

A Contrastive Study of Hedging in Medicine Research Articles

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Abstract: *As far as academic writing is concerned, hedging is used as an important linguistic feature which is concerned with the connotation of tentativeness, possibility and uncertainty. Hedging is used to minimize the potential risk of a claim or prevent embarrassing situations in case one might be found to be wrong. The purpose of the current study was to compare and contrast the frequency and types of hedges in Introduction sections of medicine Research Articles (RAs) written by English Research Writers (ERWs) and Iranian Research Writers (IRWs) who write in English. In so doing, fifty English RAs (twenty-five written by ERWs and twenty-five by IRWs) in the field of medicine from 16 leading journals were selected and analyzed. The used criterion for analysis was Salager-Meyer (1994) taxonomy. Concerning the hedging categories proposed by Salager-Meyer (1994), the data analysis indicated that there was no significance difference between the use of hedging categories, namely, compounds, approximators, and emotionally-charged expressions, in Introductions of RAs written by Iranians and English native scholars in medicine. However, the findings suggested that there is a significant difference between the use of hedging, regardless of the distribution and percentages of the categories, in medical article Introductions written by Iranians and English scholars. The results of the study have implications for ESP writing pedagogy as far as instructional practice and material development are concerned. The instruction of specific rhetorical structures and particular features of the texts in a particular genre can be of great value for the development of ESP students' ability to communicate their research findings more effectively within the discourse community.*

1. Introduction

Genre analysis is concerned with the investigation of how language is used within a particular context by a specific community, or the study of specialist areas of language. Research in genre analysis has attracted different scholars and researchers by a specific speech community which has coincided with many studies on academic genre texts such as research articles (RAs). Among such research engagements, a number of studies have focused on “hedging”, one element included in the interpersonal, interactional metadiscourse that has received great attention. (Davoodifard, 2006; Falahati, 2004; Hyland, 1999, 1998; Myers, 1989; Salager-Meyer, 1994; Skelton, 1988).

Hedging is a fundamental feature in academic discourse (Rounds, 1982) that enables the writers to show their certainty and doubt towards their statements, to show the amount of confidence they put on their claim, and to have a dialog with their readers. Through hedging, writers leave some room for their readers to judge the truth value of the assertion. Hedging expressions can be used in describing methods and results, discussing findings, and drawing conclusions from the evidence. Some examples of hedging are the use of words such as *may*, *assume*, *unclear*, and *probably*.

Varttala (1999) has emphasized the function of hedging in research articles as the indicator of textual precision and interpersonal relationship. While the literature emphasizes the importance of hedging, Hyland (1998) has stressed that we know little about its use, frequency, and distribution in different disciplines or genres. The lack of research on hedging in the past years is reported by Crystal (1995) who attempted to shed light on the areas in English language studies which have not received enough attention. Despite its major role in academic discourse, hedging has received most attention in the context of casual and oral discourse (Coates, 1987, Horman, 1989, Nittono, 2003, Stubbs, 1986). There have not been many studies across research articles (RA) sections. The limited numbers of studies which are conducted in this area have shown that there are some variations in the use of hedges across RA sections (Salager-Meyer 1994, Yang 2003).

It can be argued that probably when a writer is too self-confident, he or she is open to attack and criticism. Thus, writers may need to present themselves as "the humble servants of the discipline" (Myers, 1989, p. 5) and hedging can be used to indicate "either a lack of complete commitment to the truth of an accompanying proposition, or a desire not to express that commitment categorically" (Hyland, 1998, p. 1). However, the hedging reflects, "not the probability of the claim, and not the personal doubt of the writer, but the appropriate attitude for offering a claim to the community" (Myers, 1989, p. 12-13). It also can be taken as a rhetorical device to express scientific possibility or tentativeness, not as "a cover-up tactic" (Salager-Meyer, 1994, p. 151).

Given the significant role of hedging in academic discourse, the purpose of the current study is to examine and compare the forms and functions of hedging across the Introduction section of the RAs in medicine. In so doing, Iranian and native writers' use of hedging strategies will be compared through analyzing English medical RAs written by ERWs and IRWs. This study sought to determine the similarities and differences in the use of hedging and its categories as proposed by Salager-Meyer (1994) in the Introduction section of the articles. Therefore, the following research questions are formulated:

- 1) What are the similarities and differences in the use of hedging in the Introduction of English medical articles written by ERWs and IRWs?

- 2) Is there any significant difference in the use of hedging categories in the Introduction of English medical articles written by ERWs and IRWs?

2. Review of the Literature

2.1. Definition of Hedging

The notion of hedging was first introduced by Lakoff (1972) who, in contrary to the prevalent idea among logicians at that time who believed that the sentences of natural languages are either true or false or lacking a truth value, argued that:

natural language concepts have vague boundaries and fuzzy edges... and natural language sentences are very often neither true or false, nor nonsensical, but rather true to a certain extent and false to a certain extent, true in certain respects and false in other respects. (p. 183)

Lakoff was not interested in the pragmatic application of hedges but was mainly concerned with the logical properties of words and phrases like *rather*, *largely*, *in a manner of speaking*, *very*, and their ability "to make things fuzzier or less fuzzy" (p. 195). Some examples given by Lakoff (1972) are as follows (p. 195):

- a) A robin is a bird. (True)
- b) A chicken is a bird. (Close to false)
- c) A chicken is *sort of* a bird. (True, or very close to true)
- d) A cow is *sort of* a bird. (False)

As an example of what he means, sentence (a) is true: sentence (b) may not be true, rather close to false. However, when we hedge sentence (b) by adding the predicate modifier, *sort of*, this can make the sentence more or less vague because a degree of category membership between robins and chickens depends on a speaker's underlying distinction.

Since then, the concept has been expanded to be used in other disciplines such as Speech Acts Theory (Brown and Levinson, 1987), and oral discourse (Holmes, 1982, Horman, 1989), and has been adopted by language pragmatists and academic discourse analysts (Butler, 1990, Markkanen and Schroder, 1997).

