

The relationship between Test Takers' Multiple Intelligences and Their Performance on the Reading Sections of TOEFL and IELTS

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Abstract

The present study aimed at investigating the hypothetical relationship between the multiple intelligences of test takers and their performance on the reading sections of TOEFL and IELTS. Howard Gardner's theory of *multiple intelligences* suggests that intelligence is not a single and solely inborn capacity, rather a multiple construct which is only partly genetic, and can be crystallized or paralyzed over one's lifetime. Based on the theory, there are eight types of intelligence: linguistic, mathematical, musical, bodily, spatial, intrapersonal, interpersonal and naturalist, but the list is not exhaustive. The multiple intelligences of test takers were estimated by means of MIDAS, the Multiple Intelligences Developmental Assessment Scales, developed by Shearer (1994). Subsequently, the bias detection for the reading section of TOEFL was carried out on 90 participants, and this subtest was found to correlate positively with linguistic and logical intelligences. By the same token, 89 out of the 163 participants in the study were included in the analysis of the relationship between the multiple intelligences of test takers and their performance on the reading section of IELTS, and this test proved biased toward linguistic and spatial intelligences. The implications concern the inadequacy of the definition of language proficiency. Moreover, Measurement-Driven Instruction courses and preparatory materials of the two proficiency tests, TOEFL and IELTS, can benefit from the results of the study by being designed in such a way as to represent the intelligences which are positively correlated with performance on the tests in question.

Keywords: MIDAS, Multiple intelligences, Language proficiency, Regression analysis, Standardized test, Test bias

1. Introduction

One of the primary concerns of language testers of all time is the validity of the interpretations and uses of test scores. Decades backward, Spolsky (1968) [30] had addressed the problem of validity: "The central problem of language testing as of all testing is validity" (p.94). Validity, according to Messick (1989; cited in Bachman, 1990) [5], is the extent to which the uses and actions based on test scores are adequate and appropriate. As such, validity is not an easily attainable end in itself, taking into account the prodigious diversity of test takers' characteristics. "The process of test validation must go beyond reliability and examine the relation between test performance and factors outside the test itself" (ibid, p.239). [5]

Similarly, ensuring the reliability of test scores is a considerable undertaking as, according to Bachman (1990) [5], factors outside the test itself such as test takers' idiosyncrasies may turn into systematic sources of measurement error, while "a perfectly reliable score, or measure, would be one which is free from errors of measurement" (p.24) [5].

Intelligence, as a cognitive capacity of the brain, can be hypothesized to influence language test performance. The view of intelligence adopted in the present study is that put forth by Howard Gardner under the rubric 'Multiple Intelligences', or MI, a critique to the standard view of intelligence as a unitary trait measured through traditional IQ tests.

Gardner claimed in his "*Frames of Mind*" (1983) [14] that the multiplicity of human cognitive faculties or intelligences needs to be appreciated if we are to account for the intellectual diversity of human beings. There are, according to him, eight types of intelligence that reflect different ways of interacting with the world: Logical/Mathematical, Verbal/Linguistic, Visual/Spatial, Bodily/Kinesthetic, Musical, Interpersonal, Intrapersonal, and Naturalist.

Gardner's initiative has been embraced by a host of educators, including language educators and assessment scholars. While MI generally disfavors standardized testing, and advocates 'alternative assessment' instead, the investigation of the possible relationship between test takers' multiple intelligences and their performance on standardized norm-referenced tests can provide some deep insights into the general characteristics of such tests.

Therefore, in an attempt to contribute to the study of the reliability, validity and bias on the one hand and to the enhancement of the efficiency of preparatory materials and courses, on the other, of two different ubiquitous tests of proficiency, TOEFL and IELTS, the present study enquired into the hypothesized interaction between test takers' multiple intelligences and their performance on the reading sections of these English language proficiency tests.

Questions

1. Is the reading section of TOEFL biased toward any of the multiple intelligences?
2. Is the reading section of IELTS biased toward any of the multiple intelligences?

Null hypotheses (H_0)

1. There is no significant relationship between test takers' multiple intelligences and their performance on the reading section of TOEFL.
2. There is no significant relationship between test takers' multiple intelligences and their performance on the reading section of IELTS.

2. Literature Review

2.1. The essence of Gardner's theory of Multiple Intelligences

Motivated by his recognition of no mention of art in cognitive psychology and his neurological research on brain damage (Gardner, 2003 [17]; Gardner & Hatch, 1989 [15]), Gardner first presented his theory of multiple intelligences in a revolutionary book, "*Frames of Mind*" (1983) [14], seeking to capture all of the ways humans can excel. He posed a colossal mutiny against the prevailingly held conceptualizations of intelligence, entailing a single, fixed and measurable factor labeled 'g', grounded in factor analytic approaches and favored by purists. He defined intelligence as "the ability to solve problems and to create products that are valued in one or more cultural settings" (Gardner, 1983; cited in Gardner, 1999, p.33) [16]. This definition brings to light the ways Gardner's conceptualization of an intelligence differs from that of his predecessors: the consideration of the product creation dimension of intelligence and the significance of culture in the way intelligence is conceived.

