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The Relationship between Multiple Intelligences and Performance of EFL Students in Different Forms of Reading Comprehension Tests

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***Abstract*—The major aim of this study was to investigate the relationship between Multiple Intelligences (MI) scores and the performance of Iranian EFL students on different forms of reading comprehension tests. To this aim, 90 learners of English from Parax Institute of Science and Technology (Mashhad Branch) were selected. They were asked to complete MIDAS multiple intelligences questionnaire and a reading test, which included two tests formats (multiple-choice and cloze test). The result of the correlational study indicated that the total MI score correlated positively with performance on multiple-choice and cloze test. Out of its 8 sub-intelligences linguistic, intrapersonal, spatial, and mathematical intelligence correlated positively with multiple-choice test of reading. Performance on cloze test correlated positively with linguistic, spatial, and mathematical intelligence. The results of regression equations also showed that MI scores predict both the performance on multiple-choice and cloze test. Out of its sub-intelligences, linguistic intelligence and musical intelligence predict performance on multiple-choice questions and linguistic intelligence predicts performance on cloze test.**

***Index Terms*—MI theory, test format, test bias, L2 reading, reading performance**

I. Introduction

The notion of intelligence has a deep impact on people's social status, educational opportunities and career choices. Intelligence seems to be central to the process of teaching and learning of a language. It is, therefore, important to develop an awareness of the nature and function of intelligence so that teachers and learners can perform their roles effectively in the classroom (Anderson, 1999). The MI theory of intelligence provides a new view of intelligence that was in contrast with the unitary view of mind (Gardner, 1983). According to this theory children can approach a subject matter in more than just one or two ways. Also, Armstrong (2009) maintained "it would certainly be the height of hypocrisy to ask students to participate in a wide range of multi-spectrum experiences in all eight intelligences and then require them to show what they have learned through standardized tests that focus narrowly on linguistic or logical-mathematical intelligences"(p. 130). This uniform fashion of assessment certainly causes bias in testing. As Bachman (1995) states one of the factors that can cause bias in testing is "cognitive characteristic" of the test-takers. Some test-takers might be strong in one or two of the intelligences that in return this ability can help them to score higher than other students and cause bias in testing.

A. Theory of Multiple Intelligences

Around 1900, psychologist Alfred Binet produced a set of test items that could predict a child's success or failure in school. His discovery came to be called the intelligence test. According to Gardner (2006), with these test items "now intelligence seemed to be quantifiable. You could measure someone's actual or potential height, and now, it seemed you could also measure someone's actual or potential intelligence." (p. 34). Anderson (1999) said that this "classical view" of intelligence focus on psychometric tests. According to this classical view intelligence is defined as a uniform cognitive capacity people are born with (Anderson, 1999). Traditionally, Intelligence was defined and measured in terms of linguistic and logical-mathematical abilities and our notion of IQ is based on several generations of testing of these two domains (Brown, 2007).

In contrast to this unitary view of intelligence, Gardner (1983) presents a controversial theory of intelligence- one based on a radically different view of the mind and one that yields a very different view of school. Gardner (1983) defines intelligence generally as "the capacity to respond successfully to new situations_ to tackle a task demanded by life" (p. 8). Gardner (1999 b) elaborates on this general definition by further defining intelligence as "a bio-psychological potential to process information in a cultural setting to solve problems or create products that are of value in at least one culture" (p.33-34). Gardner's (1983) theory of intelligence is a pluralistic view of mind, recognizing many different and discrete facets of cognition, acknowledging that people have different cognitive strengths and

contrasting cognitive styles. Gardner (1983) maintained that by looking only at linguistic and logical-mathematical intelligence, we ruled out a great number of the human's mental abilities.

This pluralistic definition gives us an understanding of intelligence that differs greatly from the traditional view, which usually recognizes only two intelligences, namely verbal-linguistic and logical-mathematical intelligence. Gardner (1983) emphasizes that there are a number of distinct forms of intelligences that each individual possess. These different types of intelligences can be used independently or in combination (Gardner, Kornhaber & Wake, 1996).

