A Correlational Analysis in High-Stakes Tests: The Effect of Gender

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ABSTRACT

Relatively few studies in foreign language testing have been conducted on differences between males and females' performance on various sub-tests of the Iranian National University Entrance Exam (INUEE). The present study seeks to explore gender effect on correlation in various sub-tests of the INUEE. To explore correlation coefficient for a group of 1000 students who participated in INUEE, Pearson Product Moment Correlation Coefficient formula was employed. The outcomes of a statistical analysis denoted that there is a distinction between the functions of different sub-tests of the INUEE for female and male test-takers.

Introduction

A large body of research on language and gender (e.g., Ahmadi, 2008; Halpern & Lammay, 2000; Hyde, 2005) has demonstrated differences between male and female performance on language testing. However, as Sharafi (2010) has pointed out "in the context of second or foreign language testing, gender differences have been examined only to a limited degree." Since many significant differences between male and female performance have been identified in language testing (e.g., Kahle, 2004; Reis & Park, 2001), one area of second language testing, and specially foreign language testing in which the impact of gender might be particularly significant is in research conducted within the framework of the Correlational Analysis.

According to Bachman (2004), "in order to obtain more detailed and precise information about the relationship between two variables, we can calculate a correlation coefficient." While it has been acknowledged that males and females have different language abilities (Reis & Park, 2001), studies in foreign language testing have not considered whether the gender of the participants might influence on correlational analyses among different English sub-tests of the INUEE. The purpose of the current research is, therefore, to investigate the gender effect on the performance of the examinees on various sub-tests of the specialized English section of the INUEE. In fact, the present investigation strives to answer the question of whether various sub-tests in the specialized English section of the INUEE function in the same way for male and female test-takers. It is hypothesized here that male and female test-takers will function significantly differently on the sub-tests of the specialized English section in the INUEE.

Background

Correlational Studies

In L2 research, consideration needs to be given to the neglected skill factor of grammar knowledge in L2 reading. Early support for this is found in such publications as Berman (1984), and later in Urquhart & Weir (1998), where they noted:

"Grammar is a component of reading that has been almost ignored in the research. It seems to us that this is an interesting and potentially valuable research area which L2 teachers and applied linguists are in a good position to investigate." (p.269).

In another study, Alderson (2000) reported that there are significant and substantial correlations between the grammar, reading, and writing sub-tests in the English tests. In his book on reading assessment, Alderson (2000) referred to the importance of knowledge of particular syntactic structures, or the ability to process them, to some aspects of second language reading and states that "the ability to parse sentences into their correct syntactic structure appears to be an important element in understanding text" (p.37).

Also, it is commonly accepted that words usually do not come in isolation in natural text, and their combination into larger units is governed by the syntax of language (Lyons, 1981). Readers need syntactic knowledge to construct an interpretation of what they read. In a study, Bernhardt (1991) suggested that syntax plays a significant role in L2 reading ability. In proposing a focus on grammatical patterns, Eskey & Grabe (1988) claimed that "reading requires a relatively high degree of grammatical control over structures that appear in whatever reading are given to ESL students" (p.226). Droop & Verhoeven (2003) stated that limited syntactic knowledge and unawareness of syntactic boundaries impede the second language reading process. Learners can presumably acquire new knowledge from moderately unfamiliar texts when the necessary structural cues are provided. In a study by Berhardt (1983), she concluded that "students with good grammar ability had higher comprehension than those with poor grammar ability" (p.391).

Yet another factor which is thought to have potential effect on reading comprehension is vocabulary knowledge. In the last 20 years or so, there has been growing realization that the total language proficiency consists of much more than just grammatical competence (Schmitt & Meara, 1997). The basic language skills of reading, writing, speaking, and listening are

based upon learners' knowledge of vocabulary. Therefore, vocabulary is a very important consideration for English teachers when choosing textbooks and preparing for their classes. In a comprehensive study Yamashita (1999) found that there is a connection between vocabulary knowledge and reading comprehension ($r = .75$).