Upon surfing the existing literature (Brown, 2000 [6]; Christison, 1998 [10]; Gardner, 1983 [14], 1999 [16], 2003 [17]; Harmer, 2001 [19]; Richard and Rodgers, 2001 [29]), the essence of his theory can be stated as the following principles:

1. There are eight types of intelligence that reflect different ways of interacting with the world: Logical, Linguistic, Visual, Bodily, Musical, Interpersonal, Intrapersonal, and Naturalist.
2. All these universal and autonomous capacities or intelligences are innately endowed in all human beings, but people are unique in the strengths and combinations –profiles- of these intelligences on biological and experiential accounts.

3. Intelligences rarely operate independently as they tend to complement each other when people try to solve problems or fashion products.
4. There is more than one way to be intelligent in each of the intelligence types.
5. We can all improve each of the intelligences, though some people will improve more readily in one or more areas through training and practice.
6. Intelligences are not subject to value judgments. In other words, despite the positive connotation of the word 'intelligence', it, in its different types, can be put to good and nefarious purposes.
7. Gardner's theory implies an individualized pedagogy, one in which teachers teach and assess students based on their individual strengths and weaknesses. It is in line with such recurring educational themes as *learner differentiation*, *humanism* and *psychological flow*.

2.2. Gardner's criteria of an intelligence

To provide a clear-cut distinction between an intelligence on the one hand and a talent or an aptitude on the other, Gardner (1983) [14] stipulated a set of eight criteria or signs, "a reasonable set of factors to be considered in the study of human cognition" (Gardner, 1999, p. 41) [16]:

1. Potential isolation by brain damage, manifesting the biological basis of an intelligence;
2. The existence of idiot savants, prodigies and other exceptional individuals;
3. An identifiable core operation or set of operations;
4. A distinctive developmental history, along with a definable set of expert end-state performances;
5. An evolutionary history and evolutionary plausibility;
6. Support from experimental psychological tasks;
7. Support from psychological findings;
8. Susceptibility to encoding in a symbol system.

2.3. Gardner's MULTIPLE INTELLIGENCES defined

Initially, Howard Gardner (1983) [14] posited the existence of seven intelligences. However, his listing was provisional, as later, in 1993, he added an eighth type, namely naturalist intelligence, and is now dubious about a ninth possibility, existential intelligence, as the sensitivity to tackle deep questions about human existence, such as the meaning of life (Gardner, 1999) [16]:

So far, I'm sticking to my 8 ½ intelligences, but I can readily foresee a time when the list could grow, or when the boundaries among the intelligences might be reconfigured (Gardner, 2003, p. 10) [17].

What follows is a definition of the intelligences:

1. **Logical intelligence:** It entails the ability to think conceptually and abstractly, and the capacity to discern logical or numerical patterns. This is what, in Gardner's terms, Piaget, the most influential figure in developmental psychology, was actually focusing on. From an educational perspective, people with high logical intelligence learn and are assessed best through scientific demonstrations, calculations, creating codes, logical problems, puzzles, inductive and deductive reasoning, mental formulae and the like (Christison, 1997; cited in Richards & Rodgers, 2001 [29]; Georg, 1997 [18]).
2. **Linguistic intelligence:** It encompasses well-developed verbal skills and sensitivity to the sounds, meanings and rhythms of words. It "involves sensitivity to spoken and written language, the ability to learn languages, and the capacity to use language to accomplish certain goals" (Gardner, 1999, p.41) [16]. People with high verbal intelligence learn and demonstrate what they have learnt at their best through worksheets, word games, memorizing, using word processors, vocabulary quizzes, recall of verbal information, reporting and other similar tools and techniques (Christison, 1997; cited in Richards & Rodgers, 2001 [29]; Georg, 1997 [18]).

