalization in the categories of grammatical metaphor evinces the valuable role that this strategy plays in formulating scientific discourse. In order to compare the use of nominalization (i.e., adjective to noun (=Type 1), verb to noun (=Type 2), preposition to noun (=Type 3), and conjunction to noun (=Type 4), with their different types of semantic shifts, i.e. quality, process, circumstance, and relator respectively) in detail, the frequency of each nominalized phrase was counted and they were put in appropriate categories (see Table 3):

Table 3. Semantic Shifts in the Use of Nominalized Expressions across Disciplines and Genres

1.	**Tb. Intros. (Applied Linguistics)**	**Tb. Intros. (Medicine)**			
	F(%)	F(%)	df	X^2	P value
Type 1	1021(6.37)	772(6.04)	1	277.64	0.000
Type 2	14460(90.32)	11453(89.59)	1	581.89	0.000
Type 3	482(3.01)	507(3.96)	1	105.58	0.000
Type 4	45(0.28)	51(0.39)	1	7.92	0.005
2.	**Tb. Pres. (Applied Linguistics)**	**Tb. Pres. (Medicine)**			
	F(%)	F(%)	df	X^2	P value
Type 1	752(7.20)	571(6.36)	1	329.93	0.000
Type 2	9249(88.66)	8128(90.60)	1	308.35	0.000
Type 3	411(3.94)	250(2.79)	1	247.49	0.000
Type 4	19(0.18)	22(0.25)	1	3.12	0.077
3.	**Tb. Fors. (Applied Linguistics)**	**Tb. Fors. (Medicine)**			
	F(%)	F(%)	df	X^2	P value
Type 1	725(7.73)	406(5.89)	1	481.84	0.000
Type 2	8261(88.19)	6161(89.40)	1	372.15	0.000
Type 3	358(3.82)	304(4.41)	1	128.20	0.000
Type 4	23(0.25)	21(0.30)	1	7.10	0.008
4.	**Br. Arts. (Applied Linguistics)**	**Br. Arts. (Medicine)**			
	F(%)	F(%)	df	X^2	P value
Type 1	835(5.29)	756(6.68)	1	262.53	0.000
Type 2	14551(92.12)	10099(89.21)	1	857.77	0.000
Type 3	356(2.25)	408(3.60)	1	60.48	0.000
Type 4	52(0.33)	57(0.50)	1	10.13	0.001
5.	**All Textbook Introduction Genres (Applied Linguistics)**	**Br. Arts. (Applied Linguistics)**			
	F(%)	F(%)	df	X^2	P value
Type 1	2498(5.91)	835(5.29)	1	1299.68	0.000
Type 2	31970(75.69)	14551(92.12)	1	285.46	0.000

Type 3	1251(2.96)	356(2.25)	1	1412.98	0.000
Type 4	87(0.20)	52(0.33)	1	53.54	0.000
6.	**All Textbook Introduction Genres (Medicine)**	**Br. Arts. (Medicine)**			
	F(%)	F(%)	df	X^2	P value
Type 1	1749(6.10)	756(6.68)	1	143.31	0.000
Type 2	25842(90.21)	10099(89.21)	1	245.10	0.000
Type 3	1061(3.70)	408(3.60)	1	1361.76	0.000
Type 4	94(0.32)	57(0.50)	1	56.82	0.000

Note. Tb. Intros: Textbook Introductions; Tb. Pres.: Textbook Prefaces; Tb.Fors.: Textbook Forewords; Br. Arts.: Book Review Articles.

The results of chi-square analyses showed significant differences between the genres in focus in the two disciplines under study. Table 3 reveals the most and the least nominalized expressions used in the corpus. That is, verb to noun was extremely common and unmarked in the two disciplines. Adjective to noun ranked second in order of frequency in these academic texts. As shown by chi-square analysis, preposition to noun was used more frequently in applied linguistics than in medicine. Finally, though not significantly different, conjunction to noun was very scant in the focused texts for analysis and proved to be similarly employed in the two disciplines. The results marked verb to noun to be characteristic of the discourse of the two disciplines.

