Chapter three: Data Collection Methodology
3.1. Overview

This chapter includes a description of the research method consisting of the data collection procedures, the description of participants and instrumentation, and the procedures for analyzing the data. The aim of this study is to elicit information about the function and the application of the discourse markers in ESM texts and how they might affect the reading performance of the ESP Students. With regard to the purposes of the study which were mentioned earlier in chapter one, this study was divided into two parts. Each part investigated the relevant research questions of this study. Therefore, different data collection procedures were employed to work out the problems under investigation in these parts. The aim of the part one was to find out whether there was any difference between discourse markers used in the different sections of medical research articles in terms of their frequencies and thus addressed the first research question. The intent of part two was to investigate whether there was any relationship between the knowledge of discourse markers used in the medical discourse and reading comprehension skill of ESM learners, addressing the second research question. Also, this part investigated whether or not the explicit treatment of this knowledge was related to the performance of the learners of ESM in reading comprehension.

3.2. Organization of the Methodology

The current investigation, as mentioned earlier, was divided into two separate and distinct studies. Study one (finding out the frequencies of discourse markers in different section of medical articles) addressed the
first research question. It focused on an investigation of the difference between the uses of discourse markers in different sections in terms of their frequencies. This was examined within the entire sample of articles in different medical fields. The different sections were then compared to each other to determine whether they showed any different patterns of use of discourse markers. To this end, the frequencies of these discourse markers in different sections were determined to find out which discourse markers are frequent in any section and what their functions are. In the second part of this study, a lesson plan was prepared according to the findings of part one and then a sample of medicine students was selected to participate in a treatment course about the above-mentioned material to determine whether there is any relationship between the knowledge of discourse markers and their reading comprehension. The part two of this study addressed the second research question by providing a descriptive examination of the reading performance of the student groups participated in this study. They were administrated in the reading comprehension tests after passing the treatment course about the function of discourse markers to show their performance. The two parts of the study are discussed in terms of method, subjects, material, instrumentation and procedures and research design.

3.3. Subjects

As mentioned earlier, the intent of the part two of the study was to address the second and third research questions by examining the reading performance of students. This study was conducted with a population including 68 students, majoring in medicine. They attended English for specific purposes course at the Medicine faculty of Tabriz University of Medical Sciences. The mean age of the participants was 18-22 years with
a similar educational background. They consisted of both male and female. All the participants had Turkish and Farsi as their first and second language. None of them had any background of residency in an English speaking country. These students were from variety of regions with different cultures, backgrounds, and amount of time exposed to English. They were highly motivated towards improving all possible aspects of their English learning. There is widespread recognition that language and communication are central aspects of the doctor’s task. Also now, English as an International language has a very advantageous position in education professional communication in everywhere. With respect to their English language experience, it is to be mentioned that these subjects participating in this survey didn’t have most exposure to English language in their background education. In general, English has mostly instrumental function in education and only plays a role as a foreign language for international communication, trade, diplomacy, tourism and for specific purposes as in the reading of scientific and technical materials in all levels of education. All subjects are based on Farsi medium texts during their academic study in the school and university. On the school curriculum, less emphasis is placed on English which is a compulsory foreign language and is only introduced in the sixth grade until graduation (twelfth grade), although a suggestion to increase the time allocated to teaching English amongst all grades is currently under debate in the Ministry of Education of Iran. That is why once many of these students join university, they have difficulty for succeeding academically in their program. On the university curriculum, they are introduced a three-unit subject in general English as a compulsory foreign language and as a prerequisite unit for ESP course. Only some of their extra reading task is
mostly based on English medium texts during their academic study in the university.

The medicine students functioning as subjects in this study were divided into two groups: one as experimental (A) and the other as control group (B). All the students were selected and assigned to each group according to random clustering procedures. The number of students in each group was 30 persons. The experimental group (A) was taught about the function of the discourse markers of the ESM written texts explicitly along with their textbooks while the control group (B) received no such treatment and they were taught only their textbooks.

The aim of this classification was, to find out the effect of teaching the function of discourse markers of medical discourse on the reading performance of the students who received them explicitly. Of course, before conducting the research, a pre-test (an ESP reading comprehension test) along with a GEP test were given to the subjects to ensure the homogeneity of the subjects in terms of their proficiency in English and to measure their abilities in ESP. After the treatment, a post ESP test as an achievement test was administered to subjects in both groups to see how much they improved in reading comprehension performance.