3. **Musical intelligence:** It is best described as the ability to produce and appreciate rhythm, pitch and timber. Gardner (1999) [16] states that it is structurally parallel to verbal intelligence and, therefore, apt to be called an intelligence and not a talent. People with high musical intelligence learn best through music appreciation, linking music with learnt concepts, analyzing musical structures, listening, and other activities of the sort (Christison, 1997; cited in Richards & Rodgers, 2001 [29]; Georg, 1997 [18]).
4. **Bodily intelligence:** It's the ability to control one's body movements and to handle objects adroitly to solve problems or to fashion products. It encompasses the adeptness to comprehend the world through body experiences, to express ideas and emotions and communicate with others physically (Gaffney, 1995) [13]. People with high bodily intelligence learn best through role plays, hands-on activities, miming, field trips, processing knowledge by means of bodily sensations, and interacting with the world (Christison, 1997; cited in Richards & Rodgers, 2001 [29]; Georg, 1997 [18]).
5. **Visual intelligence:** Visual intelligence can be defined as the capacity to think in images and pictures, to visualize accurately and abstractly, and "to recognize and manipulate the patterns of wide space as well as the patterns of more confined areas" (Gardner, 1999, p.42) [16]. Among the best learning and assessment tools appropriate for such learners are flow charts and graphs, movies, imaginative storytelling, visualization, understanding and creating maps, and sketching (Christison, 1997; cited in Richards & Rodgers, 2001 [29]; Georg, 1997 [18]).
6. **Interpersonal intelligence:** It denotes a person's capacity to detect and respond appropriately to the moods, desires, motivations and feelings of others, and "to work effectively with others" (Gardner, 1999, p.43) [16]. It's evident in teachers, salespersons and politicians (Richards & Rodgers, 2001) [29]. People with high interpersonal intelligence benefit most from such learning activities as pair work, group brainstorming, peer tutoring, role plays, etc. (Christison, 1997; cited in Richards & Rodgers, 2001 [29]; Georg, 1997 [18]).
7. **Intrapersonal intelligence:** It means the capacity to be self-aware and in tune with inner feelings, values, beliefs and thinking processes, and "to use such information effectively in regulating one's own life" (Gardner, 1999, p.43) [16]. People with high intrapersonal intelligence learn and demonstrate what they have learnt best through independent student work, personal projection, complex introspective questions and answers, journal keeping, options for homework, etc. (Christison, 1997; cited in Richards & Rodgers, 2001 [29]; Georg, 1997 [18]).
8. **Naturalist intelligence:** It's the ability to recognize and categorize animals, plants and other objects in the environment. To cater for naturalist learners, teachers can draw upon such learning and assessment tools as videos, texts and films on nature, field trips and the like (Christison, 1997; cited in Richards & Rodgers, 2001 [29]; Georg, 1997 [18]).

2. 4. Multiple intelligences and Recurring Educational Themes

Since 1983, Gardner's theory of multiple intelligences has found a ready audience among educators and curriculum designers alike, and this has come as a surprise to Gardner himself: "The fervor with which educators embraced his [Gardner's] premise that we have multiple intelligences surprised Gardner himself" (Checkley, 1997, p.8) [9]. Centuries ago, Plato had put in words what is now considered the drift of MI theory in education: "Do not train youth to learning by force and harshness, but direct them to it by what amuses their minds so that you may be better able to discover with accuracy the peculiar bent of the genius of each" (cited in Campbell, 1997, p.14) [8].

MI can be regarded as a "learner-based philosophy" (Richards & Rodgers, 2001, p.115) [29] that is inextricably interwoven with the recurring themes in today's educational psychology as follows:

1. Differentiation: MI is consonant with the motto of today's educators in general and language educators in particular: "Cater for individual learner differences". According to Gardner (1999) [16], the traditional view of intelligence leads to an educational course in which everyone has to study the same material and is treated in the same way. However, an MI-based education echoes the fact that we are all different and possess different kinds of mind, and it is only with the appreciation of these differences that education works most effectively. On the whole, MI calls for a personalized, rather than a homogenized, education and is committed to achieving educational understanding.

2. Psychological flow: A second buzzword in education today is 'psychological flow'. It can be defined as a mental state that entails "total absorption in a satisfying task" (Stevens, 1986, p.26) [35]. Deeply seated in individual differences, MI is a ringing endorsement of an education which offers pleasurable and magnified learning experiences based on learners' natural talents. This has proved to catapult learners, especially language learners, toward the heights of learning and improvement. In other words, an ideal educational system, Gardner believes, is one that makes learners want to do what they have to do (Larsen, 2002) [22].

3. Humanism: Gardner's theory is in line with one of the popular and promising forces in education today: 'humanistic teaching'. Arnold (1998) [4] asserts "humanistic language teachers are concerned with the whole person and should have no difficulty accommodating many areas of experience and learning in their classrooms" (p.240). These same themes of 'catering for the whole-person' and 'the diversity of learning experiences' are exactly what the proponents of MI are committed to. Gardner maintains "we should think in terms of as large a part of humanity as possible" (cited in Larsen, 2002, p.6) [22].

Given what was said above, the theory of multiple intelligences can bring about a fundamental reform in the educational system, and not surprisingly "educational institutions have recently been applying Gardner's intelligences to a multitude of school-oriented learning" (Brown, 2000, p.102) [6]. On a smaller scale, MI theory has spurred many a teacher to reconsider their teaching methods and many a researcher alike to put forward the best ways of applying the theory within schools and classrooms in general and language learning classrooms in particular.