Since the introduction of the Multiple Intelligences, several studies have tried to find its role in the field of second language acquisition. Hou (2010) found positive relationship between Taiwanese EFL learners' proficiency with MI scores. In another study where multiple intelligences may not have a strong presence in the classroom practice, it becomes clear that including MI theory in the routine of teaching practice can have positive contribute to learners proficiency in English (Pour-Mohammadi et al, 2012). However, in a study investigating the relationship between participates' MI score and their proficiency, no significant association was found (Razmjoo, 2008). In another effort to find any relationships between MI and language learner strategies, the researchers utilized questionnaires for operationalizing the variables. The result revealed moderate association between metacognitive and cognitive strategies with linguistic, musical, and bodily-kinesthetic intelligences (Davar and Karbalaei, 2013).

Gardner (1983), with his introduction of Multiple Intelligences (MI) theory, provides a pluralistic view of mind. MI belongs to a group of instructional philosophies that focus on the differences between learners and the need to recognize learner differences in teaching and testing. Testing and assessing are inseparable and important parts of education. Teachers, test developers and researchers have always searched for more valid and reliable tests throughout history (Stobart, 2008). Unfortunately, it seems the role of intelligence has not been taken into account in testing by researchers. Assessment systems were developed so that a fairer selection can be offered and teaching and learning can be improved (Stobart, 2008). If styles and personality types affect learning and performance on certain formats then there might also be a relationship between test format and cognitive factors like intelligence (Bachman, 1995).

B. Statement of the Problem

Achieving a fairer assessment has always been a goal in education. Language tests as frequent means of gathering information about learners' linguistic ability must be examined continuously and this examination must be done with care since important decisions are usually made on the basis of test results (Shohamy, 2001). In the case of standardized tests, fairness may not be assured as these tests might disadvantage a group (Stobart, 2008). Research has taken the role of some individual characteristics such as field dependence/independence, gender and first language into account and investigations have been carried out to see if these personal characteristics influence test performance (Bachman, 1991). To develop a fair test, it is important to investigate the role learners' intelligence, as a personal characteristics, and its potential contribution to test performance. The purpose of the present study is to examine the potential influence of students' multiple intelligences (MI) scores on different formats of reading questions. If any associations find between MI and test format and students with different intelligent scores perform differently on various reading questions, then, our test would be biased with only one type of question toward a group a students. To fulfill the purpose of the study the following guiding questions are addressed:

1. Is there any statistically significant relationship between Iranian EFL learners' MI score and their performance on multiple-choice test of Reading?
2. Is there any statistically significant relationship between Iranian EFL learners' MI score and their performance on cloze test of reading?
3. Do overall and sub-categories of MI score predict learners' performance on multiple-choice questions of reading significantly?
4. Do overall and sub-categories of MI score predict learners' performance on cloze test of reading significantly?

II. Methodology

The total population who participated in this study consisted of 150 EFL learners, ranging from 18 to 30 years old, from Parax language institute in Mashhad, Iran. All participants have been studying English for more than two years. Having been homogenized through TOEFL proficiency test, by selecting those learners whose scores fall one standard deviation above and below the mean, only 90 learners were selected. All the subjects were adult female English learners. Most of the subjects were college students, majoring in different fields of study.