3.4. Instrumentation

The selection of suitable tools was of vital importance for successful research. The researcher should select some of the tools to use for the work. Four data collection tools employed in two parts of the study would be as follows:
1- A corpus of medical research articles to identify the most frequent discourse markers used in different sections of articles. They have been selected from the high prestigious medical journals.

2- A Pre-instruction ESP reading comprehension test

This test comprised four passages from different medical texts with twenty questions about the passages. Comprehension of each text followed by 4 multiple choice questions with only one correct answer per question. The questions were all text-based and tapped into factual, inferential and global comprehension of the text. The main goal of the designed ESP test was to determine the database for the students’ ability on reading comprehension in ESM texts and also to measure their ability to be sure the homogeneity of the groups.

3- A 50-item “Testing of English as a Foreign Language” (TOEFL) test

This test was given to both groups at the beginning of the study to assess the ability of the subjects’ proficiency level of general English before the experiment in terms of being homogenous groups and also it was used to determine the validity and reliability of the pre-ESP & post-ESP tests in the pilot study.

**Table 3.1. Specification of the TOEFL test**

<table>
<thead>
<tr>
<th>Parts</th>
<th>Components</th>
<th>Number of items</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>Grammar &amp; structure</td>
<td>20</td>
</tr>
<tr>
<td>Two</td>
<td>Vocabulary</td>
<td>20</td>
</tr>
<tr>
<td>Three</td>
<td>Reading comprehension</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>-</td>
<td>50</td>
</tr>
</tbody>
</table>
This test was chosen from the book “Reading for TOEFL”. It consisted of four subcomponents: structure & grammar, vocabulary, reading comprehension and listening. It should be mentioned that the listening subcomponent was deleted from this study, since only the verbal abilities of the subjects were crucial to this study. Table 3.1 indicates the specification of the TOEFL test which was employed in this study.

4- A post-instruction ESP reading comprehension test

This test was administrated to find out the effect of the treatment. It, like the pre-instruction reading comprehension test, included 20 questions about four reading comprehension passages.

All items had equal values and every correctly answered item was given one point. The subjects were not penalized for the wrong responses. In addition, no time limit was imposed; the rationale behind it was that the tester didn’t want to test the students’ performance under pressure, but rather their ability to answer the items.

3.5. Materials

3.5.1. Material of Part One: Frequency of the discourse markers used in the medical research articles

Examples of genre in academic written English are: research articles or papers, abstracts, thesis and dissertation, and textbooks. To achieve our aims, a corpus made up of real texts of medical research articles from medicine journals and some periodicals were selected randomly to analyze the texts. Because the medical scientific periodicals have a strong influence on the advancement of medical science and education, the researcher decided to select full length journal articles as
the primary source material. A corpus of English texts was chosen to meet the following prototypical features as it is shown in table 3.2.

Table 3.2: The specification of the corpus of English texts

- **text form:** scientific exposition
- **genre:** research articles
- **subject matter or topic:** medicine (directly related to ESP)
- **level of expertise:** expert writer

The findings of the present research were based on the analysis of forty articles written in English and chosen on the random method of sampling. The size of this corpus is considered fairly adequate as a basis for making useful generalizations about the discourse markers patterns in Medical English Research Paper (MERP). However, reliability will be improved when the current findings are tested out on a further similar – sized (or larger) selection of medical English articles. These articles were published in different medical journals between 2003 and 2007 and were selected from high – prestige journals. To choose valid and reasonable materials to study, these journals were selected after consultation with faculty members of the Medicine faculty of Tabriz University of Medical Sciences. The reason for choosing the most prestigious journals was that, in view of the rigorous vetting and the numerous revision processes of these journals , it can be assumed that what eventually gets published reflects a certain standard of quality, what Swales (1990) refers to as prototypical exemplars of the genre. It was not possible to determine if the writers were native or non- native English language speakers, but this distinction is not important in this study as all these articles would have
been redacted by the editors before publication. Furthermore, this study is not concerned with the variation between the different sections of research articles of native or non-native English language speakers, but instead it is concerned with how medical research articles are written in terms of use of discourse markers in different sections, that is, it is concerned with one genre and its subgenre.