This concept of fuzziness and vagueness was discussed in more detail by Prince, Frader, and Bosk (1982) on the basis of a study of physician-physician discourse in a large children intensive care unit. Following Lakoff's definition, they argued that all hedges can make things fuzzy in two different ways: the first class of hedges (i.e., *approximator*) introduced "fuzziness within the propositional content proper", while the second class of hedges (i.e., *shield*) correlated with "fuzziness in the relationship between the propositional content and the speakers, that is, in the speaker's commitment to the truth of the proposition conveyed"(p. 85). Below are some examples given by Prince, *et al.* (1982, p.85):

- a) His feet were blue. (No hedge)
- b) His feet were *sort of* blue. (Approximator)
- c) *I think* his feet were blue. (Shield)

Sentence (a) has no hedge. Without hedging, the speaker implicates full personal commitment to the truth of the proposition by simply asserting the intention. Prince *et al* suggested that sentences (b) and (c) are hedged in two different ways. The modifier *sort of* in sentence (b) can affect the propositional content, not the speaker commitment. That is, the statement implies that the patient's feet could be bluish green. The hedge, *I think*, in sentence (c) does not affect the propositional content but implies that the speaker is less than fully committed to the truth of the proposition. Regarding these distinctions, Skelton (1988) took a critical stance, arguing that "the distinction between *shield* and *approximator* seems to be sustainable only in the abstract and it looks more like a description of a property of text sentences than of language use" (p.38). A sentence with an *approximator* such as *sort of*, suggested Skelton, can also be a *shield* with the phrase, *I think*.

The definition presented by Hyland (1998) seems to be more interesting. He defined hedges as "the means by which writers can present a proposition as an opinion rather than a fact: items are only hedges in their epistemic sense, and only when they mark uncertainty" (p. 5). He believed that the authors, through using hedging devices and showing uncertainty, try to show the amount of accuracy of their statements. At the same time, they attempted to save face in case of any possible falsification of their judgments. Through using hedges and attributing the ideas to oneself, writers also invite readers to evaluate the truth value of the proposition as an independent and intelligent individual.

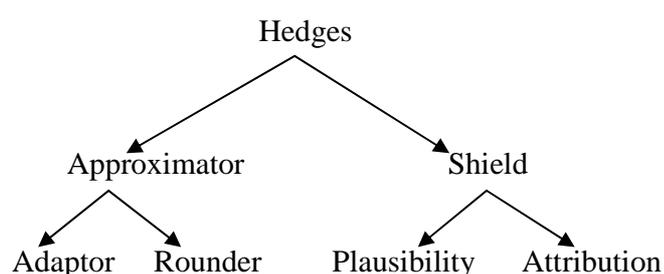
2.2. Categories of Hedging

Hedging can be done in various ways. In general, hedging can be categorized into two sorts: lexical items (e.g., *would*, *probably*, *suggest*, or *I think*) and non-lexical items (e.g., limitation to the study).

Following Lakoff's definition, Prince, Frader, and Bosk (1982) attempted to address the function of hedges in an empirical study of spoken medical discourse. They counted the number of words or phrases in their corpus which made things "fuzzier", and argued that all hedges can make things fuzzy differently and categorized hedging into two types (*approximators* and *shields*) and then made further subdivisions. According to Prince *et al*. '*approximator*' can affect the propositional content, not the writer's commitment and it introduces "fuzziness within the propositional content proper"(p. 86). '*Adaptor*' as a subclass of '*approximators*' can be used to convey the writer's consideration of the different truth conditions of the propositions by adopting *quite*, *entirely*, *really*, or *a little*, while '*rounder*' is to convey a range of items such as *over* or *about*. On the other hand, '*shield*' does not affect the truth conditions of the propositions and rather implicates that the writer is not fully and personally committed to the truth of the

proposition conveyed. Within *shields* they identified two further subclasses: *plausibility* shields "which involve something related to doubt" (e.g. " I don't see that you have anything to lose by..."): and *attribution* shields which "attribute the belief in question to someone other than the speaker" (e.g. "according to her estimates") (p.89). In other words, '*plausibility*' involves various levels of lack of certainty and '*attribution*' indicates the writer's own degree of commitment. The taxonomy is shown in figure 1.

Figure 1. Types of Hedges by Prince et al. (1982, p.96)



They designated *approximators* as a semantic phenomenon and *shields* as a pragmatic one and judged the two classes of hedges to have little in common. The function of *approximators* is either to adapt a term to non-prototypical situation (e.g. "sort of vertical") or to indicate that a term of it is rounded-off representation of some figure (e.g. "about ten fifty over five fifty"). *Shields*, by contrast, serve as a "linguistic reflex of a marked commitment on the part of the speaker to the truth of the proposition that s/he is conveying" (p.94).

On the basis of Brown and Levinson's (1987) study of conversational discourse, Myers (1989) suggested that statements in scientific research texts can be hedged by lexical items, introductory phrase, or personal attributions. First, hedging can be done with lexical items such as a modal verb (e.g., *would* or *could*), or a modifier (e.g., *probably*), or any device suggesting alternatives (e.g., indefinite article). Another way of hedging is an introductory phrase to make the writer's commitment to or rejection of a statement while leaving open the possibility that the writer's claim may be wrong. This suggests degrees of doubt about an alternative interpretation of results or theoretical possibility as shown in the following examples (Myers, 1989, p.14):

- a) Thus, *it seems highly likely that* RNA-RNA splicing is truly the mechanism for bringing "mosaic" RNAs together... (Darnell, 1978)
- b) *It seems totally implausible that* the number of radically different genes needed in a salamander is 20 times that in a man. (Orgel and Crick, 1980)

While lexical items and introductory phrases reflect the degree of probability of the statement, hedging by personal attributions reflects a relation between the writer and the reader, not the degree of probability of the statement, implying that the writer may make the reader choose the more persuasive interpretation. As a hedge on one's own claims and denials of claims, a

statement with personal attributions could vary from certain (e.g., *we believe*) to the speculative (e.g., *we shall assume*) as follows (Myers, 1989, p. 15):

- a) *We believe* that functioning gene in the myeloma will consist of the precursor region followed first by... (Tonegawa, et al. 1978)
- b) *We shall assume*, for the rest of this article, that this hypothesis is true....
We can make one prediction on the basis of energy costs. (Orgel 1980)

As Myers (1989) put it, linguistic items such as modals, epistemic verbs, or approximators are commonly used to hedge statements. Hedges can be employed by using single or combined lexical items (i.e. modal verbs, adjectives or adverbs, if-clauses and contrastive markers). In addition to lexical items, scientific statements can be weakened by drawing attention to the limitations of results and by commenting on difficulties encountered, shortcomings of findings or the possibility of alternative interpretations (Hyland, 1996c).

