

Qualitative Characteristics of Coherence, Substitution, and Reference by Non-English Major Chinese Students

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Abstract

This study addresses the interrelation among coherence, substitution, and reference by non-English major Chinese students. The author collected data through student questionnaires. Participants included 30 non-English major Chinese undergraduate students. The findings of this study suggested that the similarities and differences were confirmed either in all participants or in the two gender groups. For example, in terms of similarities either all participants or the two gender groups tend to commit more mistakes in regards to coherence than substitution or reference. On the other hand, some significant differences were found, for instance, males scored relatively higher in the mean substitution and reference than did females, whereas females performed better in the mean coherence compared to males in the same field.

Keywords: Coherence, Cohesion, Substitution, Reference, T-test, Nonparametric Wilcoxon test

1. Introduction

Studies on coherence and cohesion have so far been carried out by many researchers. For example, some studies on cohesion have been done by Halliday & Hasan (1976) and Hadley (1987). Halliday & Hasan (1976) studies the cohesion that arises from semantic relations between sentences. Reference from one to the other, repetition of word meanings, the conjunctive force of *but*, *so*, *then* and the like are considered. Hadley (1987) conducted an experiment with a goal to test the understanding of twelve anaphoric pronouns, which were embedded in passages of continuous text by 151 primary school children from three year levels, in a suburban primary school, set in a moderately high social-economic area. Results showed a significant relationship between the comprehension of the selected anaphoric personal items and ability in reading, as measured by a standardized test. Studies on coherence can be available from de Beaugrande (1980); Carrell (1982); Connor (1984a); Enkvist (1985); and Kintsch & van Dijk (1978). de Beaugrande (1980) defines that coherence subsumes the procedures whereby elements of knowledge are activated such that their sequential connectivity is maintained and made recoverable. The means of coherence include: (1) logical relations such as causality and class inclusion; (2) knowledge of how events, actions, objects, and situations are organized, and (3) the striving for continuity in human experience. Carrell (1982) criticizes the concept of cohesion as a measure of textual coherence in the light of schema-theoretical views of text processing (e.g., reading) as an interactive process between the text and reader. Connor (1984a) examines cohesion and coherence in ESL learners' writing compared with the writing of native English speakers. Altogether six essays on argumentative tasks were analyzed using the cohesion theory of Halliday & Hasan (1976). The results of the study show that to be cohesive, an ESL essay did not need to be coherent. Enkvist (1985) suggests that total coherence requires cohesion not only on the textual surface but on the semantic level as well. In semantic terms, a text is coherent if its sentences conform to the picture of a single possible world in the experience or imagination of the receiver. Kintsch & van Dijk (1978) argue that the semantic structure of texts can be described both at the local micro-level and at a more global macro-level. A model for text comprehension based on this notion accounts for the formation of a coherent semantic text base in terms of cyclical process constrained by limitations of working memory.

From the results of above-mentioned studies, it is true that enough empirical studies on the detailed problem about how to understand the correlation between coherence and some individual factors of cohesion (e.g., substitution and reference) has not been paid enough attention to. Therefore this study will focus on how to identify the characteristics and relationship between coherence, substitution, and reference for the purpose of promoting the future study of coherence and cohesion.

The main reason for trying to identify the correlation between coherence, substitution and reference as the objective of my study comes from the fact that there is a shortage of knowledge about substitution and reference by non-English major students identified by Shen (2008 a & b). Therefore, a further investigation into the effect

of substitution and reference on coherence by non-English major students should be conducted.

Only non-English majors were used as participants in this study due to the fact that non-English majors constitute a large number of English learners in China and it is estimated that the learning level of this group can represent the average level of English learners in China.

2. Definitions of coherence and cohesion

2.1 Definitions of coherence

Attempts to define coherence can be traced to the 19th century, when the predominant emphasis was put on sentence connections and paragraph structure. Bain (1890), for example, defined coherence in terms of between-sentence connections that create tightly-structured and autonomous paragraphs, which are then linked together into a large text by transition devices. However, such conceptions construe coherence narrowly in terms of sentence-level connectedness and paragraph unity rather than discourse unity.