These articles were selected in the different specialized fields of medicine such as ophthalmology, heart diseases, brain diseases, gynecology and internal diseases like cancer, digestive gastrointestinal diseases and surgery. A sample article of each field is presented in the appendix (A) section. Figure one provides a chart of the medical articles with the above-mentioned specialized fields.

Figure 3.1: The specification of the specialized fields of medical research articles
It is to be mentioned that any research has not indicated any differences between the genres of medical research articles in terms of the specialized fields of medicine discipline, however, the researcher decided to select research articles among the different specific fields of medicine to have diverse texts.

3.5.2. Material of Part two: Treatment course and Reading performance

After extracting the most frequent discourse markers from different medical research articles, they were analyzed in terms of the quality and quantity of discourse markers which were found and then they were classified in fourteen categories. The classification and analysis of discourse markers were based on functional criteria, drawing both on the analysis of text and on the study of different classifications proposed from functional perspective (Halliday and Hassan, 1983, Schiffrin, 1987, Lotfipour, 2006, Hyland, 2000, Crismore, Markanen, & Steffensen, 1993). These functions are based on their linguistic, semantics and pragmatics role in texts. Then a lesson plan based on these categories was prepared to instruct the students of the experimental group to examine its impact on their reading comprehension. This material provides information about each category of discourse markers with definition, discussion about their functional role in coherence of the text, the manner of order in discourse, list of types, and examples. It is to be mentioned for each discourse markers, some part of research articles with other examples were given to make the students comprehend better the matter. So, to do this task, much energy and activities were required to be employed from the side of the instructor. The fourteen classified categories of discourse markers are as
follows: addition, reason, adversative, result, purpose, contrast, manner, paraphrase, summary, comparison, time, sequences, exemplification and condition.

1. **ADDITION**

This type of discourse marker causing meaning relationship between clauses or sentences adds the second clause or sentence to the first. Some of elements of the second clause or sentence have been omitted in analogy with those in the first. The following are further examples of ‘addition’ discourse marker:

**Type A**
This type conjoins elements within the boundary of clauses.

- and
- not only......but ......, as well
- both..... and
- either
- again
- as well as
- not only ... but also
- or
- either ... or
- neither ... nor
- also
- too
- as well

**Example:** Maybe the symptoms of the disease are appeared in few days after the affection of patient to the virus A. Or maybe the symptoms are not shown in two weeks after affection, and it will cause some misleading to the physician.

**Type B**
We use these expressions to add information to what has been said. The usage of these words is much more elegant than just making a list or using the conjunction 'and'. This type occurs at the beginning of a sentence and indicates that what is said is added to a similar point in the previous sentence.

\[
\begin{align*}
\text{In addition} & \\
\text{Additionally} & \\
\text{Besides} & \\
\text{Moreover} & \\
\text{Furthermore} & \\
\text{what is more} & \\
\text{in fact} & \\
\text{as a matter of fact} &
\end{align*}
\]

The textual order

In addition, 
Besides,
The first sentence. Moreover, + the second sentence. 
Furthermore, 
Additionally,

Example: Eating patterns with a high glycemic load are over time associated with a greater likelihood of developing type-2 diabetes. Moreover, a lighter glycemic load not only decreases the risk of the disease, it also helps to control blood sugar.

Type C

This type creates a relationship between a noun or noun phrase and a clause.

Among these, we can name the following:

\[
\begin{align*}
\text{In addition to (+ Noun/Noun phrase)} & \\
\text{Besides (+ Noun/Noun Phrase)} & \\
\text{Apart from (+ Noun/Noun phrase)} &
\end{align*}
\]

Example: Besides animals, there are plants, fungi, and a variety of micro-organism.

2. REASON
It shows the relationship between an action or state of affairs and the reason for it. There are 2 categories of connectors for this purpose:

**Type A**

Because
Since
As
For
Now that
It was in indented that

**Sometime, the connector ‘because’ is changed into ‘that is because’ or ‘the reason is that’ and thus the dependent reason clause is changed into an independent sentence.