Salager-Meyer (1994) proposed five types of hedges shown in Table 1 (p.154). Based on the taxonomy, she analyzed a set of 15 articles drawn from five leading medical journals. In her study on hedges in medical English written discourse, she has worked on the distribution of five hedging categories (i.e., shields, approximators, authors' personal doubt, emotionally-charged intensifiers, and compound hedges) in different rhetorical sections of two fundamental medical English genres - case report (CR) and research paper (RP). Her study was revealing in showing the different distribution of hedging categories across rhetorical sections of the two genres. The results of this study showed that the three most frequently used hedging devices in both genres (shields, approximators, and compound hedges) accounted for 90 % of the total number of hedges used in the medical texts. Her study also showed that the discussion and introduction sections of research papers and comment sections in case reports were marked by a heavy use of hedging and modality whereas the methods and results sections showed the lowest percentage of hedges. In the two sections, as she pointed out, a writer may need to justify the reason for investigation, to discuss statement of rationale, or to make claims about statements from other research.

Table 1. Types of Hedges by Salager-Meyers (1994)

Category	Description
1. Shields	all modal verbs expressing possibility; semi-auxiliaries (e.g., <i>appear, seem</i>); probability adverbs (e.g., <i>probably, likely</i>); epistemic verbs (e.g., <i>suggest, speculate</i>);
2. Approximators	word(s) or phrases expressing quantity,

	degree, frequency and time (e.g., <i>approximately, roughly, somewhat...</i>);
3. Authors' insufficiency and doubt	combination of several hedges (e.g., <i>may suggest, would seem likely that, it seems reasonable to assume</i>);
4. Emotionally-charged expressions	comment words used to project authors' reactions (e.g., <i>extremely difficult/interesting, dishearteningly weak, of particular important, surprisingly</i>);
5. Compound hedges	word (s) or phrases expressing author's personal doubt and direct involvement (e.g., <i>I believe, to our knowledge, it is our view that</i>).

Among the five types of hedges, 'Shields' were favored as a convention in the introduction

sections of case reports and research papers (37.5% and 44.5% respectively) and epistemic verbs such as "*to speculate,*" "*to suggest,*" "*to indicate,*" "*to tend,*" were mostly used, while modal verbs were used less frequently. 'Approximators' in the introduction sections of research papers mostly took the form of negative or quasi-negative quantifiers (e.g., *little, quite possible, very few studies, little information exists*). 'Compound hedges' of several hedges were common, whereas hedges showing 'Authors' insufficiency and doubt' and 'Emotionally-charged expressions' were rare both in case reports and research papers. Linguistic items, as Salagar-Meyers put it, do not always indicate hedges. Such an ambiguity leads to the difficulty of identifying which of these linguistic items are hedges and which are not. Salagar-Meyers' taxonomy is adopted in this study.

In conclusion, hedging is a rhetorical device to protect one's own reputation as a scientist, to avoid absolute statements which might put the writers in a risky situation, to express the extent to which the writers commit themselves to the truth value of their statements, which can allow them to be more open to other possibilities of interpretation (Salager-Meyer, 1994).

3. Methodology

3.1. Corpus

The corpus to accomplish the purpose of the current study was a set of 50 English research articles (RA) (twenty-five written by ERWs and twenty-five by IRWs) in the field of medicine.

The RAs were taken from the leading journals in medicine such as *The British Medical Journal*, *Annals of Internal Medicine*, *The Lancet*, *Archives of Internal Medicine* and *The New England Journal of Medicine*. Such journals were selected because they represented some of the best in medical journalism. For the sake of more accuracy, all the footnotes and long quotations which appeared in the RAs were deleted from the data. Some criteria were taken into account in selecting the RAs. The first criterion was possessing the traditional IMRD (Introduction, Method, Results, and Discussion) sections. The next criterion was the date of publication. The RAs were all limited to those published within the last ten years, from 2000 to 2010. It was assumed that time influences the style of the writers and this factor was taken on the board. Upon selecting the RAs, they were analyzed in terms of the hedging forms and functions.

Table 2. Total number of research articles (1999-2009)

<i>Iranian Journal</i>		<i>Articles</i>	<i>English Journal</i>		<i>Articles</i>
1	<i>Acta medica Iranica</i>	3	1	<i>Scientific American</i>	3
2	<i>Iranian Journal of Public Health</i>	4	2	<i>The Lancet</i>	3
3	<i>Journal of Medical Education</i>	3	3	<i>Bio-med Central</i>	3
4	<i>Iranian Journal of Allergy, Asthma and Immunology</i>	3	4	<i>The New England Journal of Medicine</i>	4
5	<i>Iranian Journal of Medical Sciences</i>	3	5	<i>BMJ</i>	3
6	<i>Iranian Journal of Infectious Diseases</i>	3	6	<i>The British Medical Journal</i>	3
7	<i>Urology Journal</i>	3	7	<i>Annals of Internal Medicine</i>	3
8	<i>International Journal of</i>	3	8	<i>Archives of Internal Medicine</i>	3

<i>Endocrinology and Metabolism</i>			
<i>Total no.</i>	25	<i>Total no.</i>	25

3.2. Procedure

The main objective of the current study was to identify and classify the linguistic devices which serve as hedges. Another aim was to investigate the functions of hedges and to examine whether the incidence of hedging forms and functions varied across the medical articles written by EWRs and IRWs, in the Introduction section. In order to achieve these goals, epistemic expressions such as main verbs, adjectives, adverbs, nouns, and modal auxiliaries that show uncertainty, tentativeness and modesty were identified. Categories and the list of items expressing doubt and uncertainty provided by Salagar-Meyer (1994) were used as a guideline. Due to the different interpretations that can be made from hedging devices, decisions were made on the epistemic meanings of the devices. However, there were some instances in which such a decision was not straightforward. Such indeterminate cases were not considered as hedges in the study.

In order to realize how hedging conventions were distributed in the two medical written text types under investigation, the number of hedges per category was computed as a percentage of the total number of hedges recorded in each text-type. One difficulty with coding the data was the level of knowledge required to comprehend the academic texts not related to the researcher's field of study. To remove this difficulty, experts from the field were contacted to discuss the content of these articles. This procedure was undertaken to increase the researcher's general understanding, as a non-specialist reader, of the content of these academic texts. Afterwards, to analyze the data the researcher asked the assistance of a specialist informant in medical research who was also a fluent reader of English.

In order to check the reliability of the data coding, another rater coded some of the RAs in the study. One native speaker of English coded 15 % of the data separately to calculate an inter-rater reliability index. Since the coder, like the researcher, was not a specialist in medicine, it could be assumed that the two coders, including the main researcher, had a similar level of knowledge regarding the RAs.