The educational application of MI is espoused and explicated on by Armstrong (1994) [1] who, attempting to teach how to tell the time to a group of first graders, states "one can use this model to teach virtually everything from the "Schwa" sound to the rain forest and back" (p.1). Taking a similar path, Walters (1992) [36] counts two of the valued advantages of an MI-based classroom:

1. *Problem solving:* An MI-founded pedagogy evens up the pitfalls of the traditional restricted context that fails to reflect problem solving in the world outside school.
2. *Self-esteem:* Failing to recognize the importance of certain intelligences, schools tend to raise the self-esteem of the favored group and lower that of the group that they don't favor. In this case, MI serves as a remedy.

By the same token, Wilson (1998) [37], an enthusiastic proponent of MI, talks of the immense popularity of the theory among educators: "much like a grassroots started at the bottom of the educational pyramid" (p.3). She brings up six reasons for this widespread acceptance among teachers and researchers:

1. the proliferation of the published work and presentations on the theory, serving to raise awareness of the virtues of its application in the classroom;
2. its adaptability for a broad range of instructional experiences and curricular applications;
3. empowering learners, providing them with supportive scaffolds and enhancing their meta-cognitive and study skills;
4. fostering levels of personal, interpersonal, professional and cultural understanding;
5. creating a state of psychological flow;
6. validating teachers' insightful and qualitative assessment of learners' natural faculties;

7. broadening the conception of giftedness and providing teachers with a more comprehensive and egalitarian view.

2. 5. Multiple intelligences and language learning

Before Gardner's initiation of MI, the relationship between language learning and intelligence had been sketched differently by different scholars. Some denied the existence of such a relationship, reasoning that successful language learners represented a wide range of IQs (Brown, 2000) [6]. Others argued in favor of this hypothesized tie, and in some cases went to extremes for it. For example, Oller (1981) [27] deemed general intelligence and language proficiency as more or less the same thing.

Along the same lines, taking a more diluted view of the hypothesized connection between intelligence and language learning, Lightbown and Spada (1999) [24] review the state of the art on such a relationship and conclude that the 'intelligence' connection with language learning can only be taken for granted with reference to particular areas of language learning like reading, grammar and vocabulary, but not with oral skills.

Despite the swings of the pendulum, MI theory has gained recognition among language educators and foreign or second language teachers, though Gardner himself believes that such a relation is not to be taken for granted: "I'm less persuaded that it [MI] can be useful in mastering a foreign language, though I admire those teachers of foreign languages who claim success using MI approaches" (2003, p.11) [17].

According to Brown (2000) [6], Gardner's theory underlines those attributes that are pivotal to second language learning success. By the same token, Richards and Rodgers (2001) [29] assert that, from an MI perspective, language is integrated with music, interpersonal relationships, bodily activity and alike; what's more, it encompasses all that is critical in communication, so it "is not seen as limited to a "linguistic" perspective" (ibid, p.117) [29]. Thus, aspects of language such as rhythm and tone, for example, "are more closely linked to, say, a theory of music than to a theory of linguistics" (ibid) [29].

As far as the application of MI in a language learning classroom is concerned, Michael Berman (1998; cited in Palmberg, 2002) [28] was the first educator to systematically apply MI to ELT. In his book *"A Multiple Intelligences Road to an ELT Classroom"*, he emphasizes the importance for teachers to cater for the various intelligence profiles that exist in a language learning environment. In the majority of language learning classrooms, according to Larsen-Freeman (2000) [23], verbal and interpersonal intelligences are likely to be compulsively regularly activated, while other intelligences may not receive any particular attention on the part of teachers. Consequently, within an MI framework, language teachers are strongly recommended to represent the other intelligences as well, "while not losing sight that their purpose is to teach language" (ibid, p.172) [23].

2. 6. Multiple intelligences and reading: How can the eight intelligences be involved?

Although we have generally tended to associate the reading skill with linguistic intelligence and with distinctive brain structures in the left hemisphere, one can demonstrate the interplay of all the eight intelligences when it comes to processing the actual experience of reading. Embarking on a task of reading, the reader proceeds through a number of stages employing one or more intelligences:

1. looking at the visual configuration of the letters (spatial intelligence);
2. making visual image-sound correspondences (musical, linguistic and naturalist intelligences);
3. grounding the visual and auditory sensations into a structure of meaning (bodily intelligence);
4. drawing upon deep intuitive syntactic structures (logical intelligence);

5. visualizing the reading material (spatial intelligence), experiencing himself/herself physically engaged in a text (bodily intelligence), having emotional reactions (intrapersonal intelligence), guessing the author's intents or beliefs (interpersonal intelligence), thinking critically about the reading material (logical intelligence), etc.

This way, several or all of the intelligences are brought to bear on the multilayered process of reading. Such a broad view of the reading process accounts, at least in part, for the range of difficulties readers generally encounter; examples include failing to comprehend whole texts, problems with the underlying grammatical structures of sentences, and inability to visualize the reading material or to understand the author's intent (Armstrong, 2003) [3].