**The textual order:**

Main clause + DM + reason dependent clause
DM + reason dependent clause, main clause

**Example:** Because isolating an enzyme can be difficult, you may want to work with extracts from a plant or an animal.

**Type B**

These discourse markers come before a noun or noun phrase acting as reason for the action of the main clause and join them together.

because of
owing to
due to (the fact that)
thanks to
in view of (the fact that)
on account of (the fact that)
in as much as
the ........ er, the ........er

**The textual order:**

DM + reason phrase, the main sentence
The main sentence + DM + reason phrase

**Example:**
- Medical scientists are studying the effectiveness of a natural human protein
that can now be produced in large quantities in the laboratory, thanks to genetic engineering.
- Because of their extremely small size, bacterial cells are difficult to see.

3. ADVERSATIVE (CONCESSION)

This is a meaning relationship between two clauses or sentences where one generates certain expectations which are contrary to what is said in the other. It is to be mentioned that the type of meaning relationships here is not contrast because in contrast one sentence is semantically opposite to the other one. But in adversative meaning relationship, there is no semantic oppositeness or contrast. Besides, the type and nature of expectations generated by a proposition is not unvaried and inherent to it. They depend on the context of situation and culture. That is, the same sentence may generate different expectations in different contexts. The connectors which signal adversative meaning relationship fall into the following groups:

**Type A (within the same sentence)**

*Although*
*Though*
*Even though*
*In spite of the fact that*
*Despite of the fact that*
*Not withstanding the fact that*
*Regardless of the fact that*
*Even if the fact that*

**The textual order**
- DM + dependent clause, the main clause
- The main clause + DM + dependent clause

**Example:** Even though these creatures are microscopic, when large numbers of shells accumulate over time, they can form massive structures such as the white cliffs of Dover in England.
* In more formal style, sometimes, this pattern of adversative/concession meaning relationship (when the adverbial clause is of VF 1 type i.e. Subject + Be + Complement) is replaced by the following pattern:
  - DM + subject + Be + C is replaced by:
  - C + as + subject + Be

Example:
Although water is important for survival, it is possible for an organism to have too much water in its cells.
It can be replaced by the following sentence:
Important as water is for survival, it is possible for an organism to have too much water in its cells.

Type B
This type of DMs also functions within the sentence boundary. But unlike type A of DMs, the DMs in this type are attached to a noun or noun type. Thus, the expectation generating element assumes a noun form. This type of adversative DMs includes:

* Despite
  * In spite of
  * Not withstanding

The textual order:
- DM + Noun/ Noun Group, the main clause
- The main clause + DM + Noun / Noun clause

Example:
Despite their differences, all cells share certain characteristics.

Type C
This type of DMs relates the meanings across two independent sentences. They include:
The textual order for “But”:
The First sentence (generating the expectations). But + the second sentence one

The textual order for the other DMs in Type (C)
Sentence One (generating the expectations). DM, Sentence two.
Sentence One (generating the expectations). Sentence two, DM.
Sentence One. Part of Sentence two, DM, part of sentence two.

Example:
If you tested the effects of temperature changes, you probably discovered an optimum range for enzyme action. However, not all enzymes function best in this range.

4. RESULT

In this discourse marker, there is a meaning relationship between an action or state of affair and its result or consequence. These DMs fall into two categories as follows:

Type A
This type occurs before the dependent result clause relating it to the main clause within the boundary of a T-unit. The following are included among this type of DMs:

So that
So ...(adj/adv) ... that
Such (noun/noun phrase) ... that
The textual order:
The main clause + so that + dependent result clause
The main clause + so + adj / Adv. + result clause
The main clause + such + noun Phrase + result clause

Example:
So far, we have been able to build a tremendous knowledge base so that many phenomena are well understood by human kind.
It was such a cold day that she had a horrible cold.

Type B
These expressions show that the second statement follows logically from the first statement. This type of DMs occurs in the result clause indicating its meaning relationship with the main clause which has proceeded. The following are to be mentioned:

Therefore
Consequently
As a result
So
For this reason (= which is why)
Hence
Thus
Accordingly
As can be seen
For that reason

The textual order for ‘so’
Sentence one. So + sentence two (result).

The textual order for the other DMs in type (B)
Sentence one. DM, sentence two (result)

Example:
A bacterium has no nucleus or other cellular structures. As a result, bacteria are called prokaryotes.
5. PURPOSE

It indicates that the dependent clause is about the purpose for which the action in the main clause takes place. These DMs include the following types:

**Type A**

*To + infinitive*

**Example:**

To create various salt solutions, add distilled water to decrease salinity and boil off water to increase salinity.