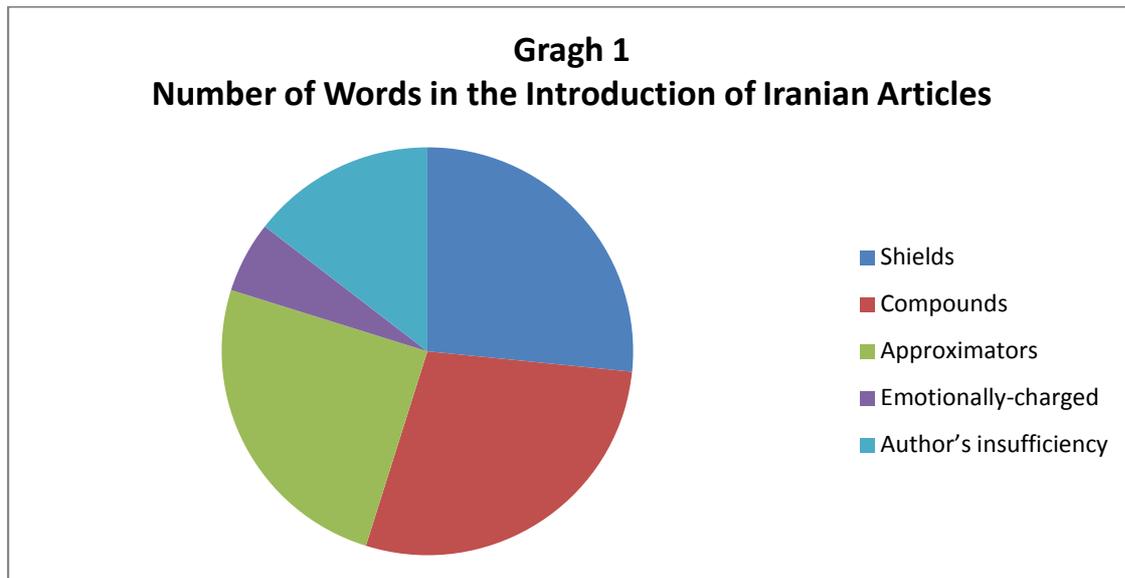
3.3. Data Analysis

To analyze the data for the purpose of the study, the number of hedging devices was recorded in the Introduction section in each article separately, and the percentage of hedges (with respect to the total number of running words making up each section in each article) was computed. The results were analyzed by means of Chi-square tests. In order to identify hedges as accurately and precisely as possible, the researcher carried out a careful contextual analysis (both from a linguistic and medical point of view) of the linguistic expressions commonly considered as hedges. This is why the taxonomy the researcher adopted in this research considers both formal and functional criteria.

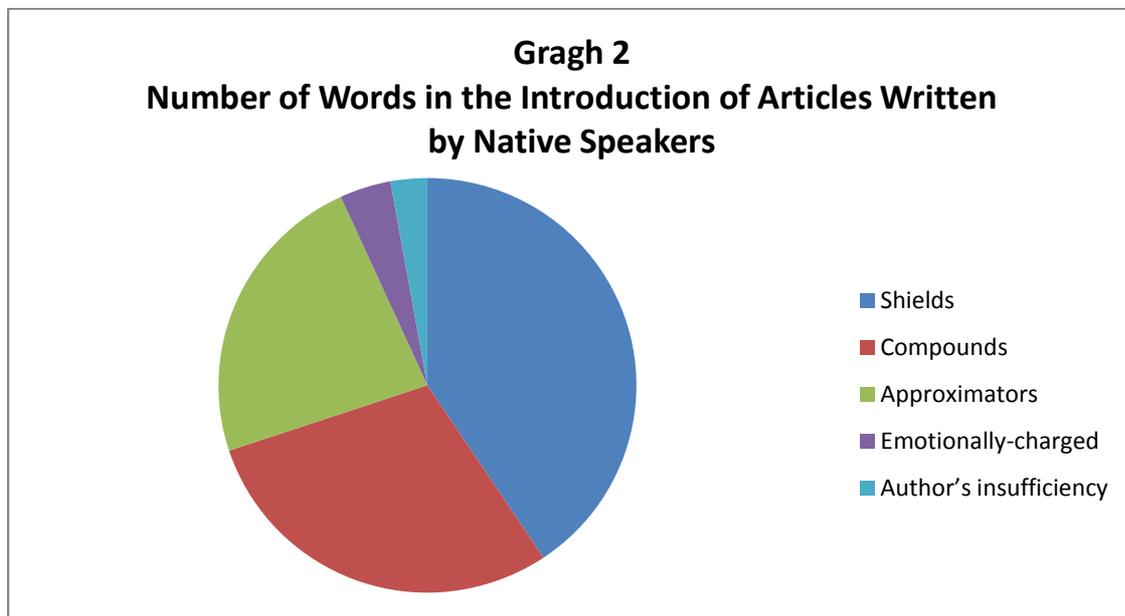
The inter-rater reliability value as measured by Cohen's Kappa for the frequency of hedging was .87. which indicates a reasonable amount of reliability in coding the data of this study. The incidence of forms and functions of hedging were recorded for Introduction section of RAs. The frequency of hedging forms in this study is calculated per "word." Due to the difficulty and impracticality of using T-unit, clause, etc. as the unit of measurement, the majority of the studies conducted in this area have applied "word" as the unit of showing the distribution of hedging devices in the study (Butler, 1990, Coates, 1983, Holmes, 1988, Hyland, 1998, 1999, Varttala, 2001, Yang, 2003). Since these units, such as clause, may have different sizes and accordingly contain different number of words, they may not provide a consistent means for measurement. In order to show the distribution of hedging forms across the two types of texts of medicine and also between the two sections of the RAs, the researcher decided to consistently use a standardized size of 2,000 words to show the frequency of hedging devices. Since the size of RAs in each type of articles varied, converting the raw scores into meaningful numbers and calculating the frequency of hedging per 2,000 words was used as a basis for comparison. The SPSS software has been utilized to compare the proportions of two samples and also to calculate the correlation coefficient used for estimating inter-rater reliability value. This software was mainly used to see if there is statistical difference between the distribution of hedging forms or functions in two different sections of medical articles written by native and Iranian speakers.

4. Results

The analysis of the gathered data revealed that the Introduction section of Iranian articles consisted of 11,257 words of which 124 words constituted hedging. Regarding the number of Iranian articles, the mean was nearly 5. Out of this number, 33 words were shields, 35 compounds, and 31 approximators. Just 7 words constituted emotionally-charged hedges and 18 words were author's insufficiency.