Table 4. Density of Nominalized Expressions in Textbook Introductions and Book Reviews

1.	**Tb. Intros. (Applied Linguistics)**	**Tb. Intros. (Medicine)**			
	F(%)	F(%)	Df	X^2	P value
Nominalized expressions	16380(87.42)	12783(68.23)	1	684.50	0.000
Number of clauses	18735	18735			
2.	**Tb. Pres.**	**Tb. Pres.**			
	F(%)	F(%)	Df	X^2	P value
Nominalized expressions	10431(88.63)	9710(82.50)	1	409.81	0.000
Number of clauses	11769	11769			
3.	**Tb. Fors.**	**Tb. Fors.**			
	F(%)	F(%)	Df	X^2	P value
Nominalized expressions	9367(85.34)	8961(81.63)	1	259.98	0.000
Number of clauses	10976	10976			
4.	**Br. Arts.**	**Br. Arts.**			
	F(%)	F(%)	Df	X^2	P value

Nominalized expressions	15796(93.65)	14736(87.36)	1	465.84	0.000
Number of clauses	16867	16867			

Note. Tb. Intros: Textbook Introductions; Tb. Pres.: Textbook Prefaces; Tb. Fors.: Textbook Forewords; Br. Arts.: Book Review Articles.

As for the third research question, Table 4 demonstrates the density of the nominalized expressions in the clauses in the four datasets. The chi-square revealed a statistically significant difference with regard to the density of the nominalized expressions in the focused genres. That is, the amount of the chi-square was higher than the critical value (3.84) at the level of $p < 0.05$. The density of the nominalized expressions in applied linguistics exceeded the corresponding expressions in medicine, showing that the writers in applied linguistics tend to condense and package a larger amount of information into single lexical items than in medicine.

Table 5. Nominalized Expressions and Grammatical Metaphors in Introductions and Book Reviews

1.	**Tb. Intros. (Applied Linguistics)**	**Tb. Intros. (Medicine)**			
	F(%)	F(%)	df	X^2	P value
Nominalized expressions	16008(89.22)	15962(88.96)	1	402.50	0.000
Grammatical metaphors	17941	17941			
2.	Tb. Pres. (Applied Linguistics)	Tb. Pres. (Medicine)			
	F(%)	F(%)	df	X^2	P value
Nominalized expressions	10431(81.71)	9950(77.94)	1	292.02	0.000
Grammatical metaphors	12765	12765			
3.	Tb. Fors. (Applied Linguistics)	Tb. Fors. (Medicine)			
	F(%)	F(%)	df	X^2	P value
Nominalized expressions	9367(80.39)	9343(80.19)	1	236.13	0.000
Grammatical metaphors	11651	11651			
4.	Br. Arts. (Applied Linguistics)	Br. Arts. (Medicine)			
	F(%)	F(%)	df	X^2	P value
Nominalized expressions	15796(75.28)	12823(61.11)	1	615.06	0.000

Grammatical metaphors	20981	20981

Note. Tb. Intros: Textbook Introductions; Tb. Pres.: Textbook Prefaces; Tb. Fors.: Textbook Forewords; Br. Arts.: Book Review Articles.

Table 5 reveals the final stage of the quantitative analyses which demonstrates the proportion of the normalized nominalized expressions to the total number of grammatical metaphors in each of the four genres under scrutiny in the two disciplines. The chi-square statistics revealed a statistically significant difference (at $p < 0.05$). The nominalized expressions in applied linguistics were more prevalent than in medicine. This shows that the presentation of information in applied linguistics is facilitated more by the use of nominalized expressions through the expansion and elaboration of nominal elements than in medicine.

With regard to the fourth research question, in all focused genres, Type 2 (i.e., conversion of verb to noun (process)) was reported to be more prevalent than other types of nominal expressions. There were different patterns in which Type 2 occurred. Table 6 summarizes the most frequent patterns with their related examples.