2. 7. Multiple intelligences and assessment

Fairness in assessment in general and language assessment in particular can be of substantive concern to both assessors and those who are assessed once the vitality of immediate and far reaching consequences of assessment acts is brought to light. In other words, a fair assessment is tantamount to the assessor's staunch commitment to 'ethics' as an intrinsic part of his/her profession. Given this, a salient aspect of assessment is the validity of the procedures and measures utilized to assess individuals, and consequently the extent to which such procedures and measures cater for the cognitive differences among those who are assessed.

MI theory proposes a quintessential restructuring of the orthodox way in which educators assess their students' learning progress. It dissents from short answer, standardized, and norm-referenced testing, postulating, in essence, that such tests represent a very restricted context for problem solving. From an MI perspective, learners should not be assessed in a uniform fashion on the grounds that they do not learn in the same way (Armstrong, 2000 [2]; Gardner, 1999 [16]; Walters, 1992 [36]). Walters (1992) asserts that MI theory is oriented toward more authentic or alternative assessments with the purpose of paying due attention to the unique intelligence profiles of learners. In a similar vein, Costanzo and Paxton (1999) [11] contend that schools have traditionally dwelled on linguistic and logical intelligences and fallen short of recognizing individual differences. They take refuge in MI as "it stimulates teachers to plan assessments that allow students to draw upon these [other] intelligences when trying to demonstrate mastery of content material" (p.24). Similarly, Kallenbach (1999) [21] believes that changing the learners' paradigm of effective teaching and learning can be fulfilled through coupling MI-based lessons with regular reflection and self-assessment of what is helping adults to learn.

3. Methodology

In compliance with such new trends in language assessment, the present study is an attempt to find out the extent to which the reading sections of TOEFL and IELTS are aligned with Howard Gardner's theory of 'multiple intelligences'. In order to answer the research questions, the following methodology was adopted:

3. 1. Materials

3.1.1. MIDAS: To obtain an estimate of the participants' mastery in each of the eight intelligences posited by Gardner, the Multiple Intelligences Developmental Assessment Scales (MIDAS) was used. These scales were developed by Shearer (1994) to provide an objective or reasonable measure of the multiple intelligences as reported by the person or by a knowledgeable informant. According to Shearer (1996) [31], the scales in MIDAS have been so developed as to describe the course and direction of intellectual growth and achievement potential in specific areas of skill for the eight intelligences. The results consist of scores on the 8 subscales of the questionnaire, usually expressed in percentages. The reliability and validity of MIDAS have been minutely demonstrated by Shearer (www.MIresearch.org) [39].

3.1.2. The reading section of general training IELTS: On this reading test, there are 40 questions for the candidates to be answered within 60 minutes, following 3 sections of increasing difficulty containing texts taken from notices, advertisements, leaflets, newspapers, instruction manuals, books and magazines(www.IELTS.org) [38].

Each item is worth one mark and scoring is facilitated through the availability of an answer key indicating alternative words/phrases within an individual answer (Cambridge IELTS 2, 2002) [7]. The Reading module in the present study was first scored through number-right scoring, whereby each item is assigned one mark, and then scaled on full and half band scores from 0 to 9 ; the scores below 30 (below the band score 6) were excluded from the analysis.

3.1.3. The reading section of paper-based TOEFL: The reading section makes up the third section of the TOEFL. It contains 50 multiple-choice questions to be completed in 55 minutes. Candidates will find 5 or 6 passages, each followed by 9 to 11 multiple-choice questions. Passages are written in a formal, academic style, typical of most college or university level texts and journals (www.TOEFL.org) [40].

The questions include vocabulary, cohesion, and reading comprehension items including factual questions and questions about the main idea of individual paragraphs and the whole passage. Each item is worth one mark (Matthiesen, 1999) [25]. The scoring was carried out by first calculating the number right scores and then converting them to scaled scores ranging from 31 to 67. The test takers scoring below the number right score 38 (the scaled score 54) were excluded from the data analysis.

3.2. Participants

For the purposes of the present study, initially 163 (68 male and 95 female) Iranian EFL learners, ranging in age from 22 to 36, and of a variety of academic backgrounds, volunteered to take part in the study. They were all advanced learners at a private English language institute in Iran, namely Kish, and had no prior experience on either TOEFL or IELTS, i.e. they hadn't done any TOEFL or IELTS courses prior to the study so as to control for their 'test wiseness'.

3.3. Procedure

The researcher set on the task of testing the hypotheses by selecting participants in such a way as to leave out 'language proficiency' as a control variable. Therefore, she initially obtained the consent of 163 male and female advanced EFL learners at Kish Language Institute to take part in the study. They had all been placed in two consecutive (fourth and fifth) advanced courses through achievement or placement tests, and the nuance in their language proficiency could therefore be ignored.