On the other hand, the Introduction section of the articles written by EWRs consisted of 13,537 words of which 352 words were hedging. Concerning the number of the articles, the mean was nearly 14. Out of this number, 143 words were shields, 103 compounds, 82 approximators, 14 emotionally-charged hedges and 10 words were authors' insufficiency.



4.1. The First Research Question

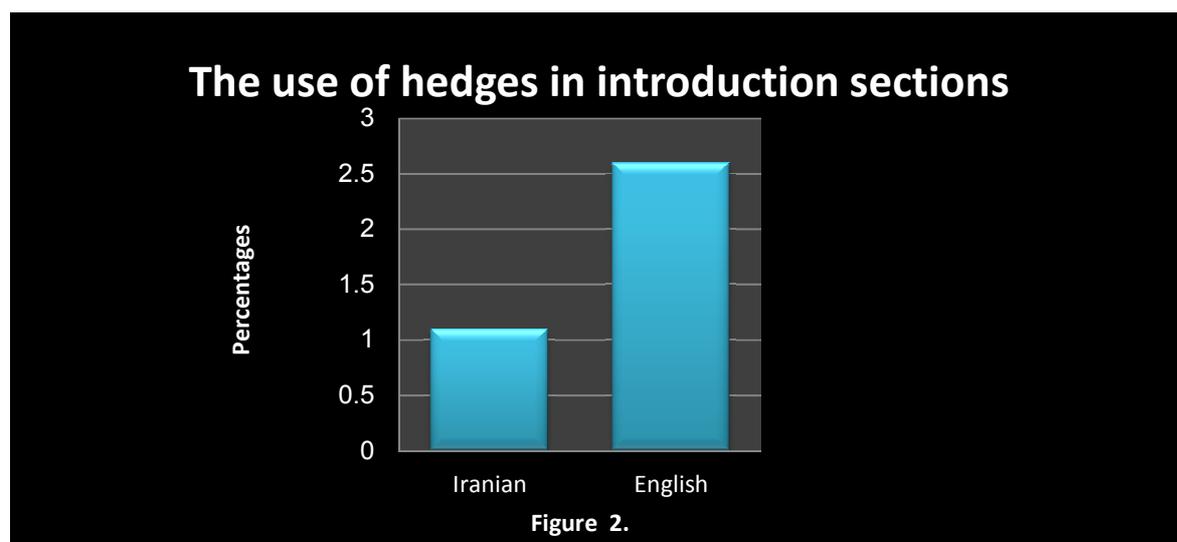
To investigate the first research question of the present study, i.e., what are the similarities and differences in the use of hedging in the introduction sections of English medical articles written by ERWs and IRWs, the nonparametric test of chi-square was run to compare the number of hedging devices in the introduction sections of English medical articles written by ERWs and IRWs. The chi-square observed value was 26.84 (Table 3). This amount of chi-square value is higher than the critical value of 9.49 at 4 degrees of freedom.

Table 3. *Chi-square for the use of hedging in the introduction by native and nonnative writers*

	Value	Df	Sig. (2-sided)
Chi-Square	26.842 ^a	4	.000
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.47.			

Since the observed value of chi-square exceeds its critical value, it can be concluded that there are significant differences between the use of hedging in the introduction sections of English medical articles written by ERWs and IRWs. Therefore, the null hypothesis was rejected.

As figure 2. indicates, the percentage of hedges recorded in the introduction sections of the articles written by ERWs outnumbers that observed in the corresponding section in the articles written by IRWs (2.6% and 1.1 %, respectively). Although Iranian writers tended to be assertive in the introduction, a total of 124 examples of hedging were found. Most hedging occurred when the writers established a position by raising doubts.



4.2. The Fifth Research Question

The fifth research question examined the difference between the distribution of hedging categories in Introduction sections of medical articles written by ERWs and IRWs. In order to answer the question, a series of chi-square analyses were run to compare the frequencies of hedging categories in that section of the articles. Table 4. reports the results of the use of hedging categories in Introduction of the articles

Table 4. Use of hedging in introduction section of articles by native and nonnative writers

Shields	Observed N	Chi-square	df	P	Conclusion
IRANIAN	33	4.86	1	.027	Null-hypothesis as no significant difference between the use of shields in the introduction section of English articles by Native and Non-native writers is rejected. Native writers made more use of shields.
ENGLISH	143				
Compounds	Observed N	Chi-square	df	P	Conclusion
IRANIAN	35	.034	1	.854	Null-hypothesis as no significant difference between the use of compounds in the introduction section of English articles by Native and Non-native writers is supported.
ENGLISH	103				
Approximators	Observed N	Chi-square	df	P	Conclusion
IRANIAN	31	.11	1	.738	Null-hypothesis as no significant difference between the use of Approximators in the introduction section of English articles by Native and Non-native writers is supported.
ENGLISH	82				
Emotionally-Charged	Observed N	Chi-square	df	P	Conclusion
IRANIAN	7	.578	1	.447	Null-hypothesis as no significant difference between the use of emotionally charged in the introduction section of English articles by Native and Non-native writers is supported.
ENGLISH	14				
Author's Insufficiency and Doubt	Observed N	Chi-square	df	P	Conclusion
IRANIAN	18	21.24	1	.000	Null-hypothesis as no significant difference between the use of author's insufficiency in the introduction section of English articles by Native and Non-native writers is rejected. Non-Native writers made more use of author's insufficiency.
ENGLISH	10				