Table 6. Summary of Patterns and Related Examples

Pattern No.	Patterns and related examples	Frequency AL.	Frequency Med.
# 1	*Nominal + Qualifier*	9904	9277
	With careful cross-referencing and *provision of explanations and examples*, we have … (BI. AL. #004)	19.19%	23.21%
# 2	*Preposition + Nominal*	1423	1245
	In comparison, this manual is a collective effort to provide simple, practical solutions to… (BF. Med. #010)	2.76%	3.12%
#3	*a/an/the/- + nominal*	2153	1287
	…, and the reconstructive flap illustrations are well-done and reproducible for broad study and *recall*. (BR. Med. #081)	4.17%	3.22%
#4	*there/is/are/was/were + nominal*	2243	1066
	There are illustrations added in this edition wherever important points could be made more clear,…(BP. Med. #016)	4%	2.67%
# 5	*Nominal + Prepositional Phrase*	9147	7454
	…but *treatment of other contact phenomena* is less sure…(BR. AL. #085)	18%	18.65%
# 6	*Preposition + Nominal + Prepositional Phrase*	205	189
	We are pleased that Springer has taken this title under its direction and has helped to improve its quality *in preparation for international release (BP. Med. #089).*	0.39%	0.47%

# 7	*Classifier + Nominal* …provides examples specific to healthcare on how hospitals have greened their operations and facilities, ranging from healthy food procurement, to *hospital waste*, to measuring and…(BR. Med. #014)	5043 10%	6359 15.91%
# 8	*Nominal as classifier + Nominal/ Noun* Chapter 1 gives an overview of the green *healthcare movement*, …(BR. Med. #014)	5045 9.77%	2034 5.09%
# 9	*Classifier + Classifier + Nominal* In recognition of the growing excitement and potential of ES cells as models for both the advancement of *future clinical applications* and, …(BP. Med. #003)	937 2%	1536 3.84%
# 10	*Numerative + Nominal* *One concern* is to explore the nature of temporal frames of reference…(BP. AL. #098)	1821 4%	1342 3.36%
# 11	*Nominal + Participle* The *information contained* herein… (BF. Med. #011)	1952 4%	2374 5.94%
# 12	*Nominal + Relative clause* … A more reasonable *expectation that* interested readers will simply select the chapters that … (BI. AL. #001)	3575 7%	2242 5.61%
# 13	*Nominal + Gerund* However, in view of rapid *changes occurring* in medical science,… (BF. Med. #011)	971 2%	552 1.38%
# 14	*Nominal + Adjunct* This is addressed in greater *depth in chapter 11…* (BI. Med. #085)	729 1%	184 0.46%
# 15	*Nominal + Infinitive* We are most grateful to him for his *permission to do* this. (BP. Med. #036)	973 2%	367 0.92%
# 16	*Nominal + Adjective/Adverb as postmodifier* …about the accuracy of the scientific information communicated by many….. (BR. Med.#009) … to base their practice individually… (BR. Med. #008)	842 2%	362 0.91%
# 17	*Adverb as classifier + Nominal* No attempt was made to do experimental tests under *carefully controlled plans*… (BF. AL. #001)	631 1%	345 0.86%
#18	*This/that/these/those+Nominalization* This reference is a not-so-quick one… (BR. Med. #070)	4011 7.77%	1751 4.38%
Σ		51602	39966

Note. Med: Medicine; AL.: Applied linguistics.

The most dominant pattern was nominalization + qualifier (#1). In the examples below, the congruent forms of Example 5 are the part of the section that remains addresses, and the fact that hypertext and modern media can influence comprehensibility…, and the congruent forms of Example 6 are the students' efforts have come out.., and They considerably experienced teaching biochemistry… The words remainder, influence, outcome, and experience

function as things in these nominal expressions, and the words section, hypertext, and modern media, efforts, and teaching which serve as qualifier in metaphoric forms, are, in fact, the head of material processes in their congruent realizations. Therefore, they belong to the ideational grammatical metaphor because their grammatical functions are transferred from Head to qualifier:

5. *The remainder of* the section addresses issues like *the influence of* hypertext and modern media on comprehensibilty and translating professional documents (BR. AL. #004)
6. The textbook of Medical Biochemistry for the medical students is *the outcome of* the joint efforts of a medical and a nonmedical biochemist, who possess considerable *experience in* teaching biochemistry to undergraduate and postgraduate medical students of Indian universities. (BP. Med. #33)

In some cases, from the grammatical point of view, nominalizing a process allows the addition of both modifiers and qualifiers packing the flow of information into fewer words. Note the following examples:

7. The last decade has witnessed *an explosive growth of molecular data* ... (BP. Med. #018)
8. …that should be taken into account to give the reader *a scientific understanding of the writing process* relative to planning … (BR. AL. #009)

(The typical form of Example 7 is molecular data grows explosively. Example 8 is represented congruently as writing process is understood scientifically.)