The emergence of studies in discourse¹ analysis in the 1960s shifted the emphasis of coherence from the sentence and its constituents to the larger principles of discourse—namely, a text. Labov (1970) claimed that the fundamental problem of discourse analysis is to show one utterance follows another in a rational, rule-governed manner, in other words, is to explain what is coherent (i.e., well-formed) discourse.

Phelps (1985) described coherence as “the experience of meaningfulness corrected with successful integration during reading, which the reader projects back into the text as a quality of wholeness in its meaning.” de Beaugrande & Dressler (1981) posited that coherence is based on “a continuity of sense among the knowledge activated by the expressions of the text” (p.84). Brown & Yule (1983) also viewed coherence as related to the reader’s interpretation of linguistic messages.

In addition to the above-mentioned ideology about coherence, the author wants to define coherence as a means of linking different parts of components of a discourse by proceeding most commonly from top to bottom in the structure of hierarchically ordered discourse, that is, from more general to more particular concepts. In other words, a discourse must consist of separate components (information) and thus create a specific condition in which the combination of individual components of a discourse is valid.

2.2 Definitions of cohesion

In the course of discourse analysis, the research on cohesion has long been carried out, and thus there are many terms for defining what cohesion is. In *Contrastive Rhetoric: Cross-Cultural Aspects of Second-Language Writing*, Connor (1996) defines cohesion as “the use of explicit linguistic devices to signal relations between sentences and parts of texts.” These cohesive devices are phrases or words that help the reader associate previous statements with subsequent ones. In *Cohesion in English*, Halliday & Hasan (1976) identifies five general categories of cohesive devices that signal coherence in texts:

- (1) reference
- (2) ellipsis
- (3) substitution
- (4) lexical cohesion
- (5) conjunction

According to Hadley (1987), “reference is concerned with the identification of a thing, or specific group of things, by the use of certain reference items, such as personal pronouns. As these items appear in the text for the second or more times, they establish a network of meaning between the various sections of the discourse.” Reference constitutes items in the English language which, “instead of being interpreted semantically in their own right, make reference to something else for their interpretation (Halliday & Hasan 1976). It can be divided into the following three types:

- a. personal reference, for example: *I, me, you, we, us, him, she, her, they, them*, and *it*
- b. demonstrative reference, for example: *the, this, there, that*, and *those*
- c. comparative reference, for instance: *same, identical, equal, other, different, more, better*

Substitution is thought of as the replacement of one term by another. According to the viewpoint of Bloor et al. (1995), substitution is used when “a speaker or writer wishes to avoid the repetition of a lexical item and is able to draw on one of the grammatical resources of the language to replace the item.” That is, when one item in a text is being substituted, it must follow that the substituted item maintains the same structural function as the presupposed item.

3. Literature reviews on the relationship between cohesion and coherence

Cohesion and coherence have been clearly defined respectively by many researchers as it can be seen from section two. In this section I want to summarize previous researches on the relationship between cohesion and coherence.

First, Widdowson (1973) makes cohesion and coherence become popular as a pair. Apart from the theory claimed by Widdowson (1973), there are still various points of view about the relationship between cohesion and coherence. For example, researchers in the field of applied linguistics have traditionally attempted to define cohesive devices in English as providing the basis for coherent texts.

Besides these, a direct correlation between cohesion and coherence is also asserted by Fitzgerald (1990) & Chau (1999). Fitzgerald (1990) examines the relationship between cohesion and coherence in children's writing and describes this relationship as (1) varies according to text content; (2) does not vary according to quality of writing; and (3) does not vary according to the students' grade level.

However, there have been no consistent agreements about the positive or negative effects on the relationship between cohesion and coherence. Contrary to Fitzgerald (1990) & Chau (1999), Carrell (1982) criticizes the concept of cohesion as a measure of coherence of a text.

Oller (1994) also identifies that cohesion is not necessarily connected with coherence based on the analysis of the following examples from Enkvist (1990):

My car is black. Black English was a controversial subject in the seventies. At seventy most people have retired. To retire means "to put new tires on a vehicle." Some vehicles such as hovercraft have no wheels. Wheels go round.

The text in this example has plenty of lexical cohesion (lexical repetition), but it is difficult to imagine any consistent plausible text world (Enkvist 1990; & Oller 1994).