The functions of different facets of L2 vocabulary knowledge in reading comprehension are examined by a number of experimental studies (Guo & Roehring, 2011, p. 44). Moslehpour (2008) reported that students often comment that the primary source of difficulty and frustration in reading comprehension is insufficient vocabulary knowledge. Horrocks (1987) and Crystal (1997) seem to attach more importance to meaning. According to Horrocks (1987) "Syntax is concerned with the principles according to which words can be combined to form larger meaningful units, and by which larger units can be combined to form sentences" (p. 24). For Crystal (1997) syntax is "the way in which words are arranged to show relationships of meaning within (and sometimes between) sentences" (p. 94).

Gender and Language Abilities

One of the concerns for educational researchers is the effect of examinees' gender on their performance on language testing. In a study Keshavarz & Ashtarian (2008) tried to investigate the relationship between reading comprehension and gender of Iranian EFL learners. To this end several reading passages were selected which had the same length and readability. Sixty two senior and junior English major students (28 male and 34 female) studying at Razi University were selected based on their score on the TOEFL test. According to the results male and female EFL learners differ in their reading comprehension ability. In fact, females are better comprehenders of English passages.

Another study that implied the effect of gender in performing language tests was carried out by Lin & Wu (2004, cited in Ahmadi, 2008). They examined the performance difference at the item level of male and female Chinese university graduates on an English proficiency test. The proficiency test was EPT (English Proficiency Test) which was administered after the TOEFL containing listening comprehension, grammar and vocabulary, cloze test, and reading comprehension. T-tests revealed that female significantly out scored males in the listening comprehension section, while males performed significantly better than females in the cloze and grammar and vocabulary section of the test.

Furthermore, males and females use the same number of strategies in language learning but females are more skillful at applying these strategies qualitatively (Sharafi, 2010). Additionally, some researchers staed that males and females differ in their knowledge, interest, and experiences, hence, their performance on different reading topics can also differ (Brantmeier, 2003; Bugel & Buunk, 1996; Young & Oxford, 1997).

Statement of the Problem

Standardized testing is to provide fairness for all test-takers by making valid and reliable tests and uniform test administration and scoring procedures (Ahmadi, 2008). To make a standardized test, test-makers should consider test items and test forms both qualitatively and quantitatively and also analyze the relationship of test scores with the variables that affect the interpretations that are made on the basis of test scores (Ahmadi, 2008).

One of these variables is the gender of the test-takers. Males, for example, have been found to perform better than females on items related to science (O'Neill & McPeek, 1993). Further, males tend to perform better than females on items that involve ratios, geometry, graphs, tables, or figures (O'Neill & McPeek, 1993). In contrast, females tend to perform better than males on items related to human rights and those that involve symbols (O'Neill & McPeek, 1993). However, a few studies have been conducted on differences between males and females' performance on various sub-tests of the specialized English section in the INUEE which will be considered in this study.

Method
Participants

The data for this study come from a population of 276,164 high school graduates. They were 185306 female and 90858 male students of Natural Sciences, Humanities, and Mathematics who were participated in the specialized English section of the INUEE. The test is planned, developed and administered by the Iranian Educational Testing Organization (Sanjesh) every year. To get to the final participants of this study, the population was first divided into females and males. The ultimate participators were chosen by chance from each assemblage of students in accordance with their proportion in the population of test-takers. An absolute sample of 1000 test-takers was elected for the present research (671 female and 329 male test-takers).

The majority of the participants in this test were girls. This was due to the larger proportion of female test-takers in the whole population of the specialized English section of the INUEE.