A. MIDAS Questionnaires

In order to measure learners' MI, Multiple Intelligences Developmental Assessment Scale (MIDAS) questionnaire (Shearer, 1996; cited in Hosseini, 2003) was used, which consists of one hundred and nineteen questions about eight intelligences that are mentioned in Gardner's MI theory. In this questionnaire, the number of questions for each intelligence is as follows:

Intelligence	Musical	Kinesthetic	Mathematical	Spatial	Linguistic	Interpersonal	Intrapersonal	Naturalistic
Frequency	14	13	17	15	20	18	9	13

The alpha coefficients for all various intelligences range from 0.78 to 0.89. Kinesthetic is the only scale where the reliability is slightly below the desired level of 0.80, this is most likely due to the nature of the item set which is split between large and fine motor and expressive movements. To measure subjects' MI scores, the researcher employed the translated version of the questionnaire. Participants were asked to read each question carefully and choose the option which best describes them. The average time to complete the questionnaire was 50-60 minutes and participants are completely informed about how to answer the questions by their own teacher and they answer these questions in the class time under their teacher's supervision. In this study, the reliability of the questionnaire was 0.88, and the reliability of the questionnaire for each intelligence calculated via Cronbach Alpha was found to be as follows:

Intelligence	Musical	Kinesthetic	Mathematical	Spatial	Linguistic	Interpersonal	Intrapersonal	Naturalistic
Reliability	.88	.75	.83	.88	.86	.86	.79	.89

B. Reading Comprehension Tests

Two reading texts were chosen from Longman Preparation Course for the TOEFL test (2003). The multiple-choice questions of the TOEFL test were used. The first text had 9 and the second one had 10 multiple-choice questions. So, there were 19 questions to answer in 30 minutes. The calculated Cronbach alpha for the administered test was 0.68. The cloze test was prepared from the same texts that were used in multiple-choice reading test. Every tenth word in the text was deleted (Farhady, et.al 1994). The subjects were expected to read the texts with the total 40 gaps to fill them. The calculated Cronbach alpha for the administered test was 0.56

C. TOEFL Proficiency Test

The paper-based TOEFL test was used to homogenize participants' proficiency level.

III. Procedure and Data Analysis

In order to accomplish the purpose of this study, the following procedures will be brought into action. One hundred and fifty language learners, who were homogenized by the institute as they were studying at certain levels (Upper-intermediate classes) in the institute, took part in paper-based TOEFL test (2003) to ensure the homogeneity of the participants' proficiency. The test took about two hours. In order to motivate participants to take part in the exam, they were told that the first 10 learners with high scores would be given a 50 % discount for three terms. After examining the participants' scores, it was revealed that some students got very low scores because they were not familiar with the format of TOEFL. Therefore, in order to have more homogeneous participants, those whose scores were one standard deviation above and below the mean was selected for this study (N=90 learners).

After selecting the subjects, the reading tests were given to them. Because the subjects were in different classes, their own teachers administered the reading tests. The tests were given to subjects in two sessions. In the first session, cloze test was administered. It was given to these students first so that their memory did not affect test results. And after four days the multiple-choice test was given to the subjects. The subjects were told that these tests are part of their total score to attract their full attentions. Subjects were supposed to answer all the multiple-choice questions in 30 minutes. At the end of the multiple-choice test, the MIDAS questionnaire was given to subjects. They were asked to answer the questions in 50 minutes. The necessary explanation and direction regarding the objectives and nature of the content and also how to answer questions were given to students. The subjects are required to state how true each statement of the questionnaire is. The responses ranged from the most frequent of something, or the highest amount of something, to the least or lowest ones. The subjects are asked to choose one of the choices according to their preferences.

This research will provide descriptions about naturally occurring phenomena connected with language development and processing. The design of the study is **ex post facto**. In this design, the researcher has no control over what has already happened to subjects. As Hatch and Farhady (1981) mention: "correlational designs are the most commonly used subset of ex post facto designs. In correlational designs, a group of subjects may give us data on two different variables."(p. 27). The variable of MI score is considered as *independent variable* and the performance of subjects on reading test is considered as *dependent variables*.

Using the descriptive statistics, Table 1 provides us with the summary and general picture of the data.