4. Rationale and criteria for designing the questionnaire for this study

In order to accommodate the generalization of the study findings, several criteria were carefully considered.

First, the criteria used to determine the design of the questionnaire are based on the theory to define coherence and cohesion. Namely, the criteria defining coherence can be considered as a means of linking different parts of a single component by most commonly proceeding from top to bottom in the structure of hierarchically ordered information, that is, from more general to more particular concepts. On the other hand, the criteria that verify cohesion depend on the theory of Halliday & Hasan (1976).

Second, the criteria used to select ten multiple-choice questions for question two and ten fill-in-the-blank questions for question three in the questionnaire depend on the assumption that non-English major Chinese students are adept at answering these types of questionnaires rather than replying to questions by writing free from answers.

Third, the reason of explaining the results by gender differences depends on previous researches claiming that gender differences play a very important role in language learning, especially in different use tendency of words, phrases, and some discourse markers' choices. For example, according to Lakoff's (1975) pioneering work, gender differences have been investigated at the level of specific phrases. Lakoff identified in women's language two specific types of phrases—hedges (e.g., "it seems like,") and tag questions (e.g., "...aren't you?")—that can be inserted into a wide variety of sentences. A number of studies have reported that females use more often tag questions (e.g., McMillan, Clifton, McGrath, & Gale 1977; Mulac & Lundell 1986) although others have found the opposite (e.g., Dubois & Crouch 1975). Besides this, gender differences have also been examined by studying the actual words people use. Women have been found to use more intensive adverbs, more conjunctions such as *but*, and more modal auxiliary verbs such as *could* that place question marks of some kind over a statement (Biber, Contad, & Reppen 1998). Men have been found to swear more, use longer words, use more articles, and use more references to location (e.g., Gleser, Gottschalk, & John 1959). In this study I want to make it clear whether there are gender differences in terms of the use of coherence, substitution, and reference characterized by non-English major Chinese students.

5. Research questions, data collections, and research method

5.1 Research questions

I formulated the following research questions for this study:

(1) What are the characteristics of coherence, substitution, and reference typical of non-English major Chinese

medical university students inferred from the results of several statistical tests, such as a t-test, Pearson's correlation test, and nonparametric Wilcoxon test?

(2) Are there any similarities and differences between coherence, substitution, and reference based on gender differences?

5.2 Research objective

The main objective of the questionnaire used for this study is to determine whether there is a relationship between coherence, substitution, and reference by non-English major Chinese undergraduate students. In other words, I want to understand if coherence has an influential role in substitution and reference or vice versa. Based on this notion, I asked thirty participants to complete the questionnaire that I previously designed, for which the knowledge of coherence, substitution, and reference is necessary for the participants to finish this questionnaire. The final score is calculated by using a ten-point rating system.

5.3 Research participants

An important consideration for this study was the university context for the research. The main participants in this study are non-English major Chinese students. Specifically, thirty medical university students (i.e., 14 males and 16 females) were randomly selected as participants for this study. Their ages range from twenty-one to twenty-two and they have studied English for twelve to fourteen years. All of them are monolingual and their native language is Chinese.

Compared with data collected from secondary school students learning English in China, data is preferred from non-English major undergraduate students. This is because it is difficult for secondary school students in China to answer the questionnaire that I designed for this study, especially to answer the question related to coherence. In China, knowledge of textual coherence in English is not taught to secondary school students as a grammar item.

The participants were allowed to answer the questionnaire either in the classroom or outside of class. Nevertheless, the participants were asked to limit their time answering the questionnaire to 90 minutes. They were not allowed to rely on a dictionary to complete the questionnaire.

5.4 Research method

I calculated the total number of correct answers to the questionnaire by all of the participants in this study and then placed the total correct answer scores into SPSS 17, which was used to conduct a Pearson's correlation test, t-test, and nonparametric Wilcoxon test in order to evaluate what I want to know about the relationship between coherence, substitution, and reference as used by non-English major Chinese students.

6. Findings

The following answers can be derived from research question one.

First, from the mean correct responses to questions one through three listed in the questionnaire by the participants, I noticed that the subjects in this study received the highest scores in the use of reference, with the mean reference scores reaching 6.72, while the mean scores of coherence were 0.61 and those of substitution were 5.56. **Table 1** displayed the detailed information.