Instrument
"Iranian National University Entrance Exam"

The specialized English section of the INUEE is specially prepared to select students who intend to study English as a foreign language (EFL) as their major of university level. This test has two parts. The first part includes 100 multiple-choice items in Persian language and literature, theology, Arabic, and general English. Each of these parts includes 25 multiple-choice questions. The next part is specifically planned to filter applicants for studying English as a foreign language and is composed of 70 multiple-choice items in six parts of grammar (12 questions), vocabulary (20 questions), language structure (word order) (4 questions), language functions (4 questions), cloze test (15 questions), and reading comprehension (15 questions). The questions in this section are more trained than those in the first section. In fact, this part is used for much higher mastery over the language (Ahmadi, 2008).

The present study has taken this -so called- specialized English section into consideration to determine if the sub-tests are functioning similarly for both female and male test-takers.

Data Collection Procedure

The data for this study is the results of the specialized English section of the INUEE managed in 2004. This has been collected from Sanjesh Organization. The answer sheets of all the participants for the English course (more than 276,000 answer sheets) were gathered and 1000 answer sheets were picked out fortuitously from different genders in different fields of study in accordance with their portion in the population of test-takers.

Data Analysis Procedure

In this part the scores of the applicants were taken into account for each sub-test. To do that, applicants received $+1$ for correct responses, $-1/3$ for wrong answers, and 0 for unanswered

questions. This routine is used in Iran by the Sanjesh Organization. This action was done for each sub-test for both groups of females and males.

Following the scoring procedure, the correlations between different sub-tests for both female and male test-takers were computed. The SPSS software was used for correlating various sections.

As Henning (1987) stated "when we compute a correlation matrix from a battery of sub-tests, we should bear in mind that the magnitudes of these correlation coefficients is affected by the reliabilities of the sub-tests" (p.85). Therefore the correction for attenuation formula was utilized. In so doing, the reliability of each sub-test was needed. This was estimated by the use of Cronbach's alpha.

Results

Correlation Coefficient between Different Sub-tests for Female Candidates

As it was discussed, this research has male and female participants. This was due to the focus of the study on examining the functions of different sub-tests for male and female test-takers. To search about this Pearson Product Moment Correlation Coefficient was implemented for both male and female candidates.

Grammar and Vocabulary

This section shows correlational analysis between grammar and vocabulary sub-tests for female participants. The sub-tests were analyzed by Pearson Product Moment Correlation Coefficient. Figure 1 and Table 2 demonstrate the results.
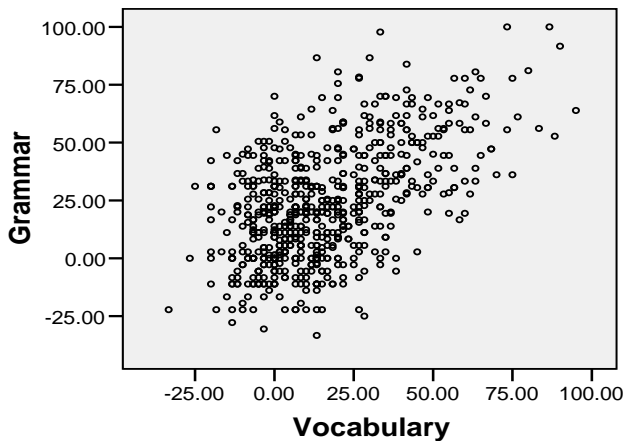

Figure 1: Scatter Diagram for Grammar and Vocabulary for Female Candidates

As denoted in Table 2 the correlation coefficient between grammar and vocabulary sub-tests is .53. But when the correction for attenuation formula was used it changed to .74. As Yamini & Rahimi (2007) stated "the correlation coefficient indicates the degree of relationship between two variables. If the variables are related, there must be some common variance or some variance overlap between them. To know about the shared variance, we simply square the correlation coefficient." Therefore, the common variance of these sub-tests is 54%.

Grammar and Reading Comprehension

Pearson Product Moment correlational analysis was accomplished as for the previous sub-tests. The results are presented in Table 3 and Figure 2.