TABLE 1.
DESCRIPTIVE STATISTICS OF THE INSTRUMENTS

	N	Minimum	Maximum	Mean	Std. Deviation
Multiple Choice	90	7.00	17.00	11.1111	2.14342
Cloze test	90	6.00	16.00	9.5556	2.08316
Musical Intelligence	90	11	60	34.1794	10.99880
Kinesthetic Intelligence	90	13	52	32.8282	9.03728
Mathematic Intelligence	90	20	66	44.4403	10.57002
Spatial Intelligence	90	20	71	43.1819	12.36842
Linguistic Intelligence	90	33	89	59.6989	12.19699
Interpersonal Intelligence	90	29	85	56.1444	12.46576
Intrapersonal Intelligence	90	13	41	26.2938	6.62711
Naturalistic Intelligence	90	12	58	28.7017	10.40676

Correlation is a technique that shows the relationship between the independent variable and the dependent variable. There are different formulas for calculating correlation based on the type of collected data. This study tried to investigate the relationship between two test formats: multiple-choice, cloze test and MI. As the scores obtained from these tests are interval data, the *Pearson product moment formula* was used. First, the relationship between the test formats and MI are presented and then the relationship between the test formats and the eight intelligences of MI are presented.

TABLE 2.
THE CORRELATION BETWEEN MI TOTAL SCORE AND READING TESTS

			Cloze Test	Total MI
MultipleChs	Pearson Correlation	1	.411**	.563**
	Sig. (2-tailed)		.000	.000
	N	90	90	90
Cloze Test	Pearson Correlation	.411**	1	.488**
	Sig. (2-tailed)	.000		.000
	N	90	90	90
Total MI	Pearson Correlation	.563**	.488**	1
	Sig. (2-tailed)	.000	.000	
	N	90	90	90

**. Correlation is significant at the 0.05 level (2-tailed).

As Table 2 presents, performance on cloze test correlates with the total MI ($r = .488$, $p < .05$). There is also a good correlation between Multiple-choice questions and the total MI ($r = .563$, $p. < .05$). The result indicates that as the total MI increases, subjects' performance on multiple-choice and cloze test wills increases. These correlations are illustrated in the following graphs:

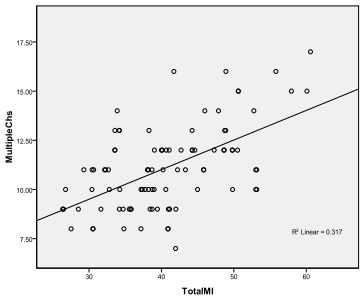

Figure 1. The scatterplot of Multiple-choice and total MI

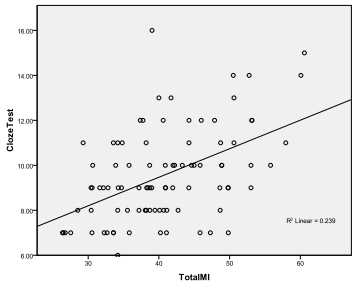

Figure 2. The scatterplot of cloze test and total MI

As the different forms of intelligences might be more relevant to the test formats, here, the correlation between the eight intelligences (musical, kinesthetic, mathematic, spatial, linguistic, interpersonal, intrapersonal and naturalistic intelligence) and the two test formats (multiple-choice and cloze test) is investigated.

The correlation between scores on different intelligences and performance on the two test formats is shown in Table 3.

TABLE 3.
THE CORRELATION BETWEEN TEST FORMATS AND 8 INTELLIGENCES

	Multiple-choice	Cloze test
Musical intelligence	.170	.200
Kinesthetic intelligence	.486	.373
Mathematical intelligence	.295**	.370**
Spatial intelligence	.416**	.411**
Linguistic intelligence	.762**	.539**
Interpersonal intelligence	.508	.400
Intrapersonal intelligence	.364**	.058
Naturalistic intelligence	-.178	.025