Each participant attended a 120 minute testing session, first taking the reading section of the TOEFL within 55 minutes followed by a 15 minute break, and taking the reading section of the IELTS within 50 minutes afterwards. Overall, eight such testing sessions were held, supervised by the researcher. After each session, the test takers were given the MIDAS to fill in whenever they got the time to as no time limitation has been set by the questionnaire developer, and asked to hand in their completed MIDAS answer sheets within one week of receiving the questionnaires.

Later, in order to equate participants on their English reading proficiency, the researcher omitted from the data analysis the scores lower than 30 (band score 6) on the reading section of IELTS, and lower than 38 (scaled score 54) on the reading section of the TOEFL (i.e., lower than the 75% of the whole score on either test). Totally, 77 participants met the score requirement on both tests; 12 more participants met the score requirement on the reading section of IELTS; and 13 more participants met the requirement on the reading section of TOEFL. The remaining 61 participants fall into two groups:

1. Eleven didn't fill out the MIDAS.
2. Fifty met the score requirement on neither TOEFL nor IELTS.

3.4. Design

For the present study, the eight multiple intelligences comprised the set of independent variables, and the participants' scores on the reading sections of TOEFL and IELTS were the two dependent variables. Seeking such a relationship makes the research apt for the label '*applied correlational*'. As for the general design of the study, it can be said of an '*ex-post-facto*' nature because the researcher exerted no control over the independent variables, namely the eight intelligences put forth by Gardner.

4. Data analysis and Results

In order to test each of the null hypotheses, multiple regression analyses were run, via SPSS 11.5, twice with two different entry systems. The first stage of the analysis for each research question aimed at finding out whether the null hypotheses were to be rejected. In the second stage, a more detailed picture of the correlations and the predictability of the dependent variable based on the independent variables was provided.

4.1. Investigating the first research question

As mentioned earlier, out of 163 participants who took the TOEFL reading, 90 met the score requirement (i.e. their scaled scores were 54 or above) and provided their MI profiles. The information concerning the 90 valid cases' performance on MIDAS and the TOEFL reading is presented in Table 1.

The descriptive statistics on the TOEFL provides further evidence as to the homogeneity of the sample on reading proficiency. Simply put, with a mean of 56.46 and a standard deviation of 3.051, all the 90 scaled scores, which range from 54 to 66, fall within a standard deviation range from -0.5 to +1.5. This table also contains some statistical information on the distribution of the intelligences within the sample. Among all the intelligences, the participants show the greatest mastery in linguistic intelligence.

Table 1. Descriptive statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
TOFEL Reading Score	90	12	54	66	56.46	3.051
Musical	90	67.0	17.0	84.0	49.754	16.6156
Bodily	90	78.6	14.4	93.0	49.041	14.8687
Logical	90	70.0	23.0	93.0	57.923	15.4207
Spatial	90	74.4	17.8	92.2	55.808	17.3522
Linguistic	90	83.7	12.3	96.0	63.843	16.1350
Interpersonal	90	63.6	23.0	86.6	55.539	16.2140
Intrapersonal	90	69.3	23.0	92.3	58.291	17.1491
Naturalist	90	81.7	6.0	87.7	46.286	16.9112
Valid N	90					

Data analysis results for the first research question

Statistically speaking, the assumption behind the null hypothesis is that the multiple correlation or multiple regression equals zero ($R=0$). In order to test the hypothesis, the researcher ran a multiple regression analysis with the data using the "enter" entry system. The output can be seen in the following table (table 2).

Table 2. Model summary (1)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.577(a)	.333	.267	2.612

a Predictors: (Constant), Naturalist intelligence, Linguistic intelligence, Bodily intelligence, Intrapersonal intelligence, Musical intelligence, Interpersonal intelligence, Logical intelligence, Spatial intelligence

As the data indicate, the correlation coefficient between the set of independent variables, namely the eight intelligences, and the dependent variable, namely scores on the reading section of the TOEFL has a value of 0.577 ($R=0.577$). More specifically, the common variance between the intelligences and the TOEFL reading scores, represented with 'R square' in the table, is 0.333. It would mean that only 33.3% of an examinee's score on the reading section of the TOEFL can be accounted for by their level of mastery in the eight multiple intelligences.

Table 3. Partial and part correlations

Model		Correlations			Sig.
		Zero-order	Partial	Part	
	MUSICAL INT.	-.093	-.045	-.036	.689
	BODILY INT.	-.223	-.183	-.152	.097
	LOGICAL INT.	.393	.353	.308	.001
	SPATIAL INT.	.069	.024	.020	.827
	LINGUISTIC INT.	.354	.281	.239	.010
	INTER PERSONAL INT.	-.188	-.173	-.143	.119
	INTRA PERSONAL INT.	-.138	-.191	-.159	.084
	NATURALIST INT.	-.059	-.027	-.022	.810

a Dependent Variable: TOFEL Score

The second stage of the analysis was intended to see how well each of the eight intelligences correlated with scores on the reading section of TOEFL. The following table (Table 3) presents the partial correlations between each of the intelligences and the TOEFL reading score, along with their levels of significance. The data indicate that *linguistic* and *logical* intelligences are significantly correlated with the dependent variable ($r=0.281$ and $\alpha=0.010$ for linguistic intelligence, and $r=0.353$ and $\alpha=0.001$ for logical intelligence), while *intrapersonal* and *bodily* intelligences negatively correlate with the TOEFL reading score, and for them only a trend toward statistical significance is observable (Rosner, 1986) [30]. Hence, these four intelligences were entered in the final model.