**Sometimes the infinitive is preceded by elements such as:**

- *that*
- *in order to*
- *so as to*
- *in an attempt*
- *in a bid*

**The textual order**

*in order*

- *The main clause + in an attempt + to + infinitive + in a bid*

*In order*

*In an attempt + to + infinitive + the main clause*

*In a bid*

**Example:** in order to ensure the best education for their children, parents are willing to make sacrifices.

**Type B**

The purpose adverbial comes after the DM, which is mostly "for" or "for the sake of" or "for the purpose (that)."
Example: He doesn’t go anywhere these days for the sake of being relaxing at home.

Type C

The purpose adverbial is presented in the form of a clause which is connected to the main clause by DMs such as:

- so that
- in order that
- to this end
- with this object / the reason why

The textual order:
The main clause + so that + the result clause

Example:
In multi-cellular organisms, the digestive system breaks down food materials into smaller pieces so that they can be absorbed and used by individual cells.

“So that”: this discourse marker is used as a result discourse marker and also a purpose DM. The difference between them lies in the fact that the purpose clauses always require a modal verb “can / may / will” or their past forms “could / might / would”. The past form of the modals is used when the verb in the main clause is in past tense.

6. CONTRAST

This group of discourse markers gives expression to two ideas which contrast but do not contradict each other. This group refers to the clauses which include some semantically opposite elements. Contrast conjunction may sound similar to adversative meaning relationship. But, the quality of being ‘contrary to expectations generated by a previous statement’ required for an adversative conjunction, need not necessarily be ‘oppositeness’ of
meaning. The adversative relationship holding between the two propositions
is not contrastive in nature.

Type A
This type connects two clauses with contrastive meaning. Examples are:

But
While
Where
Whereas

The textual order for “But”:
Clause one + but clause + two

The textual order for “While”, “where”, “whereas”
Clause one + DM + Clause two
DM + clause one, clause two

Example:
While it’s true that quickly digested carbons can lead to a rapid rise in blood
sugar together with a spike in insulin, in many cases, these foods are not
eaten on their own.

Type B
It relates two independent sentences with contrastive meanings.

But
In contrast
On the contrary
Contrarily
Instead
On the other hand
On the other extreme
Just the other way round
Nonetheless
Actually
In deed
In effect

The textual order for “But”:
Sentence one. But Sentence two.

The textual order for the other discourse marker in Type B
Sentence one. Discourse marker, Sentence two.

Example: In organism with a large number of cells, certain cells may be specialized for digestion, others for respiration, and still others for circulation. In contrast, a unicellular organism must perform all its life functions within the contents of its single, non-specialized cell.

- Smoking is proved to be dangerous to the health. Nonetheless, 40% of the population smokes.

Type C
This type connects the main clause to a noun or noun group. The following are included among this type:

- In contrast to
- Contrary to
- As opposed to
- Instead of
- Rather than
- Unlike

The textual order
- The main clause + DM + Noun/ Noun group
- DM + Noun / Noun group, the main clause

Example: Rather than using the enzyme in liver or saliva, isolate a different enzyme from either an animal or a plant.

Unlike other creatures, a bacterium has no nucleus or other cellular structures.

7: CONDITION

It refers the occurrence or performance of an action would depend on a condition. The DMs used in this meaning relationship include the following:

Type A

- If/unless (= if + not)
- Provided (that)
Providing (that)  
On condition that  
Otherwise  
Or (else)  
In case  
In the event that  
In case (that)  
Whether ... or not

**Textual order for ’otherwise’, ’or’, ’or else’**
Sentence one. Otherwise / or / or else + Sentence two

**Textual order for ’if’, ’unless’, ’provided’, ’providing’ ....**
- DM + dependent condition clause, the main clause.
- The main clause + DM + dependent condition clause.

**Example:**
If you found heredity interesting when you studied it in biology class, then you might want to carry out a project in genetics.

**Some times, in conditional sentences, the condition DM is deleted and the conditional clause is inverted.**

**Type B**
Sometimes this type is not listed under ‘conditionals’, but as this type indicates a kind of dependency between two clauses in a sentence, so it is classified under condition DMs.

Regarding  
With regard to  
Depending on  
With respect to  
Given  
Based on  
Regardless of  
Whether or not  
No matter  
Irrespective of  
Whatever ...