**. Correlation is significant at the 0.05 level (2-tailed).

Out of the eight intelligences in MI theory, linguistic intelligence has positive and strong association with performance on multiple-choice questions ($r = .762$, $p < .05$). Spatial intelligence is seen to have moderate relationship with multiple-choice questions ($r = .416$, $p < .05$). We also have positive but week correlation between the performance of multiple-choice questions and intrapersonal intelligence ($r = .364$, $p < .05$) and mathematical intelligence ($r = .295$, $p \leq .05$). Performance on cloze test correlates with linguistic intelligence moderately ($r = .539$, $p < .05$). Week but positive correlation found between cloze test and spatial intelligence ($r = .411$, $p < .05$) and mathematical intelligence ($r = .370$, $p < .05$)

A. Variability in Performance on Multiple-choice Test Based on MI Scores

The question to be dealt with is whether participants who have high MI score will score high on multiple-choice test format. The null hypothesis based on this question is:

H_0: MI scores don't predict performance on multiple-choice questions significantly.

TABLE 4.
VARIABLES ENTERED/REMOVED[B]

Model	Variables Entered	Variables Removed	Method
1	Total MI[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Multiple Choice

Table 4 shows us that we are predicting *multiple-choice scores* (the dependent variable) from the *MI scores* (the independent variable).

TABLE 5.
MODEL SUMMARY OF R SQUARE OF THE CORRELATION COEFFICIENTS BETWEEN MULTIPLE-CHOICE AND MI SCORE MODEL SUMMARY

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.563[a]	.317	.309	1.78125

a. Predictors: (Constant), Total MI

In Table 5, the R-value shows the correlation coefficient. The R square shows the amount of variability in the dependent variable that can be accounted for by the independent variable. As table 5 shows, R is .563 and R square equals .317. R square can be directly interpreted in terms of percentage of predicted variation. So, it can be said that MI score can predict about 31% of the variance in performance on multiple-choice questions. The column labeled adjusted R square equals .309. Adjusted R square is calculated so as to prevent overestimation of R square so the smaller the difference between the R square and the Adjusted R square the better. The last column _ the standard error of estimate_ shows 1.78. It shows how much the actual multiple-choice score is expected to differ from the predicted multiple-choice score. In fact, it illustrates the accuracy of the prediction model, so the smaller the standard error of estimate, the more accurate the prediction.

The analysis of variance (ANOVA) is the best statistical technique for measuring whether the regression model has a linear relationship. It can be used to determine whether the regression equation is significant. We can see from table 6 that $F(1, 88) = 40.87$, $p \leq .05$. It can be concluded that the regression is statistically significant.

TABLE 6.
VARIABILITY IN MULTIPLE-CHOICE SCORES BASED ON MI
ANOVA[b]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	129.677	1	129.677	40.873	.000
	Residual	279.212	88	3.173		
	Total	408.889	89			

a. Predictors: (Constant), Total MI Score

b. Dependent Variable: Multiples Choice question

In linear regression, the size of the coefficient for each independent variable shows the size of the effect that variable is having on the dependent variable, and the positive and negative signs on the coefficient demonstrate the direction of the effect. In regression with a single independent variable, the coefficient tells how much the coefficient is expected to increase (if the coefficient is positive) or decrease (if the coefficient is negative) if the independent variable increases by one. Table 7 contains the regression equation. The value of the regression coefficient is given in column B of the table 7. The values in this column give us information about the importance of each variable. As table 7 illustrate, the un-standard regression equation is:

Performance on multiple-choice test =4.98+ (.151) total MI

Table 7 also provides us with the standard regression equation:

Performance on multiple-choice test = (.563) *total MI*

Standardized beta values indicate the number of standard deviation that scores in the dependent variable would change if there were one standard deviation unit change in the predictor (Pallant, 2007). In this study, if we could increase total MI scores by one standard deviation, the multiple-choice scores would be likely to increase by .56 standard deviation units.