As expressed above, the correlation coefficient between grammar and reading comprehension is .70 which after using the correction for attenuation formula altered to .94. Accordingly common variance for two sub-tests is 88%.
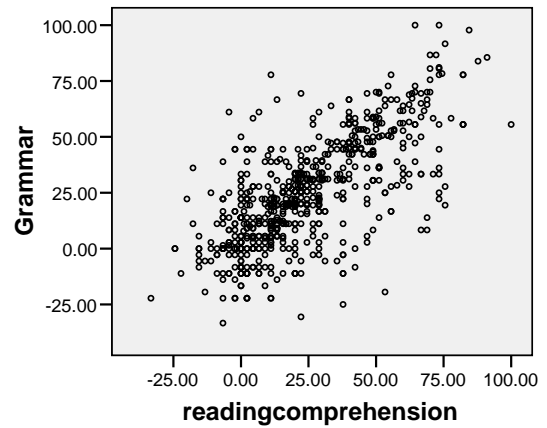

Figure 2: Scatter Diagram for Grammar and Reading Comprehension for Female Candidates

Vocabulary and Reading Comprehension

Pearson Product Moment Correlation Coefficient was engaged to calculate the correlation coefficient between vocabulary and reading comprehension. The results of the analysis are displayed in Table 4 and Figure 3.
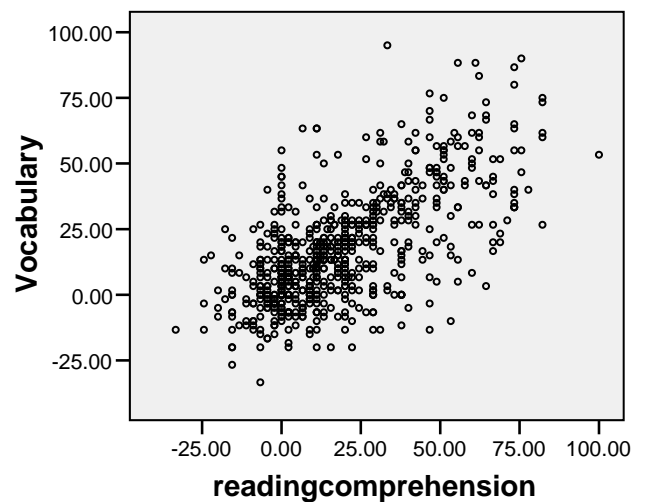

Figure 3: Scatter Diagram for Vocabulary and Reading Comprehension for Female Candidates

According to Table 4 the correlation coefficient between vocabulary and reading comprehension is .65. By the using of correction for attenuation formula it changed to .83. Thus the common variance of two sub-tests is 68%.

Correlation Coefficient between Other Parts of the Test

The results of Correlation Coefficient between other sub-tests for female participants are demonstrated in the following table. Indeed, according to the results the correlation coefficients between these parts are too low and are not important. So the results are not debated.

Analyses of the Correlation Coefficient between Different Sub-tests for Male Candidates

In another study (Javadizad, Barati & Hesabi, 2011) different sub-tests of the specialized English section of the INUEE were analyzed by correlation coefficient. According to the results "there is a high correlation between grammar and vocabulary (r = .89), grammar and reading comprehension (r = .89), language functions and reading comprehension (r = .89), and vocabulary and reading comprehension (r = .86)." (Javadizad, Barati & Hesabi, 2011).