**The textual order**
Both of these DMs occur with nouns.
( if a clause occurs instead of a noun, the clause should be preceded by a question word such as ‘whether’, ‘who’, ‘which’)

Example:
- Doctors and patients expect the latest drugs and technology, regardless of the cost.
- No matter what scientific processes you use, be sure to neatly record our observations and data in a notebook.

8: TIME
It refers the time relationship between two clauses. The following are included among these DMs:

Type A
This type relates a dependent time clause to the main one in a sentence or clause:

*When*
*While*
*After*
*Before*
*As soon as*
*As long as*
*Once*
*As*
*Following (= after)*

The textual order
DM + dependent clause, the main clause
The main clause + DM + dependent clause

Example:
- As a cell carries out its normal biological processes, it generates waste products.
- You could show what happens to the glucose after it is absorbed by the small intestine.
Type B
This type of DMs occurs with a noun or noun phrase rather than with a clause:

- After
- Before
- Upon
- Since
- During
- Until
- By the time
- Now that

**The textual order**
- DM + Noun/Noun phrase, the main clause
- The main clause + DM + noun / noun phrase

**Example:**
During metaphase, the chromosomes organize near the middle of the cell.

Type C
This type of DMs relates two independent sentences

- Meanwhile
- In the meantime
- At the same time

**The textual order**
Sentence one. DM, sentence two

**9: PARAPHRASING**

In this type of DMs, the second clause re-states what has been said by the first one. The following are examples of the DMs indicating this conjunction:

- in other words
- namely
- that is
- i.e.
- To put it in other words

**The textual order**
- Sentence one. DM, Sentence two
- Sentence one, DM + A phrase

10: EXEMPLIFICATION

It indicates that the second part offers examples for what has been discussed in the first part.

Type A:
This type of DMs comes between two independent sentences:

*For example*
*For instance*
*As an example*
*To give an example*

The textual order
Sentence one. DM, Sentence two

Type B
This type comes with nouns or noun types rather than sentences:

*For example*
*E.g*
*Like*
*As*
*Such as*
*Say*

Example:
For cases of diseases such as hemophilia, sickle-cell anemia, cystic fibrosis, and a number of immune – deficiency diseases

11: COMPARISON

In this discourse marker, two elements are compared within or across sentences. Comparison DMs fall into two major types:

Type A
It operates within the boundary of a sentence:

The same as
As ... as
So ... as
‘-er ... than’
more ..... than’
‘the .... est’
‘the most ....’
Not so ... as
Less ...... than

**Type B**

This type operates across sentence:

Likewise
Similarly
In the same manner
Such
Like
Equally important

**Example:**

Just as muscles would become helpless sinews if there were no nerves to
direct them into action, so without communications the most advanced
industrial equipment and social organizations would become useless.

**12: MANNER**

This type of DMs comes with two dependent sentences. The sentence
which includes DM justifies the state of other sentence. Also it indicates, in
some cases, the manner of occurrence of the sentence.

As if
As though

The textual order (before and after)
sentence one + DM + sentence two

**Example:** After recovery, he felt in good health as if he hasn’t done under
surgery for such a long time.
This surgeon is a skilled man, he stitches the skin as if he stitches the material.

13: SUMMARY

These discourse markers indicate a conclusion of the discussion. Their function is to sum up of the mentioned subjects. It is a way to focus the gist of the mentioned sentences as a whole. Also it can be a rephrase of the mentioned sentence.

*In brief*
*In sum*
*In conclusion*
*Finally*
*That is*
*As has been noted*
*On the whole in short*
*In other words*
*To be sure*
*In any event*
*As I have said*
*They come alone*

**Example:** on the whole in short, the infectious disease of HIV, killing many affected patients annually, should be considered as one of WHO priorities to be cured.

14: SEQUENCE

This type of discourse markers indicates the order or sequences of happening the sentences comparing happening the other sentences. Their function is to note a sequence and make a list. They come with one sentence.