TABLE 7.
CORRELATION COEFFICIENTS OF MI AND MULTIPLE-CHOICE SCORES
Coefficients[a]

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	4.986	.976		5.106	.000
Total MI	.151	.024	.563	6.393	.000

a. Dependent Variable: Multiples

B. Variability in Performance on Multiple-choice Test Based on Different Intelligence Scores

In this part, it is shown whether the different intelligences in MI are good predictors of variation in multiple-choice scores.

H_0**:** Sub-scales of MI scores do not predict performance of learners on multiple-choice questions significantly.

Table 8 shows that the *stepwise* method of regression has been used and out of the eight intelligences in MI only *linguistic intelligence* and *musical intelligence* can enter the equation regression.

TABLE 8.
VARIABLES ENTERED/REMOVED[A]

Model	Variables Entered	Variables Removed	Method
1	Linguistic Intelligence	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	Music Intelligence	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: Multiple Choice Questions

Table 9 illustrates that R equals .776 and the R square is .602. The R square value shows the amount of variance in the dependent variable that can be accounted for by the independent variables. The independent variables of *linguistic intelligence* and *musical intelligence* together account for 60 per cent of the variance in the scores of multiple-choice test. According to the R Square Change, we can see that out of the 60 per cent of variance in multiple-choice scores, 58 per cent of the variance is by the *linguistic intelligence* and only 2 per cent is by the *musical intelligence.* The adjusted R square is .59. The standard error of estimate also equals 1.36 that is a rather small amount.

TABLE 9.
MODEL SUMMARY OF R SQUARE OF THE CORRELATION COEFFICIENT BETWEEN MULTIPLE-CHOICE AND MI SUB-INTELLIGENCES

Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.762[a]	.581	.576	1.39554	.581	121.952	1	88	.000
2	.776[b]	.602	.593	1.36796	.021	4.585	1	87	.035

a. Predictors: (Constant), Linguistic Intelligence

b. Predictors: (Constant), Linguistic Intelligence, Music Intelligence

c. Dependent Variable: Multiple Choice Questions

The ANOVA examines the significance of each regression model to see if the regression predicted by the independent variables explains a significant amount of the variance in the dependent variable. As Table 10 shows: F (2, 87) = 65.75, $p \leq .05$. So, it shows that relationship is significant. The linearity of the relationship can also be interpreted form the table.

TABLE 10.
VARIABILITY IN MULTIPLE-CHOICE TEST SCORES BASED ON MI SUB-INTELLIGENCES

ANOVA[c]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	237.506	1	237.506	121.952	.000[a]
	Residual	171.383	88	1.948		
	Total	408.889	89			
2	Regression	246.085	2	123.043	65.752	.000[b]
	Residual	162.804	87	1.871		
	Total	408.889	89			

a. Predictors: (Constant), Linguistic Intelligence

b. Predictors: (Constant), Linguistic Intelligence, Music Intelligence

c. Dependent Variable: Multiple Choice Question

As shown in Table 11, out of all the eight variables entered, only *linguistic intelligence* and *musical intelligence* can be predictors. Therefore, the un-standard regression equation is:

Performance on Multiple-choice test = 3.50 + (.145) linguistic *intelligence* + (-.031) *musical intelligence*

And the standard regression equation is:

Performance on Multiple-choice test= (.82) *linguistic intelligence* + (-.15) *musical Intelligence*

According to the last equation, with the increase of one standard deviation in the linguistic intelligence scores, multiple-choice scores will increase about .82 standard deviation units; and if we increase musical intelligence scores one standard deviation, the multiple-choice scores will drop .15 standard deviation units.

TABLE 11.
CORRELATION COEFFICIENT OF MI INTELLIGENCES AND MULTIPLE-CHOICE SCORES

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.115	.739		4.217	.000
	Linguistic Intelligence	.134	.012	.762	11.043	.000
2	(Constant)	3.508	.747		4.696	.000
	Linguistic Intelligence	.145	.013	.825	11.188	.000
	Music Intelligence	-.031	.014	-.158	-2.141	.035

a. Dependent Variable: Multiple Choice Question

C. Variability in Performance on Cloze Test Based on MI Scores

The question to be dealt with in this part is whether participants who scored higher on MI also scored high on cloze test format. The null hypothesis based on this question is:

H_0: MI scores don't predict performance on cloze test significantly.