According to Javadizad, Barati & Hesabi (2011) tables and figures related to these sub-tests are as follow.
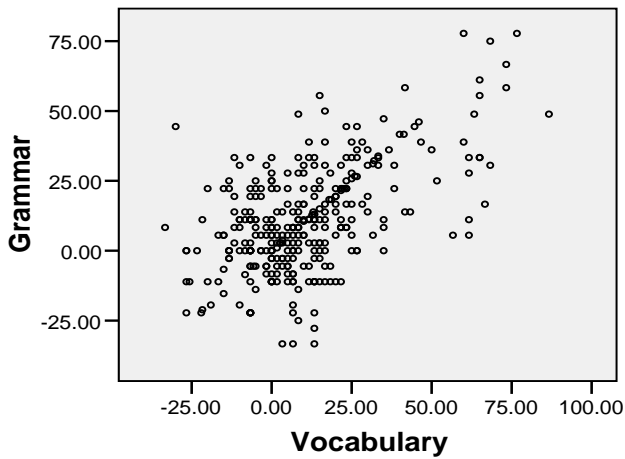
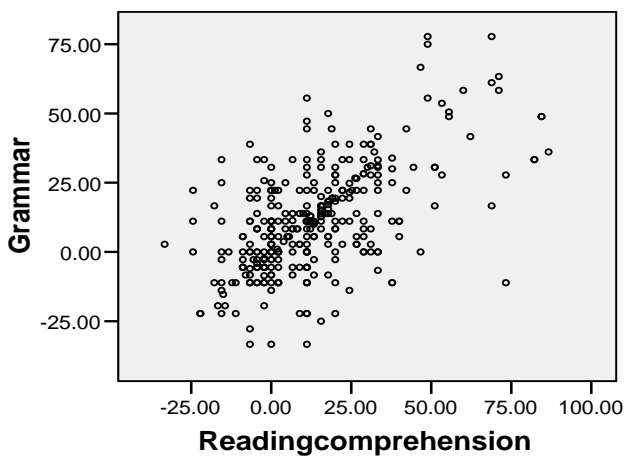**Figure 4**: Scatter Diagram for Grammar and Vocabulary for Male Candidates

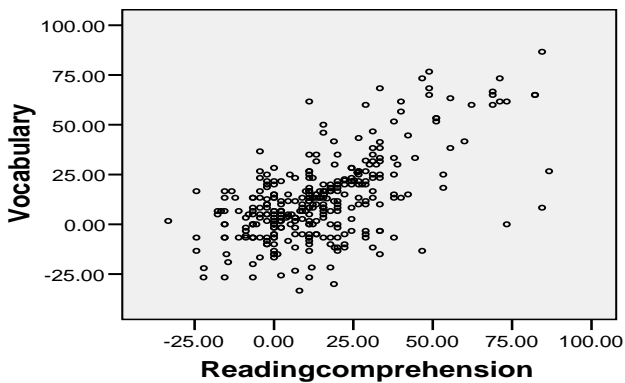**Figure 5**: Scatter Diagram for Grammar and Reading Comprehension for Male Candidates

Figure 6: Scatter Diagram for Vocabulary and Reading Comprehension for Male Candidates
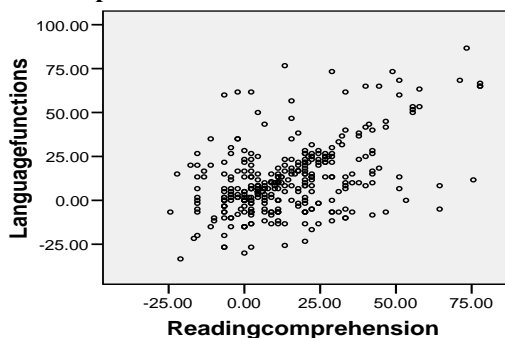

Figure 7: Scatter Diagram for Language Functions and Reading Comprehension for Male Candidates

As Javadizad, Barati & Hesabi (2011) stated "according to the following table the correlation coefficient between other sub-tests are insufficient and are not important."

Based on the results, there is a difference in functions of various sub-tests for female and male candidates. That means there is a high correlation between grammar and vocabulary (r = .74), grammar and reading comprehension (r = .94), and vocabulary and reading comprehension (r = .83) for female candidates. But there is a high correlation between grammar and vocabulary (r = .89), grammar and reading comprehension (r = .89), vocabulary and reading comprehension (r = .86), and language functions and reading comprehension (r = .89) which is just for male participants. So, according to the results of this study there is a difference between the functions of different sub-tests of the INUEE for female and male test-takers.