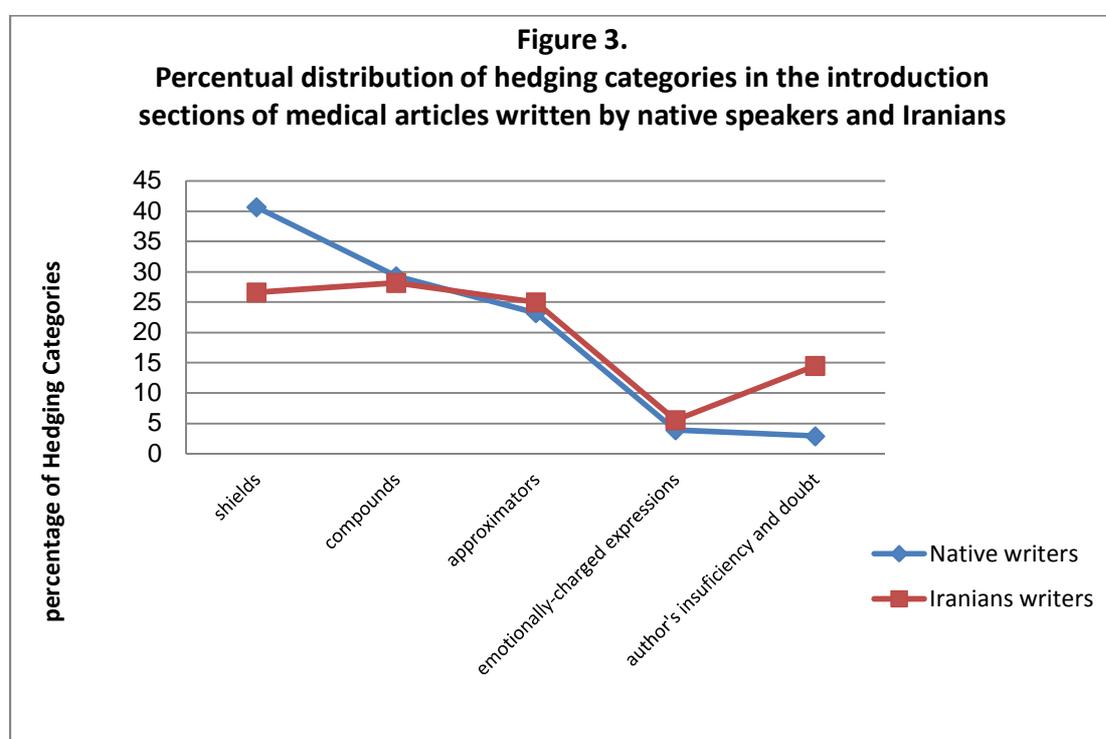
5. Discussion

The results of the analysis of Iranians' Introductions revealed that Iranian writers tended not to hedge their statements, and were assertive, mostly using different forms of verb 'to be'. As

shown in the following example, the author has made a strong assertion:

- Diabetes mellitus is the most prevalent endocrine disease...

As can be seen in Figure 3, the most frequently used hedging device in introduction sections of articles written by ERWs was the shield category (40.7%). It was followed by compound hedges (29.3%) and approximators (23.2%). Nevertheless, although shields were the most frequent hedging technique, they were not significantly more frequent than approximators or compound hedges. As the data indicated, these three hedging categories (shields, approximators and compound hedges) accounted for over 93% of the total number of hedges used in articles written by ERWs.



It is interesting to note that the remaining two categories of hedges, *emotionally-charged hedges* and hedges showing *author's insufficiency and doubt*, occurred with an extremely low frequency (less than 7%). In contrast, they have been found to be quite frequent in editorials and review articles by Salager-Meyer (1991, 1993). The frequent use of shields (mostly verbal modality) encountered in the medical articles may support the findings that modals are frequently used in scientific-technical literature to tone down and enhance quantitative and qualitative information as well as to adapt the degree of certainty on the author's part to make it more suitable (Selinker 1979, Adams-Smith 1984, Trimble 1985, Kubui 1988, Tarantino 1991).

On the other hand, as can be seen on Figures 3., Introduction sections in articles written by **IRWs** favor compound hedges as the most frequent hedging device (28.22%), followed by shields (26.61%) and by approximators (25%). Although compound hedges outnumber shields and approximators in the *Introduction* sections, in neither case is the difference statistically significant. In the *Introduction* sections of both Native-written Articles (NA) and Nonnative-written Articles (NNA), shields mostly take the form of epistemic verbs ("*to speculate*," "*to suggest*", "*to indicate*", "*to tend* ") and, although less frequently, of modal verbs (see examples below).

- Surveys of physicians and other estimates *suggest* there exists up to 22.600 alcoholic physicians in the US, or a prevalence of 12%. (NA)
- Earlier studies *indicate* a cell cycle dependent effect ... (NA)
- Survey *suggested* that sensitization took place during the first hours after birth.(NNA)
- Previous estimates of the incidence of acute mountain sickness *suggest* that ... (NNA)
- Alternatively, ω -3 PUFAs *may* modulate the vasoconstrictor response to pressor hormones and *may* decrease BP viscosity.(NA)
- Small sample sizes *may* have hindered the interpretation of many studies.(NNA)
- Several lines of evidence *suggest* that supplementation of diet with fish oils *may* reduce BP.(NNA)
- Several authors have *speculated* that abnormal aggregation *might* result in ... In addition, three clinical studies *suggested* a lower than expected prevalence of ... (NA)

A difference was observed in the use of approximators in the Introductions of native speakers' articles and those of Iranians. Indeed, whereas approximators mostly take the form of negative or quasi-negative quantifiers in native speakers' articles, they generally correspond to rounders/adaptors in terms of frequency in the *Introductions written by the nonnative writers*. The following examples illustrate this:

- There is *little* research that ... (NA)
- It is therefore *quite possible* that ... (NA)
- *Very few studies* have been carried out on ... (NA)
- *Little information exists* on the frequency and severity of the disorder. (NA)
- *More needs to be learned* about the incidence of ... (NA)
- At present, the mechanism by which ω -3 PUFAs reduce BP *remains uncertain*. (NA)
- Ciguatera poisoning is *usually* a clinical diagnosis. (NNA)
- *Very rarely*, primary pneumonia is overwhelming and complicated by respiratory

failure. (NNA)

The examples presented above (the majority of which illustrate contrastive comments) point to a controversial research area, an important but unresolved issue, and present evidence which questions existing theory, or calls into question some problems with the accepted knowledge. By citing numerous studies, which stand on the same issue, scientists hope to build an argument to support their own work. This, as was said before, serves to justify the publication of the study "by showing that the author's contribution to the discipline, whilst previously established as significant and reference-worthy, is as yet incomplete" (Swales 1990, P. 138). To use Gilbert and Mulkey's expression (1984, p. 87), the examples provided above are part of a "subtle and organized social analysis". The beliefs expressed are presented in a way which enables the authors to contrast them unfavorably with those of another group of scientists, to which the authors themselves belong. What is particularly noticeable about such examples is how the beliefs which they summarize are prepared for immediate rejection. Instead of presenting the central idea as a reasonable, though inconclusive, interpretation associated with at least some experimental evidence, it is brought in the text as a mere assumption. The feeling is conveyed that, although the ideas expressed in such sentences have been presented for some time, they have no firm scientific foundation and are not to be taken seriously. The nature of such sentences prepares the readers to expect and welcome the contrasting views to be presented by the researchers in the remaining sentences of their Introduction.

It should be noted that the authors' desire to emphasize a knowledge gap (which justifies their own research), and to contrast other researchers' views with their own, was not as intense in Iranian writers' articles as it was in the native articles because, as we previously stated, Iranian writers do not pretend as much to universality and generalization as native writers do.