Second, no correlations were found between coherence, substitution, and reference for the answers to questions one through three by non-English major Chinese students in this study. To explain this in greater detail, the Pearson's correlation coefficient (r) is 0.43 between substitution and reference, 0.42 between coherence and reference, and 0.40 between coherence and substitution respectively. However, the correlation between substitution and reference is stronger (i.e., $r = 0.43$) in comparison to the correlation between coherence and reference (i.e., $r = 0.42$), and between coherence and substitution (i.e., $r = 0.40$). Please refer to **Table 2** for detailed correlations.

Third, with respect to the results of the t-test for all of the subjects in this study, no mean difference was observed between substitution and reference ($t = 1.6$, $p = 0.12$), whereas an obvious mean difference appears between coherence and substitution ($t = -16.1$, $p = 0.000^{**}$) and between coherence and reference ($t = -8.5$, $p = 0.000^{**}$) at the level of 1%. Please see **Table 3** for the results of the t-test.

Fourth, according to the results of the nonparametric Wilcoxon test shown in **Table 4**, significant median differences were clearly seen between coherence and substitution and between coherence and reference, yet no obvious differences were observed between substitution and reference.

Besides the above results, we must consider the results of coherence, substitution, and reference based on gender

differences, which can be regarded as an answer to research question two.

First, as shown in **Table 5**, the mean score (MS) for coherence is the lowest, i.e., MS equals 0.83 for females and 0.5 for males, whereas MS equals 5 for females and 5.83 for males for substitution. The MS for reference is 6.5 for females and 6.83 for males.

Second, **Table 6** illustrates that a strong Pearson's correlation coefficient was observed. That is, a correlation ($r = 0.777$ and $p = 0.003 < 0.01$) was found between coherence and substitution for males, but no significant correlations were evident between coherence and reference and between substitution and reference for the male participants in this study.

Third, according to the results of the Pearson's correlation test as shown in **Table 7**, it is clear that no strong Pearson's correlation coefficient was detected between coherence, substitution, and reference for the female participants. Nevertheless, the highest correlation of all (i.e., $r = 0.511$) was observed between coherence and reference, and the correlation between substitution and reference was the second highest (i.e., $r = 0.34$).

Fourth, **Table 8** refers to the results of the t-test for the males who participated in this study. An obvious mean difference was observed between coherence and substitution, and between coherence and reference, whereas no evident differences appeared between substitution and reference. This result is consistent with the results shown in **Table 3**.

Fifth, as shown in **Table 9**, the results of the nonparametric Wilcoxon test for the male participants reveal significant median differences between coherence and substitution and between coherence and reference, whereas no great differences were observed between substitution and reference. These median differences closely correspond with the mean difference identified in **Table 4**.

Sixth, with regard to the results of the t-test for the female participants, obvious differences between coherence and substitution and between coherence and reference were evident while no evident difference was observed between substitution and reference. Please see **Table 10** for reference.

Seventh, **Table 11** shows obvious median differences between coherence and substitution and between coherence and reference at the 5% level while no difference was seen between substitution and reference for the female participants.

7. General Discussions

As indicated in the above statistical analysis of coherence, substitution, and reference for non-English major Chinese students, we come to the following conclusions:

According to the mean score on coherence, substitution, and reference, we realized that the subjects of this study have comparatively weak knowledge and practical skills in creating a passage or text as coherent as possible.

This conclusion was supported by the fact that they got the lowest score (0.61) on the coherence question compared with the second lowest score on the substitution question (5.56) and a relatively high score on the reference question (6.72). We can infer from this finding that a lack of knowledge of coherence is not an easy problem to solve. It may involve semantic and pragmatic learning, from another angle, the perception of coherence is assumed to be relevant to the understanding of semantic and pragmatic points of view. The sole teaching on coherence may cause a result without meaning for students.

Based on the results of the mean differences in coherence, substitution, and reference reflected by two genders, we are aware that males scored higher on the coherence question than females did. Females, however, performed better in both substitution and reference compared to males in the same field. In this respect, we can conclude that gender differences result in variations in undergraduates' perception of coherence, substitution and reference.