Discussion and Conclusion

According to the statistical analysis there is a difference in correlation coefficient between various sub-tests for female and male candidates in specialized English section of the INUEE. So the research hypothesis is confirmed. This finding is in line with previous studies. A number of studies conducted especially in the US have confirmed the presence of gender-based differences in certain tests, especially the Scholastic Aptitude Test (SAT). These studies indicate that males outscore females on the SAT-math section (Clark & Grandy, 1984, cited in Ahmadi, 2008); women typically have equal or better grades in college math compared with their male classmates with higher SAT-math scores (Doolittle & Cleary, 1987, cited in Ahmadi, 2008); females score lower on the SAT-verbal section (Doolittle & Cleary, 1987, cited in Ahmadi, 2008).

Similar studies have found that high school males generally outperform females in standardized tests of science, mathematics, history and social studies although females generally have similar or higher school awarded marks (Benbow, 1988; Doolittle & Cleary, 1987; Doolittle, 1989; Halpern, 1992; Weightman, 1998). Conversely, females have generally been reported to outperform males in tests of verbal and written abilities, especially if constructed response items are included (Jacklin, 1974, cited in Feingold, 1993; Willinghan & Cole, 1997).

The finding of the present study supported Hyde & Linn (1988, cited in Sharafi, 2010), who conducted a comprehensive study investigating gender differences in verbal ability and reading comprehension. Among the fifty six vocabulary tests included, six reported a significant difference in favor of males, while eight reported significant differences in favor of females. In terms of reading comprehension, five out of twenty one tests reported a significant difference in favor of males, while ten found significant differences in favor of females. Six studies reported no significant differences between males and females. Generally, females were found to have slight advantages in reading and general verbal ability.

In fact, in the context of second/foreign language testing, gender differences have been examined only to a limited degree (Sharafi, 2010). Generally the findings reported in the related studies are inconsistent. Therefore, there is no consensus among the studies relating to the role of gender in language testing and more research is required to determine whether or not gender differences exist in correlation coefficient among different sub-tests.

In this research the relationship between different English sub-tests of the INUEE for both male and female candidates has been inspected.

Table 1: Reliability of the Specialized English Test (Total Test and Its Sub-tests)

	Reading Comprehension	Cloze Test	Language Functions	Language Structure	Vocabulary	Grammar	Total
Male	.64	.61	.53	.54	.59	.55	.89
Female	.82	.80	.59	.65	.75	.68	

Table 2: Pearson Product Moment Correlation Coefficient between Grammar and Vocabulary for Female Candidates

Correlations

		Grammar	Vocabulary
Grammar	Pearson Correlation	1	.538**
	Sig. (2-tailed)		.000
	N	671	671
Vocabulary	Pearson Correlation	.538**	1
	Sig. (2-tailed)	.000	
	N	671	671

. Correlation is significant at the 0.01 level (2-tailed).

Table 3: Pearson Product Moment Correlation Coefficient between Grammar and Reading Comprehension for Female Candidates

Correlations

		Grammar	readingcomprehension
Grammar	Pearson Correlation	1	.703**
	Sig. (2-tailed)		.000
	N	671	671
readingcomprehension	Pearson Correlation	.703**	1
	Sig. (2-tailed)	.000	
	N	671	671

. Correlation is significant at the 0.01 level (2-tailed).

Table 4: Pearson Product Moment Correlation Coefficient between Vocabulary and Reading Comprehension for Female Candidates

Correlations

		Vocabulary	readingcomprehension
Vocabulary	Pearson Correlation	1	.658**
	Sig. (2-tailed)		.000
	N	671	671
readingcomprehension	Pearson Correlation	.658**	1
	Sig. (2-tailed)	.000	
	N	671	671

. Correlation is significant at the 0.01 level (2-tailed).