To sum up, all the above examples (typical exponents of modulating signals in the *Introduction* section of the two groups of writers) allow the researcher to establish what Swales (1990, p. 155) calls an "early niche" for the research being reported (as if none of the evidence the researchers are using is conclusive) and to explain what the author's unknown territory consists of.

6. Conclusion

The findings of the present study suggested that there was a significant difference between the use of hedging in the Introduction section of the medical article written by ERWs and IRWs. Further analysis indicated that there was no significant difference between the use of hedging categories, namely, compounds, approximators, and emotionally-charged expressions, in Introductions of articles written by ERWs and IRWs.

It is argued that writers favor using writer-oriented hedges once they make a "higher level" claim to guard themselves against any probable falsification of their proposition. Moreover, since the

conventions for scientific writing and the style of argumentation have been shown to vary from culture to culture (Galtung, 1979, Markkanen and Schröder, 1988, Clyne, 1991), scientific writers can differ on the way they construct their discourse in different languages.

The vagueness used to present information is frequently overlooked by nonnative speakers of English (Lackstrom et al. 1972). One reason might be, as Zuck and Zuck (1987) remarked, the fact that little information is available in ESL textbooks to help students familiarize themselves with hedging. The authors add that the treatment of hedging should at least be sufficient to raise the issue. The same feeling is shared by Rounds (1982), Skelton (1988), Kubui (1988) and Fand (1989) who all agree that hedging in scientific discourse is a necessary and vitally important skill which should be seen as a tool for making thought subtle rather than fudged, and taught to the students in order to assist them in their studies and professional careers.

Rounds (1982, p. 5) considers that hedging is "an important problem for non-native speakers (NNSs) of English which is worthy of consideration and instructional attention." Fand (1989) further agrees that consistent categories of "linguistic items linked to bias" might provide helpful guidelines for learners. Non-native speakers of English who want to function in the academic world must be able to recognize hedging in written texts and use them when necessary in the presentation of their own research.

Students should be made aware of the need to mediate their claims and of making the difference between observed facts (which, as we said before, are said strongly) and interpretations (i.e., explanations which are invariably subjected to "may be") in order to be effective readers and writers of scientific genres. The problem lies in the fact that NNSs tend to give the same weight to observed facts and interpretations. Instructors should then teach their students how to choose their reporting verbs; how to make the difference between the verbs whose use asserts the authors' commitment to the attendant proposition (*to show, to demonstrate, to establish*) and those whose use carries no such commitment (*to suggest*). As Swales (1990, p. 151) remarks, this distinction "is a powerful rhetorical tool in authors' attempts to create research spaces for themselves because it allows them to signal early whether claims are to be taken as substantiated or not".

Salagar-Meyers (1994) suggests a few exercises which ESP instructors can use in their classes in order to make their students aware of the various techniques (available in English) to mitigate and modulate scientific discourse. He proposes *sensitization and translation exercises* and *rewriting exercises* to be explained below:

- a. Sensitization and translation exercises are those in which students can work in groups and underline all the hedges they can find in an article, justify their use, and provide equivalents (if possible) in their native language. Language instructors can also delete the hedges from a

section of a scholarly paper and ask their students to rewrite it by hedging it when convenient.

- b. Rewriting exercises: Salagar-Meyers (1994) demonstrated that in popularization articles and in textbooks (Myers 1992), the uncertain notes of research articles are replaced by certified fact and/or definite assertions ("*this suggests the possibility*" is replaced by "*they discovered*") that need no hedging, and that terms suggesting a possible association are reworded to state a direct cause-effect relationship. Students could then be asked to "rewrite" a popularization article according to the stylistic "hedging guidelines" of present day scientific prose.

As a matter of fact, since hedging is a common technique of communicating information in scientific discourse, it should be explicitly studied and taught to the students in order to assist them in their studies and professional career.

References

- Adams-Smith, D.E. (1984). "Medical discourse: aspects of author's comments." *English for Specific Purposes*. 3, 25-36.
- Ahmad, K. U. (1997). Research article introductions in Malay: Rhetoric in an emerging research community. *Trends in Linguistics: Culture and Styles of Academic discourse*, 139-145. Berlin; New York: Mouton de Gruyter.
- Anthony, L. (1999). Writing research article introductions in software engineering: How accurate is a standard model? *IEEE*, 42(1), 38-46.
- Brown, P. & Levinson, S. (1987). *Politeness: Some universals in language usage*. Cambridge: Cambridge University Press.
- Butler, C. S. (1990). Quantification in Science: Modal Meanings in Science Texts. In *The Writing Scholar: Studies in Academic Discourse*, ed. Walter Nash, 137-170. Newbury Park: Sage Publication.
- Clyne, M. (1991). The sociocultural dimension: the dilemma of the German-speaking scholar. In Schröder, H. (Ed.). *Subject-Oriented Texts. Languages for Special Purposes and Text Theory*. de Gruyter. Berlin. 49-68.
- Coates, J. (1983). *The Semantics of the Modal Auxiliaries*. London: Croom Helm.
- Coates, J. (1987). Epistemic Modality and Spoken Discourse. *Transactions of the Philological Society*, 85, 100-131.
- Crystal, D. (1995). In Search of English: A Traveler's Guide. *ELT Journal*, 49, 107-121.