At this stage of the analysis, the relative effect of each of the relevant intelligences was determined. The following table contains the output of the analysis:

Table 4. Model Summary (2)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.393(a)	.154	.145	2.821
2	.481(b)	.232	.214	2.705
3	.519(c)	.270	.244	2.652
4	.556(d)	.309	.276	2.595

a Predictors: (Constant), Logical intelligence

b Predictors: (Constant), Logical intelligence, Bodily intelligence

c Predictors: (Constant), Logical intelligence, Bodily intelligence, linguistic intelligence

d Predictors: (Constant), Logical intelligence, Bodily intelligence, linguistic intelligence, Intrapersonal intelligence

As indicated in the model, logical intelligence was the first intelligence analyzed, based upon which 15.4% of the TOEFL reading score can be accounted for. However when paired together, logical and bodily intelligences show a relatively higher correlation with the dependent

variable ($R=0.481$), and also the predictability of the TOEFL reading score, as the common variance (R square) shows, rises to 23.2%. In a similar vein, when the effects of the other two intelligences, linguistic and intrapersonal respectively, are included step by step, the correlation coefficient goes up and finally reaches 0.556, and the predictability of the TOEFL reading score also increases to 30.9%.

4.2. Investigating the second research question

As far as the second research question is concerned, out of the 163 participants who took the IELTS, 74 scored less than 30 (the band score 6) on the test or did not provide their MI profiles, while the remaining 89 served as valid active cases in the study. The statistical values concerning the participants' performance on the reading section of IELTS and MIDAS are presented in Table 5:

Table 5 Descriptive statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
IELTS Reading Score	89	2.50	6.00	8.50	7.0674	.63152
Musical	89	67.3	15.7	83.0	47.447	17.1020
Bodily	89	66.0	15.0	81.0	47.731	13.7442
Logical	89	76.0	17.0	93.0	56.219	16.7156
Spatial	89	64.8	27.4	92.2	57.080	16.0187
Linguistic	89	82.0	14.0	96.0	62.487	17.9667
Interpersonal	89	70.6	16.0	86.6	55.109	16.9023
Intrapersonal	89	74.8	17.5	92.3	58.033	17.6628
Naturalist	89	80.6	10.4	91.0	45.237	17.3587
Valid N	89					

As for the participants' performance on the IELTS reading section, the value of the mean (7.0674) and the standard deviation (0.63152) indicate a wider distribution of scores than what was observed for the TOEFL reading. The lower standard deviation can be accounted for by the fact that the IELTS scores are reported on band scales (here from 6 to 8.5). In addition, most of the scores cluster within one standard deviation from the mean. It is also evident in Table 5. that among all the intelligences, the highest mean (63.8) and range belong to *linguistic* intelligence.

Data analysis results for the second research question

Based on the second null hypothesis, the multiple correlation or multiple regression (R) between the multiple intelligences and scores on the General Training Reading module of IELTS has a value of zero. To test the hypothesis, the researcher ran the multiple regression analysis and came up with Table 6. The table provides evidence for the rejection of the second hypothesis.

Table 6 Model summary (1)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.507(a)	.257	.183	.57087

a Predictors: (Constant), Naturalist intelligence, Linguistic intelligence, Bodily intelligence, Intrapersonal intelligence, Musical intelligence, Interpersonal intelligence, Logical intelligence, Spatial intelligence

In actual fact, there is some degree of correlation between the eight intelligences as the set of independent variables and scores on the reading section of IELTS ($R=0.507$). The R square which is the common variance between the intelligences considered as a whole and the dependent variable equals 0.257. The implication is that about a quarter (25.7%) of the score on the reading

section of IELTS can be predicted based on a test taker's MI profile, therefore the assumption of no multiple correlation is rendered untenable.

Table 7 presents the partial correlations between each of the eight intelligences and the IELTS reading score alongside the Zero-order or bivariate correlations and the levels of significance. It can be observed that linguistic and spatial intelligences correlate significantly with the dependent variable. The partial correlation has a value of 0.291 for the spatial intelligence and 0.370 for the linguistic intelligence, and both correlations are highly significant at 0.01 level. It would mean that linguistic and spatial intelligences can be taken as the best predictors of the score on the General Training Reading module of IELTS.