From the results of Pearson's correlation for all of the participants in this study, I found that no strong correlation could be seen among coherence, substitution, and reference. This phenomenon demonstrates that in the case of Chinese students who do not study English as a major, their knowledge of coherence, substitution, and reference cannot be assumed to be at the same developmental level. Non-English major Chinese students have quite varied understandings of how to correctly create a coherent passage through substitution or reference.

As shown in the results of the t-test and nonparametric Wilcoxon test for all of the participants in this study, it is interesting to note that while evident mean or median differences between coherence and substitution; and between coherence and reference were found, no noticeable mean or median differences were detected between substitution and reference. This finding indicates that the participants did not show a great diversity in their use of substitution and reference. More particularly, it can be considered that the higher the scores on substitution the

participants can receive, the more likely the participants would get relatively high scores on reference. At the same time, this suggests that all of the participants may have nearly the same tendencies in the use of substitution and reference, compared with that of coherence and substitution, and that of coherence and reference. In sum, what we can learn from the results of our data analysis is that non-English major Chinese students' understanding of substitution has significant effects on their use of reference.

8. Conclusions and pedagogical implications

In the light of the above findings it should be clear that to report the results of this study by saying that although this study is not an extensive one, the results suggest certain pragmatic directions that teachers might profitably follow.

First of all, the participants got the lowest scores on question one in the questionnaire, which most directly requires the knowledge of coherence. To state it more clearly, of the thirty participating subjects in this study, twenty-one got a score of zero on the first question in the questionnaire. This means 70% of the participants were confirmed not to have any knowledge about how to produce a coherent passage by uniting several individual incoherent sentences into a coherent one. Therefore, teachers should more highly prioritize the effective teaching of coherence in the future.

Because coherence seems to continue to be a difficult concept for non-English majors, it would be worthwhile to conduct in-depth case studies to find out what actually occurs in the minds of the writers as they employ coherence-creating mechanisms in writing. In other words, further research should be implemented to explore coherence as a property of the mind of the writers through think-aloud protocols.

In addition, given the importance of grammar in learning English as a foreign language, the relationship between the teaching of coherence and grammar may provide another interesting area for future research.

Furthermore, as shown in previous studies on the relationship between coherence and cohesion (Widdowson 1973; Carrell 1982; Fitzgerald 1990; Enkvist 1990; Oller 1994; & Chau 1999), I realized some researchers claimed that there is a close relationship between coherence and cohesion (Widdowson 1973; Fitzgerald 1990; & Chau 1999), whereas others (Carrell 1982; Enkvist 1990; & Oller 1994) ignored such kind of correlation between coherence and cohesion. In this study I have successfully underscored that a true correlation between coherence, substitution and reference does exist, which has been supported by this study's data analyses via several statistical evaluations. Therefore, the result of this study can be thought of as having added a component to the existing literature in elaborating on the relationship between coherence and cohesion, which was detected by means of making a questionnaire survey of non-English major Chinese students. As a result of this, the future teaching and learning of English as a foreign language can be recommended to be implemented without neglecting to take a teaching and learning of coherence and cohesion into a specific consideration. In other words, the findings of this study may provide information to help instructors to think out better teaching methods and techniques and learners to find more efficient ways to master English from discourse analysis.

9. Limitations of this study

This study only deals with how to clarify the characteristics and relationship between coherence, substitution and reference. Whether this result based on non-English major Chinese students is applicable in practical English language teaching for general English learners in China as well as in other Asian countries (e.g., Japan or Korea) will be worth investigating in the future.

In addition, thirty non-English major Chinese undergraduate students participated in my research. The total number of the participants in this study is relatively small. The results obtained from this research could therefore result in some implications for future English language teaching, but it is far from a comprehensive study. In future research much more data should be collected in order to elaborate on a more substantial study of the teaching and learning of coherence, substitution, and reference.

In future research, not only should the perception of coherence, substitution and reference be handled out, studies should also include other elements of coherence and cohesion (e.g., lexical cohesion, ellipsis, and conjunctions).