*First*
*Second*
*Last*
*Prior to*
*Next*
*Then*
*Later*
*Eventually subsequently*
*Finally*
*Before/ two sentences*
*After/ two sentences*
3.6. Procedure

3.6.1. Part one: Frequency of the discourse markers used in the medical research articles

To accomplish the aims of the present experimental investigation, certain procedures were implemented. Initially, this study was going to analyze the sample texts to identify the frequencies use of discourse markers which commonly appear in different sections of the written medical research articles. This type of genre comprises a fixed structure with respect to five rhetorical divisions and section; they are known as the standard format by the editorial of the high prestigious journals. These sections, the body of the research articles, are named as: abstract, introduction, methodology and materials, discussion and result, and conclusion. The frequencies of discourse markers in every section were extracted and categorized; they fell into fourteen categories. Then, they were counted and recorded to be analyzed. A lesson plan (mentioned in the related section) was prepared based on the information and function of these discourse markers in order to be taught to the experimental group of medicine students during the treatment course. In every session, one category of these discourse markers was presented; it was incorporated...
with several examples about that feature to help the learners comprehend the lesson better.

3.6.2. Part two: Treatment course and Reading Performance

To empirically determine the role of instruction of the discourse markers function in comprehending medical research article genre, the patterns of used discourse markers were instructed to the medicine students in twelve sessions to examine if this treatment enhances their reading comprehension of medical texts. But prior to the treatment, in order to ensure the homogeneity of the experimental and control groups, a GEP and ESP tests as the pre-tests were constructed to administer to all the subjects in the two groups. The reading comprehension ESP test was prepared in the multiple-choice (MC) format. One of the advantages to use the multiple choice test which has had extensive use in many research projects is that its validity and reliability have been established. The presence of these two properties is essential if a survey instrument is to have any value in research. Therefore, this type of test was implemented in this research to obtain as much valid data as possible. The test included twenty items. Appropriacy of individual items, reliability as well as content validity of the newly developed reading comprehension ESP tests were approved by means of a pilot study in which the questionnaires were administered to students. The purpose of item analysis was to discard or revise items that were too difficult or too easy. The typical range of item facility used in this study was .33 to .67. Therefore, some of the items, which didn’t meet, statistically, accepted standards were either modified or discarded. The pilot study was carried out with one class (N = 22). No need to say that the subjects of the pilot study were selected from the same pool as the participants of the study. Then the reliability of the developed
ESP reading comprehension tests was estimated. Generally, reliability is defined as “the degree of consistency that the instrument or procedure demonstrates: whatever it is measuring it does so consistently”. A reliable test is not necessarily a test which has some degree of validity. A test may have consistency in measurement; however, it does not measure what it intended to measure. In other words, “a test must be reliable for it to be valid, but a test can be reliable and still not to be valid” (Best & Kahn, 2003, p.277). The higher is the coefficient of the reliability of a test; the lower will be the errors of measurement. A number of different formulas have been devised to compute the reliability coefficient. In this study, the reliability indices for the developed tests were estimated against the Kudar-Richardson formula 21 (KR-21). This method provides a measure of internal consistency. The KR-21 is the most practical, frequently used and convenient of estimating reliability (Mousavi, 1999). The following formula is used to estimate the KR-21 reliability:

\[(KR-21) \ r = \frac{K}{K-1} \left[ 1 - \frac{X(K-X)}{KV} \right] \]

K= the number of items in the test  
X = the mean of the test scores  
V= the variance of the test scores

Along with the measurement of reliability, the validity of the pre and post tests was measured. Validity refers to the extent to which the tool used for data collection measures what it is supposed to measure. As Seliger and Shohamy (1989) point out, “Validity cannot really be proven but it is necessary to obtain evidence of validity”. To validate the pre and post-ESP tests, these tests along with a version of TOEFL test were given
to the pilot group in this study. Then, the validity was estimated through correlating reading comprehension scores with the results of the TOEFL test. The TOEFL test scores, then, provided the basis for finding the correlation between the tests used in this study and a standardized test, and to estimate the validity of the former. Concurrent validity is determined by calculating the correlation between the scores obtained when a new instrument is administered along with another known test to the same group at or near the same time. After the determination of validity, reliability, SD and mean of the pilot study group and also after finding out the reasonable results, psychometrically speaking, the ESP test along with the GEP test were ready to be administered to the target groups in this study. Then the test was administered to subjects within a single session in approximately 60 minutes. After analysis the data, it was found out that the two groups were homogenous. That is, the level of GEP and ESP reading comprehension of the two groups was not statistically different. After ensuring the homogeneity of the groups in terms of GEP and ESP reading comprehension ability, an instructional phase was planned and implemented based on the discourse markers application and function in reading comprehension. The treatment was planned to be performed in twelve sessions to the subjects. More specifically, they were taught their textbooks focusing on the above mentioned material, while the control group received their course textbooks in the regular way. Each category of discourse marker noted in the above mentioned lesson plan was taught in one sessions; every session concerned with the explanation and the practice on one of fourteen categories. The texts were taught with a focus on these categories and the students were asked to read the medical texts paying more attention to them in order to acquire fluency in getting the meaning of the text during their reading comprehension tasks. In order to
nullify the contaminating effect of other potential factors, the teacher, the
schedule, and the textbook were controlled in this study. After finishing
the treatment, an ESP achievement test was constructed. Then, it was
given to the pilot study group and after having found out the acceptable
reliability and validity of the ESP test, the ESP achievement test was
administered to both groups at the end of the experiment. And finally, the
obtained data were analyzed through statistical procedures to find if there
is any significant relationship between the knowledge of discourse
markers and reading comprehension performance of students.