Table 5: Pearson Product Moment Correlation Coefficient between Other Sub-tests for Female Candidates

	Before using the correction for attenuation	After using the correction for attenuation		Before using the correction for attenuation	After using the correction for attenuation
Grammar & Language Structure	.33	.41	Grammar & Language Functions	.32	.50
Grammar & Cloze Test	.39	.53	Vocabulary & Language Structure	.36	.52
Vocabulary & Language Functions	.41	.62	Vocabulary & Cloze Test	.43	.55
Language Structure & Language Functions	.32	.52	Language Structure & Cloze Test	.38	.52
Language Structure & Reading Comprehension	.37	.50	Language Functions & Cloze Test	.39	.57
Language Functions & Reading Comprehension	.40	.57	Cloze Test & Reading Comprehension	.44	.55

Table 6: Pearson Product Moment Correlation Coefficient between Grammar and Vocabulary for Male Candidates

Correlations

		Grammar	Vocabulary
Grammar	Pearson Correlation	1	.500**
	Sig. (2-tailed)		.000
	N	329	329
Vocabulary	Pearson Correlation	.500**	1
	Sig. (2-tailed)	.000	
	N	329	329

**. Correlation is significant at the 0.01 level (2-tailed).

Table 7: Pearson Product Moment Correlation Coefficient between Grammar and Reading Comprehension for Male Candidates

Correlations

		Grammar	Readingcomprehension
Grammar	Pearson Correlation	1	.536**
	Sig. (2-tailed)		.000
	N	329	329
Readingcomprehension	Pearson Correlation	.536**	1
	Sig. (2-tailed)	.000	
	N	329	329

**. Correlation is significant at the 0.01 level (2-tailed).

Table 8: Pearson Product Moment Correlation Coefficient between Vocabulary and Reading Comprehension for Male Candidates

Correlations

		Vocabulary	Readingcomprehension
Vocabulary	Pearson Correlation	1	.536**
	Sig. (2-tailed)		.000
	N	329	329
Readingcomprehension	Pearson Correlation	.536**	1
	Sig. (2-tailed)	.000	
	N	329	329

**. Correlation is significant at the 0.01 level (2-tailed).

Table 9: Pearson Product Moment Correlation Coefficient between Language Functions and Reading Comprehension for Male Candidates

Correlations

		Languagefunctions	Readingcomprehension
Languagefunctions	Pearson Correlation	1	.520**
	Sig. (2-tailed)		.000
	N	329	329
Readingcomprehension	Pearson Correlation	.520**	1
	Sig. (2-tailed)	.000	
	N	329	329

**. Correlation is significant at the 0.01 level (2-tailed).

Table 10: Pearson Product Moment Correlation Coefficient between Other Sub-tests for Male Candidates

	Before using the correction for attenuation	After using the correction for attenuation		Before using the correction for attenuation	After using the correction for attenuation
Grammar & Language Structure	.29	.53	Grammar & Language Functions	.28	.52
Grammar & Cloze Test	.33	.57	Vocabulary & Language Structure	.26	.46
Vocabulary & Language Functions	.31	.56	Vocabulary & Cloze Test	.35	.59
Language Structure & Language Functions	.27	.50	Language Structure & Cloze Test	.24	.42
Language Structure & Reading Comprehension	.26	.44	Language Functions & Cloze Test	.36	.65
Cloze Test & Reading Comprehension	.41	.66			

Indeed, because the effect of gender on correlation coefficient among different English sub-tests of the INUEE has not been regarded in previous studies, this study contributes to the literature on correlational studies. The research is consequential since it has measured the effect of gender across different sub-tests.

Moreover, with respect to correlation among different sub-tests attempts can be made to comprise sub-tests which are less sensitive to bias.

Besides, employing a large sample (1000) and considering six different sub-tests of grammar, vocabulary, language structure, language functions, cloze test, and reading comprehension were the features that could add to the value of this study. This study could be considered as a small step in this regard hopefully to lead to more studies.

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