10. Future research subjects

One of my hopeful future research subjects is considered to apply the findings of this study to other foreign language learning environments such as Japan or Korea in order to find comparatively common characteristics in the use of coherence, substitution, and reference by Asian non-native English speakers. In addition to this, many other questionnaires different from those used in this study should be taken into consideration. For example, in order to analyze possible problems existing in coherence performance by the participants, STAR² can be tried to

be integrated into the analysis of coherence, especially into the topic structure analyses³ that are closely related to coherence.

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Notes

Note 1. Discourse is a communicative event in which language plays a prominent role. It minimally requires a sender (writer, speaker), a receiver (reader, listener), and a message that is being communicated. The message is not just a concatenation of clauses; it forms a unified, coherent whole. Both the sender and receiver normally have the implicit agreement that the message being communicated is coherent.

Note 2. STAR is used to teach coherence. It was developed using a basic system model. In this model, the objectives and the scope of the project are defined first. Next, the lesson is designed using principles and techniques derived from learning theory and research. An instructional product is then developed based on the design requirements. The product is tested to see if it meets its objectives, the necessary revisions are made.

Note 3. Topic structure analyses, originally developed by Lautamatti (1987) for the purpose of describing coherence in texts, focuses on the semantic relation between the sentence topics and the discourse topic, analyzing the relation of topic and comment in sentences.

Appendix: Questionnaire

Question 1: Using what you have learnt in this unit, rearrange each group of the following sentences, so as to make it a coherent paragraph.

- (1) A. Of the effects caused by vitamin A deficiency, those involving eye diseases are the most pronounced and widespread.
 B. Another result of vitamin A deficiency is skin dryness.
 C. What children eat can affect their health.
 D. Several thousand children become blind each year because of this dietary deficiency, which is most prevalent in poor, non-industrialized countries.
 E. Children who do not eat enough foods containing vitamin A can develop serious nutritional disorders.
- (2) A. So, even at their middle age, they were as ignorant as children, and could hardly support themselves, not to speak of rendering valuable service to their country.
 B. Some of them did not continue their course to the end for fear of difficulties, while others, having studied for some years, grew tired of their lessons, and tried to pursue some new studies.
 C. In one word, they did not endeavor to reach their destination, but stopped halfway.
 D. I have heard that many students failed because they stopped halfway.
 E. Their time and strength were thus wasted.
- (3) A. The kiwi deserves to become much better known in America.
 B. I found a rare treat in our supermarket today—a kiwi!
 C. Its appearance makes it look rather unappetizing, but the kiwi has a slightly tart, melon-like pulp that most people enjoy from the first bite.
 D. A kiwi is a kind of fruit that is imported from faraway New Zealand.
 E. About the size of a lemon, it has a distinctive golden-brown skin coated with a light fuzz.
- (4) A. When Professor Adams returned to the college this fall, we noticed several changes in his appearance.
 B. Instead of shoes he wore leather sandals.
 C. His hair was combed forward over his forehead.
 D. His coats were brighter in color than they used to be.
 E. On his upper lip grew a small moustache.

F. He has started wearing heavy eyeglasses with black frames.

G. His trouser legs were narrower than they had been last year.

Question 2: Circle the appropriate alternatives.

- (1) He has a shave every morning, but you wouldn't think he *did/had*.
- (2) "Ben won't be coming this weekend," "But he *promised so/promised he would*."
- (3) "It looks like Schumacher is going to win again." "It *appears/appears so*."
- (4) "I didn't know you cycled to work." "Yes, I always *do/do so*."
- (5) They asked me to go fishing with them, but I *didn't want /didn't want to*.
- (6) "Will it take you long to fix it?" "Well, it might *do/do so*. I am not sure yet."
- (7) "Has Rachel arrived yet?" "No, I don't think he *has done/has*."
- (8) We'd like to go to Canada to see Ruth, but we can't *afford to/afford*.
- (9) I don't know whether my parents want to go to Norway, but I *suspect not/don't suspect*.
- (10) "Do you think Ray will be up by now?" "I *doubt that he will/ doubt so*."

Question 3: Fill in the blanks with *this, that, these, or those*.