Table 7 Partial and part correlation coefficients (a)

Model		Correlations			Sig.
		Zero-order	Partial	Part	
1	MUSICAL INT.	.006	-.131	-.114	.242
	BODILY INT.	.057	-.001	.000	.996
	LOGICAL INT.	.111	-.164	-.144	.140
	SPATIAL INT.	.355	.291	.262	.008
	LINGUISTIC INT.	.392	.370	.343	.001
	INTER PERSONAL INT.	.028	-.037	-.032	.741
	INTRA PERSONAL INT.	.097	-.071	-.062	.523
	NATURALIST INT.	.021	.015	.013	.896

a Dependent Variable: IELTS Score

Finally, utilizing the 'stepwise' entry system, the researcher once more regressed the independent variables on the dependent variable. The output can be seen in the following table:

Table 8. Model Summary (2)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.392(a)	.153	.144	.58436
2	.455(b)	.207	.188	.56894

a Predictors: (Constant), Linguistic intelligence

b Predictors: (Constant), Linguistic intelligence, spatial intelligence

It is evident in the table above that apart from *linguistic* and *spatial* intelligences, all other intelligences have been omitted from the analysis as they proved not to correlate with the dependent variable. The first variable entered into the model is the linguistic intelligence based upon which 15.3% of the IELTS reading score can be predicted and the correlation has a value of 0.355. This intelligence is then paired with spatial intelligence in the second model; the correlation rises to 0.455 and the common variance increases by nearly 5%. In other words, given a test taker's linguistic and spatial intelligences, about 20% of his/her score on the General Training Reading module of IELTS is predictable.

5. Discussion and Conclusions

The fact that the reading sections of IELTS and TOEFL were found to favor some of the multiple intelligences comes as bad news and good news. In other words, there are both positive and negative implications. The negative implications relate to the fact that such standardized tests as TOEFL and IELTS are supposed to operationalize *English language proficiency* as their underlying construct and nothing else. Mousavi (1999) [26] defines a 'language proficiency test' as "a test which measures how much of a language someone has learnt. It seeks to answer the question: "Having learnt this much, what can the student do with it?" " (p.288). Accordingly, if language proficiency tests are found to be in favor of a particular group of test takers, or *biased* toward them,

“the VALIDITY of inferences we make on the basis of the test scores” is jeopardized (Mousavi, 1999, p.397) [26]. This means that to ensure the validity of widely used standardized language proficiency tests, bias detection is always welcomed.

As an example of bias detection on the reading sections of TOEFL and IELTS, the present study proved that test takers’ multiple intelligences can in fact influence their performance on the reading sections of these two tests. The significance of the problem comes to light if one considers the inordinate number of those who take IELTS and TOEFL every year with their unique intelligence profiles. One might argue that these tests are expected to test the language proficiency of test takers and not their multiple intelligences. A viable solution, according to Farhady(1981) [12], is to alter the definition of English reading proficiency in such a way that the test takers’ multiple intelligences are taken into account. It is evident, however, that inducting the test takers’ multiple intelligences in the definition of language proficiency would entail numerous problems, but it is worth considering. In actual fact, this redefining might entail the revising or even redeveloping of the tests in question so that they cater for all the eight intelligences, or at least the ones which seem to be relevant, equally well. This way, MI proponents’ call-out for an ‘intelligence-fair assessment’ can be, to some extent, fulfilled, and the construct validity of the tests partly ensured. Moreover, by measuring a broader range of cognitive skills or intelligences, individuals who might have been labeled as low performers when assessed on a limited set of cognitive skills may have better opportunities to demonstrate their level of proficiency (Stemler, Grigorenko, Jarvin & Sternberg, 2006) [33].

On a smaller and more practical scale, though, the results of the present study can prove beneficial to IELTS and TOEFL instructors and material developers. Simply put, now that we have found out which intelligences IELTS and TOEFL’s reading sections are biased toward, their preparatory courses and materials can be designed partly around these intelligences until the ETS professionals improve the tests so that they represent all the eight intelligences put forth by Gardner.

The theory of multiple intelligences has mostly been applied to language acquisition and authentic assessment programs, and only few researchers have extended it to the area of standardized and norm-referenced testing. To compound the problem, most of the work done in this area has taken the traditional view of intelligence (IQ) for granted, and failed to appreciate its multiplicity. The present study was then intended to fill in the gap to some extent, through the investigation of the relationship between test takers’ multiple intelligences and their performance on the reading sections of TOEFL and IELTS.

In the end, it is noteworthy that “*because theorists of intelligence disagree as to what it is, any consideration of its relationship to other constructs must be tentative at best*” (Sternberg, Grigorenko & Kidd, 2005, p.46) [34]. Moreover, the correlations observed do not imply a cause-effect relationship between the intelligences and the dependent variables, and this kind of misinterpretation of the results, called *post hoc fallacy*, needs to be avoided. These and the low correlations observed preclude carrying the implications too far. However, the popularity of MI among educators over other theories of intelligence makes it apt as one of the promising bases (if not the one) of language teaching and testing.

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