The rest of the patterns excluded from the analyses indicated that the dense clauses are usually formed by nouns with multiple premodifiers and postmodifiers in both disciplines. This, in effect, creates a text that is tightly packed with information in the form of nominal phrases rather than clauses to add information (Gray and Biber, 2010).

5. Discussion

The main findings of this study with respect to introductions and book reviews in medicine and applied linguistics are discussed below.

As revealed by the results of the four research questions, the similarities and differences in nominalization deployment in the four genres is likely to illustrate different tendencies for packaging the information in academic texts which involve fluctuation over the use of this strategy in the different types of texts. Although all texts were replete with instances of nominalizations, the introduction sections of textbooks had comparatively the most frequent distributions of nominals, whereas the book review articles had the least number of nominals. Prefaces and forewords were fairly similar in their frequencies of nominals. These results confirm that grammatical metaphor is a powerful language resource that

"simultaneously builds cohesion, foregrounds meanings in static nominal groups, and backgrounds personal and subjective voice".

Furthermore, information density is intimately tied to disciplinary characteristics. In this respect, grammatical metaphor is a resource that language uses to condense information by expressing concepts in an incongruent form which is very valued in scientific registers as a way of expressing "objectification" and "abstraction" (Halliday and Martin, 2005: 33). However, unlike other studies (Halliday, 1994; Halliday and Martin, 2005; Xue-feng, 2010), the writers in both disciplines put ideas into abstract forms variably and thus, at the level of lexicogrammar, the disciplinary distinction is manifested in the degree of the nominal phrases used.

Besides the density of nominal phrases that distinguishes the two disciplines, there were a few patterns that made the applied linguistics texts distinct from the texts in medicine. For instance, adjective-derived nominalization in applied linguistics mostly occurs in the clause initial position. In the following example, the writer explains why writers are required to act uniformly in emphasizing consistency in the next clause:

9. *Consistency* is a necessary characteristic of polished, highly readable prose. (BI. AL. #076)

Another recurring pattern characterizing applied linguistics is the nominalization of adjective and qualifier or nominalization of adjective with another adjective as illustrated below:

10. … the *importance of accessibility* of curriculum to the language teacher as a tool for increasing … (BR. AL. #019)

The pattern exclusive to medicine, which establishes the cause and effect relationship between the nominal groups, is of simple construction, with one nominal group clause initially, *the importance of genes,* one nominal group clause finally, *their ability,* and one verbal group, *lies in,* pushed in between indicating the logical relation between the two phenomena. Note the following example which is congruently taken to be *because genes are able to control the formation of cell, they are important*:

11. *The importance of genes lies in their ability* to determine key personality traits, as well as… (BI. Med. #31))

A noticeable difference in the use of prepositional nominalization in applied linguistics and medicine is revealed in the next two examples. Whereas, in medicine introductory genres, the nominalization of preposition occurs with nominalization of process and qualifier, in applied linguistics, nominalization of preposition often occurs before nominalization of process as shown below:

12. As *language learning* is a *cumulative effort*, it *must* be consolidated outside ... (BR. AL. #007))
13. *The juristic basis of the classification of disease* is concerned with the legal circumstances in which death occurs. (BI. Med. #026)

Therefore, even if there arguably are core features and characteristics in academic discourse, it is important to acknowledge the fact that many variations exist when it comes to how certain disciplines struggle with the challenges of conveying information and achieving academic writing. Various disciplines in the natural sciences, technology, social sciences, and humanities have their specific, conventionalized ways of describing ideas, knowledge, methods, results and interpretations (e.g., Basturkmen, 2011; Hawes and Thomas, 2012; McGrath and Kuteeva, 2013; Parodi, 2010). This *discipline specificity*, which stresses the distinctive ways of meaning making and constructing discourse (Hyland, 2009), attempted to highlight the necessity to go beyond the generalized view of academic writing and to pin down specific characteristics of the scientific discourse in each of these disciplines.