- (1) Could you bring ___ box to me, please?
- (2) Why did you say ___?
- (3) ___ is Peter-is Mary at home?
- (4) Who are ___ people over there?
- (5) Listen—you will like ___ story.
- (6) Wait—I can't walk fast in ___ shoes.
- (7) " ___ is my sister Helen." "How do you do."
- (8) ___ was a wonderful meal. —Thanks.
- (9) I am not enjoying ___ conversation.
- (10) Do you remember ___ people that we met in Greece?

Table 1. Mean and standard deviation (SD) of all the participants calculated from their scores on questions one through three listed in the questionnaire

	Coherence	Substitution	Reference
Mean	0.61	5.56	6.72
Standard deviation (SD)	0.85	1.38	3.32

Table 2. Correlation matrix of all of the participants calculated from their scores on questions one through three listed in the questionnaire

	Coherence	Substitution	Reference
Coherence	1	0.40	0.42
Substitution	0.40	1	0.43
Reference	0.42	0.43	1

Table 3. Results of the t-test for all the participants calculated from their scores on questions one through three listed in the questionnaire

	N	Mean	Std. deviation	t-value	2-Tailed probability
Coherence vs. substitution	30	-4.9	1.3	-16.1	0.000**
Coherence vs. reference	30	-6.1	3.1	-8.5	0.000**
Substitution vs. reference	30	-1.2	3	-1.6	0.12

**The difference is significant at the 1% level.

Table 4. Results of the nonparametric Wilcoxon test for all of the participants obtained from their scores on questions one through three listed in the questionnaire

	Z	2-Tailed probability
Coherence vs. substitution	-3.749	0.000**
Coherence vs. reference	-3.532	0.000**
Substitution vs. reference	-1.546	0.122

**The difference is significant at the 1% level.

Table 5. Mean scores (MS) and the standard deviation (SD) of the two genders calculated from their scores on questions one through three listed in the questionnaire

	Coherence	Substitution	Reference
Mean scores (MS) for males	0.5	5.83	6.83
Mean scores (MS) for females	0.83	5	6.5
Standard deviation (SD) (males)	0.80	1.47	3.34
Standard deviation (SD) (females)	0.98	1.10	3.78

Table 6. Correlation matrix of the male participants calculated from their scores on questions one through three listed in the questionnaire

	Coherence	Substitution	Reference
Coherence	1	0.777**	0.387
Substitution	0.777**	1	0.491
Reference	0.387	0.491	1

**The difference is significant at the 1% level.

Table 7. Correlation matrix of the female participants calculated from their scores on questions one through three listed in the questionnaire

	Coherence	Substitution	Reference
Coherence	1	-0.186	0.511
Substitution	-0.186	1	0.34
Reference	0.511	0.34	1

Table 8: Results of the t-test for the male participants calculated from their scores on questions one through three listed in the questionnaire

	N	Mean	Standard deviation	t-value	2-Tailed probability
Coherence vs. substitution	14	-5.33	0.98	-18.76	0.000**
Coherence vs. reference	14	-6.33	3.02	-7.25	0.000**
Substitution vs. reference	14	-1.00	2.83	-1.23	0.25

**The difference is significant at the 1% level.

Table 9. Results of the nonparametric Wilcoxon test for the male participants obtained from their scores on questions one through three listed in the questionnaire

	Z	2-Tailed probability
Coherence vs. substitution	-3.105	0.002**
Coherence vs. reference	-2.946	0.003**
Substitution vs. reference	-1.209	0.227

**The difference is significant at the 1% level.

Table 10. Results of the t-test of the female participants calculated from their scores on questions one through three listed in the questionnaire

	N	Mean	Standard deviation	t-value	2-Tailed probability
Coherence vs. substitution	16	-4.16	1.60	-6.37	0.001**
Coherence vs. reference	16	-5.67	3.39	-4.10	0.009*
Substitution vs. reference	16	-1.50	3.56	-1.03	0.35

** The difference is significant at the 1% level.

*The difference is significant at the 5% level.

Table 11. Results of the nonparametric Wilcoxon test for the female participants obtained from their scores on questions one through three listed in the questionnaire

	Z	2-Tailed probability
Coherence vs. substitution	-2.214	0.027*
Coherence vs. reference	-2.032	0.042*
Substitution vs. reference	-1.054	0.292

* The difference is significant at the 5% level.