TABLE 12.
MODEL SUMMARY OF R SQUARE OF THE CORRELATION COEFFICIENT BETWEEN CLOZE TEST AND TOTAL MI

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.488[a]	.239	.230	1.82807

a. Predictors: (Constant), Total MI

b. Dependent Variable: Cloze Test

As Table 12 shows, R= .488 and R square equals .239. It can be said that scores on total MI can predict about 23% of the variance in performance on cloze test questions.

TABLE 13.
VARIABILITY IN CLOZE TEST SCORES BASED ON MI

ANOVA[b]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	92.139	1	92.139	27.571	.000[a]
	Residual	294.083	88	3.342		
	Total	386.222	89			

a. Predictors: (Constant), Total MI

b. Dependent Variable: Cloze Test

As illustrated in Table 13, F (1, 88) = 27.57, p≤ .05, we can conclude that this regression is significant.

TABLE 14.
CORRELATION COEFFICIENTS OF MI AND CLOZE TEST SCORES

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1(Constant)	4.392	1.002		4.383	.000
Total MI	.127	.024	.488	5.251	.000

a. Dependent Variable: Cloze Test

Table 14 provides us with the equation is:

Performance on Cloze Test Format = 4.392 + (.127) *Total MI*

According to the above regression the cloze test scores will increase .12 standard deviation units if we increase the total MI scores one standard deviation.

D. Variability in Performance on Cloze Test Based on Scores on Different Intelligences in MI

This section investigates whether the 8 intelligences in MI can be predictors of performance on cloze test. In this regression the stepwise method is employed.

H_0: Sub-scales of MI scores do not predict performance of learners on cloze test significantly.

Table 15 shows that R equals.53 and R square is .29. It indicates that *linguistic intelligence* accounts for about 29% of the variance in performance on cloze test. The adjusted R square equals .28. The standard error of estimate also equals 1.76 that is a rather small amount.

TABLE 15.
MODEL SUMMARY OF R SQUARE OF THE CORRELATION COEFFICIENT BETWEEN CLOZE TEST AND MI SUB-INTELLIGENCES

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.539[a]	.291	.283	1.76419

a. Predictors: (Constant), Linguistic Intelligence

b. Dependent Variable: Cloze Test

The F value clarifies that the relationship between the variables is significant and that there is a linear relationship between the variables (F (1, 88) = 36.09, p≤.05) (Table 16).

TABLE 16.
VARIABILITY IN CLOZE TEST SCORES BASED ON MI SUB-INTELLIGENCES

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	112.333	1	112.333	36.092	.000[a]
	Residual	273.889	88	3.112		
	Total	386.222	89			

a. Predictors: (Constant), Linguistic Intelligence
b. Dependent Variable: Cloze Test

According to Table 17, out of the 8 independent variables, only *linguistic intelligence* can be a predictor. Therefore the un-standard regression equation is:

Performance on cloze test=4.057+ (.09) *Linguistic intelligence*

And the standard regression equation goes as:

Performance on cloze test = (.53) Linguistic intelligence

The standardized beta tells us that if we increase *linguistic intelligence scores* by one standard deviation, the *cloze test scores* will increase by .53 standard deviation unit.

TABLE 17.
CORRELATION COEFFICIENTS OF MI SUB-INTELLIGENCES AND CLOZE TEST SCORES

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	4.057	.934		4.343	.000
	Linguistic Intelligence	.092	.015	.539	6.008	.000

a. Dependent Variable: Cloze Test

IV. CONCLUSIONS

It was shown that there is a positive relationship between MI and learners' performance on multiple-choice questions and cloze test. Out of the eight intelligences identified in MI theory, *linguistic intelligence* has a relatively strong relationship with multiple-choice performance. In addition to this intelligence, *mathematical*, *spatial* and *intrapersonal intelligences* moderately correlated with multiple-choice questions. *Linguistic intelligence* is also correlated with cloze test performance. Moreover, a moderate relationship between cloze test and *mathematical intelligence* and *spatial intelligence* has been found.