3.7. Research Design

Regarding the nature of the research questions and the hypotheses, and
so to achieve the purpose, the researcher followed the descriptive and
experimental methods involving the constructing, developing and testing
hypothesis.

According to Farhady (1995), there are three major research
designs: descriptive, correlational and experimental. The present study is
both descriptive and experimental. The part one of this research is
descriptive because, based on Farhady “in a descriptive method, the
researcher attempts to describe and interpret the current status of
phenomena”. Best and Kahn (2003) state that a descriptive study “ is
concerned with conditions and relationships that exist, opinions that are
held, processes that are going on, effects that are evident, or trends that are
developing. It is primarily concerned with the present, although it often
considers past events and influences as they relate to current conditions”
(p. 114). Also this research is done using an experimental design
involving pre- instruction and post–instruction ESP tests. This design is
the design of all information-gathering exercises where variation is present, whether under the full control of the experimenter or not. In this design, sometimes the experimenter is interested in the effect of some process or intervention (the "treatment") on some objects (the "experimental units"), which may be people, parts of people, groups of people, etc. Schematically the design of this study is represented below:

<table>
<thead>
<tr>
<th>Group A (Experimental)</th>
<th>T1</th>
<th>X + C</th>
<th>T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group B (Control)</td>
<td>T1</td>
<td>C</td>
<td>T2</td>
</tr>
</tbody>
</table>

T1 = Pre-tests (ESP)
T2 = Achievement test (ESP)
X = Treatment
C = Placebo treatment (only teaching the textbook)

The selection of the participants in each group is based on randomized parallel design distribution of the subjects and the mean scores were calculated for each group for a cross-comparison. Then, the means obtained from each group were compared with the other one through a t-test formula.

3.8. Analysis

In order to carry out the present study, some statistical and inferential analyses were applied to statistically analyze the obtained data
and to examine the improvement of the experimental group in comparison with the control group. These analyses provided an appropriate answer to the stated research questions of this study; to address the first one, a percentage statistic analysis was conducted. This was used to obtain the frequencies of discourse markers used in different section of medical research articles. Referring back to the “Strategy of avoidance”, it should be noted that we can not run a chi-square analysis to compare the frequencies because their number of occurrences are not equal. Thus the best statistics are the “percentages”. The second set of analysis was concerned with the correlation coefficient procedures between pre- and post-ESP tests and TOEFL test to determine the reliability and validity of the ESP tests, and the third analysis was about correlation coefficient between the performances of the subjects of the two groups to find the degree of homogeneity of the subjects. The fourth analysis aimed at finding the significance of the differences between the means of two groups to investigate whether the explicit instruction of discourse markers function improves the performance of reading comprehension of medicine students. This was calculated through the independent t-test formula. Through analyzing the data, the observed t-value is checked against the t-critical value in the t distribution table to see whether the difference is significant at .05 levels of significance (Hatch & Lazaraton, 1991). By using this type of analysis, the researcher can compare the performance of two groups with each other in terms of their performance in reading. According to Glass and Hopkins, t-tests are a reliable and common statistical analysis to assess significant differences of mean scores of two groups on a single measure. This test was also used to make sure about the homogeneity of the control and experimental groups before the experiment in the current study. Moreover, the descriptive statistics of the
scores were calculated to find out the mean and standard deviation of the reading performance tests. All the stages and the results are presented in detail in the next chapter.