- Fand, R.J. (1989) "Detecting bias in newspapers: implications for teaching ESL." *Reading in a Foreign Language*. 6(1): 315-321.
- Galtung, J. (1979). "Deductive thinking and political practice. An essay of the teutonic intellectual style style. " In Galtung, J. (Ed.) *Papers on Methodology. Essays on Methodology*. Vol. II. Copenhagen.
- Gilbert, G.N., and Mulkay, M. (1984). *Opening the Pandora's Box: A Sociological Analysis of Scientific Discourse*. Cambridge University Press.
- Heine, B. (1992). Agent Oriented vs. Epistemic Modality: Some Observations on German Modals. In *Modality in Grammar and Discourse*, ed. Joan Bybee and Suzanne Fleischman, 17-53.
- Holmes, J. (1982). Expressing Doubt and Certainty in English. *RELC Journal*. (13), 9- 28.
- Holmes, A. (1988). A genre-based investigation of the discussion sections in articles and dissertations. *English for Specific Purposes*. (7) 113-22.
- Hosman, Lawrence A. (1989). The Evaluative Consequences of Hedges, Hesitations, and Intensifiers: Powerful and Powerless Speech-styles. *Human Communication Research*, 15, 383-406.
- Huckin, T.N. (1987). Surprise value in scientific discourse. Paper presented at the Convention. Atlanta. Ga. March.
- Hyland, K. (1994). Hedging in academic writing and EAP textbooks. *English For Specific Purposes*, 13(3). 239-256.
- Hyland, K. (1996a). Writing without conviction? Hedging in science research articles. *Applied Linguistics*, 17(4).433-454.
- Hyland, K. (1996b). Talking to the Academy: Forms of hedging in science research articles. *Written Communication*, 13(2). 252-281.
- Hyland, K. (1996c). Nurturing hedges in the ESP curriculum. *System*, 24(4). 477-490.
- Hyland, K. (1998). *Hedging in scientific research articles*. Amsterdam/Philadelphia: John Benjamins Publishing Company.
- Hyland, K. (1999).Genre: Language, context and Literacy. *Annual Review of Applied Linguistics*. (22), 113-135.
- Hyland, K. (2000). *Disciplinary Discourses: Social Interactions in Academic Writing*. Singapore: Longman.
- Kong, A., D. Barnett, F. Mosteller & C. Youtz. (1986). How medical professionals evaluate expressions for probabilities. *New England Journal of Medicine*, (12). 740-4.

- Kubui, A. (1988). Aspects of Hedgings in the Discussion of Medical Research Discourse. LSU ESP Collection. MSc. in TESP Dissertation. University of Aston in Birmingham.
- Lackstrom, J.E., L. Selinker, & L. Trimble (1972). Grammar and technical English. *English Teaching Forum*. 10(5): 3-14.
- Lakoff, G. (1972). Hedges: A study in meaning criteria and the logic of fuzzy concepts. *Journal of Philosophical Logic*. 2, 458-508.
- Lee, S. (2001). *A contrastive rhetorical study of Korean and English research paper introductions*. University of Illinois at Urbana-Champaign.
- Lotfizadeh, A. (1972). A Fuzzy-set-theoretic Interpretation of Linguistic Hedges. *Journal of Cybernetics*, 2, 4-34.
- Lyons, J. (1977). *Semantics*. Great Britain: Cambridge University Press.
- Markkanen, R & Schröder, H. (1988). Hedging as a translation problem in scientific texts. In C. Lauren & M. Nordman (Eds.) *Special Language: From human thinking to thinking machines. Multilingual matters* (pp. 171-180). Clevedon.
- Myers, G. (1985). Texts as knowledge claims: the social constructions of two biology articles. *Social Studies of Science*. (15) 593-630.
- Myers G.(1989). The pragmatics of politeness in scientific articles. *Applied Linguistics*, 10(1). 1-35.
- Myers, G. (1992). Textbooks and the sociology of science. *English for Specific Purposes*, (11), 3-19.
- Nittono, M. (2003). Japanese Hedging in Friend-friend Discourse. Unpublished Ph.D Dissertation. Columbia University, U.S.A.
- Politzer, P.E. (1987). Medical education for a changing future: new concepts for revising texts. *Medical Education*. (21) 320-33.
- Prince, E. F., Frader, R. J. & Bosk, C. (1982). On hedging in physician- physician discourse. In J. di Prieto (Ed.), *Linguistics and the Professional* (pp. 83-97). Norwood, NJ: Ablex Publishing corporation.
- Rounds, P. (1981). *On hedging in social science written texts*. University of Michigan (Mimeo).
- Rounds, P. (1982). *Hedging in Written Academic Discourse: Precision and Flexibility*. University of Michigan (Mimeo).
- Salager-Meyer, F. (1994). Hedging and textual communicative function in medical English written discourse. *English for Specific Purposes*, 13(2). 149-170.

- Salager-Meyer, F. (1998). Language is not a physical object [Response to P. Crompton's "Hedging in academic writing: Some theoretical problems. *English for Specific Purposes*, 16, 271-287]. *English for Specific Purposes*, 17, 295-302.
- Samraj, B. (2002). Introductions in research articles: Variations across. *English For Specific Purposes*. (21), 1-17.
- Schwartz, S., and T. Griffin (1986). *Medical Thinking*. Springer-Verlag. Berlin.
- Selinker, L. (1979). On the use of informants in discourse analysis and language for specialized purposes. *IRAL*. 27(3).
- Skelton, j. (1988a). Care and maintenance of hedges. *ELT Journal*, 42, 37-43.
- Skelton, j. (1988b). Comments in academic articles. *Applied linguistics in society*. London: CILT/BAAL.
- Stubbs, M. (1986). A Matter of Prolonged Fieldwork: Notes towards a Modal Grammar of English. *Applied Linguistics*, (7), 1-25.
- Swales, J. (1981). *Aspects of Article Introductions*. *Aston University ESP Research Reports N 1*. University of Aston in Birmingham.
- Swales, J. (1987). Utilizing the literature in teaching the research paper. *TESOL Quarterly*, (1) 41-67.
- Swales, J. (1990). *Genre analysis: English in academic and research settings*. Cambridge: Cambridge University Press.
- Swales, J. & najjar, H. (1997). The writing of research article introductions, *Written Communication*, 4, 175-192.
- Tarantino, M. (1991b). EST: Dispassionate discourse and the discreet presence. *UNESCO-ALSED-LSP Newsletter*. 13(4), p.28-34.
- Taylor, G. & Chen, T. (1991). Linguistic, cultural, and subcultural issues in contrastive discourse analysis: Anglo-American and Chinese scientific texts. *Applied Linguistics*, 12, 319-336.
- Trimble, L. (1985). *English for Science and Technology: A Discourse Approach*. Cambridge University Press.
- Varttala, T. (1999). Remarks on the communicative functions of hedging in popular scientific and specialist research articles on medicine. *English for Specific Purposes*, 18(2), 177-200.
- Varttala, T. (2001). *Hedging in Scientifically Oriented Discourse: Exploring Variation According to Discipline and Intended Audience*. Unpublished Ph.D Dissertation, University of Tampereen Yliopisto, Finland. Accessed online from Website: <http://acta.uta.fi/pdf/951-44-5195-3>.

- Yang, Y. (2003). A Contrastive Study of Hedges in English and Chinese Academic Discourse. Unpublished MA Thesis, Jilin University, Changchun, China.
- Zuck, j. G. & Zuck, L. V. (1987). Hedging in newswriting. In A. M. Cornu, J. Vanparijs, & M. Delahaye (Eds.), *Beads or bracelets: how do we approach LSP?* Leuven, Belgium: Oxford University Press. 172-181.