Regression analysis was also run to see if MI or any of its sub-intelligences could predict performance on multiple-choice questions and cloze test. The obtained results indicate that the performance of multiple-choice and cloze test can be moderately predicted by the total MI score. *Linguistic intelligence* can predict performance on multiple-choice questions positively. However, multiple-choice performance can be negatively predicted by *musical intelligence*. Out of the sub-intelligences of MI, only *linguistic intelligence* score can predict the performance on cloze test.

Out of the eight intelligences in MI, it seems that *linguistic intelligence* is the most related intelligence of MI to the performance on multiple-choice questions and cloze test. It is also the best predictor of success regarding performance on multiple-choice and cloze test. One reason for that is that those with higher linguistic intelligence are able to perceive and find the relations among linguistic data and this ability assists them while performing on linguistic tests.

Mathematical is another intelligence of MI that is both related to performance on multiple-choice and cloze test. It seems that those with high *mathematical intelligence* are more logical. They use their logic while performing on multiple-choice questions, and logically analyze the structures of the sentences and decide correctly how they should fill in the blanks in a cloze test.

Another intelligence that is both related to multiple-choice and cloze test is *spatial intelligence*. Those with high spatial intelligence scores are able to recognize both large and small visual patterns (Gardner, 1983). It means that this ability enables learners to process a text from bottom-up and top-down. Employing these two approaching a text assists learners to find the relationships among paragraphs, sentences and structures. Therefore guessing the missing words may be quite easy for learners with high spatial intelligence.

Intrapersonal intelligence, the ability to understand and self-monitor oneself, is related only to multiple-choice questions. Intrapersonal intelligence, as conceptualized by Gardner (1983), includes the awareness of one's own desires, fears, and abilities, and also using this information to make sound life decisions.

As the results show, multiple-choice and cloze test are both affected by total MI score and its sub-intelligences. Thus, in order to assess learners' ability in reading, reading test should have different formats of test items. As fairer

assessment is the objective of testing and researchers all over the world are trying to develop fairer and more accurate tests, test developers must be careful not to include only one test format in the reading tests they develop so that the tests measure performance of test takers more accurately and more fairly (Pishghadam & Tabataba'ian, 2011).

The teachers must also be aware of these differences among their students so that they do not base their decisions only on the tests administered as these tests rarely include all test formats. Teachers as test users must understand the qualities of the tests they use and their appropriateness in the context these tests are used. They must try to develop fairer tests that include all test formats. The false belief that standardized tests guarantees test fairness must be abandoned (Stobart, 2008). As Brown (2004) also questions standardized tests, they do not guarantee fairness for all participants and some will be in the minority group and if a more comprehensive picture of language learners' knowledge is required, different types of performance should be elicited.

If these differences are paid attention to, the designed tests will be more valid as the consequential validity of the tests, which is an important measure of validity and has been ignored until recently, will increase. And as Bachman (2000) correctly states, now that we have the methodological, theoretical and technological resources, plans must be made to ensure validity in practice and high quality tests must be developed.

The current study shows that test format affects reading test performance moderately so assessment must be done with care to ensure that this factor, which is irrelevant to language ability of test takers, does not affect test scores.

As all sources of bias are not identified yet, it will be best to use a mixture of different test types (Pishghadam & Tabataba'ian, 2011) and using varied test items can provide us with a more thorough picture of learners' capability (Brown and Hudson, 1998). Doing research in testing can provide us with the problematic areas that may exist for the test-takers while taking the language test. Therefore, as having a fair assessment is the main objective in the process of test developing, test developers and teachers should address learners' differences in their testing and teaching.

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