One other major finding drawn from our analysis was the greater density of nominalization in applied linguistics than medicine. This being said, in formal written language, there are fewer clauses, as the ideational information of two or more clauses may be realized as one. Thus, the possibility of two or more cases of grammatical metaphor being combined in the same nominal group would mean that two or more clauses are being expressed as a single participant. This feature prevails in applied linguistics because the writers tend to put the focus on objects, states, and process all encoded by nouns rather than human agents and their actions which are, in turn, encoded by verbs (Jalilifar, Alipour, and Parsa, 2014). Thus, it seems reasonable to assume that information density is closely related to disciplinary characteristics. Previous studies (e.g., Galve, 1998; Halliday, 1994) have also measured lexical density by dividing the number of lexical items to the number of ranking clauses. Galve (1998) argued that when a language is more planned and more formal, lexical density is higher (over 0.40 per clause). When processes are repacked as participants, academic texts become more abstract and complex, and much of the complexity is due to the nominal group structure which allows an extended explanation to be condensed into a complex phrase, as depicted in the following example:

14. The earliest activities in the documentation and description of language have been attributed to… (BI. AL. #093)

Therefore, writers and speakers make choices from the various options that language makes available, according to the social and cultural context in which meaning is exchanged. As an interlocking set of grammatical systems, language enables its users to make different kinds of meaning for different purposes and contexts. Schleppegrell (2001) argues that register differences manifest

themselves both in choice of words or phrases and also in the way that clauses are constructed and linked. Therefore, the higher proportion of lexical density in applied linguistics in comparison to medicine reveals that the language that constructs knowledge is subject to disciplinary specificities. The choice of different lexical and grammatical options is related to the functional purposes that are foregrounded by the writers of different disciplines. Lexical density is one way of qualifying the differences in lexical choices.

6. Conclusion

The research undertaken in this study can contribute to better understanding of nominalization in textbook introductions and book reviews. In this regard, it can help those who attempt to know the role and function of nominalization in scientific writing and as a writing style of academic discourse. Nominalization is closely linked to the principles of economy (Zhou, 2012) . Being a form of condensation of information, nominalization is a very efficient means of bundling information and consequently frequently used in formal writing. When compared with verbs, nominalizations can be more ambiguous due to valency reduction but they also provide valuable opportunities to organize discourse and express abstract relations among processes in a more efficient way. Hence, the realized differences in deployment of nominal groups in textbook introductions of harder and softer sciences can be pedagogically inspiring. Indeed, developing an awareness of the functions of nominalization—for example, enabling writers to pack more information in fewer clauses and increase information load of the text, expressing particularity by using classifiers in nominal phrases, elaborating and clarifying concepts by using relative clauses as postmodifiers for nominalizations—helps novice writers understand how this writing feature might help shape their writing in their specific discipline in a more compact and dense manner.

Furthermore, in the domain of pedagogy, teachers can make students aware of the complexity of language and how language works to compress various meanings in a sentence. Instruction of such rhetorical strategies can create an awareness of how by use of nominalization a single clause compacts several complex abstract ideas and makes language complex for the students. Thus, they need to learn a basic knowledge of grammatical metaphor and the different ways it is expressed in academic discourse.

The present study investigated the role of nominalization in applied linguistics and medicine textbook introduction genres and book reviews based on the model of grammatical metaphor proposed by Halliday and Mathiessen (1999). As the study was based on a limited data set, the results cannot be seen as conclusive. Further studies working on other disciplines can create opportunities for researchers to reflect on disciplinary characteristics. Nominalization can also be examined in other genres to determine the way nominal items are realized in

different contexts. Furthermore, our knowledge of nominalization in languages other than English is very sparse. To offset the balance, the nominal expression types used in English scientific discourse can be compared with those used in other languages to see how cross-cultural differences might play a role in using this feature of language which leads to concomitant decisions on the text texture. Given that the study design was text-based, this investigation can be extended by enquiring into academic writers' intentions and awareness about using nominal expressions in their writing. Interviews might be designed so as to gain insights into why the academic writers make use of particular patterns of nominalizations in developing their texts.

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