Intelligence and academic achievement: an investigation of gender differences

Habibollah. Naderi[1], Rohani. Abdullah[2], H. Tengku Aizan[3], Jamaluddin. Sharir[4]

1. Department of Educational Studies, University of Mazandaran, Street of Pasdaran, Babolsar, Iran
2. Department of Human Development & Family Studies, University Putra Malaysia, Serdang43400, Malaysia
3. Institute of Gerontology, University Putra Malaysia, Serdang, 43300, Malaysia
4. Department of Educational Psychology and Counseling, University of Malaya, 50603 Kuala Lumpur, Malaysia
naderihabibollah@yahoo.com
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Abstract

The objective of this research is to examine if a relationship exists between intelligence and academic achievement and if the relationship differs between males and females. Two research questions are examined in this paper: (1) what is the relationship between different aspects of intelligence and academic achievement? (2) Is there any significant gender differences regarding the relationship between different aspects of creativity and academic achievement? Participants (N=153; male=105 and female=48) completed creativity test. Cumulative grade point average (CGPA) was used to select the participants. Intelligence was measured using the Catell Culture fair Intelligence Test (CFIT-3a & b). Pearson Correlation analysis indicated that aspects of intelligence were not related to academic achievement for both males and females. However, implications of the findings for this study in intelligence and academic achievement are discussed. [Life Science Journal. 2010;7(1): 83 – 87] (ISSN: 1097 – 8135).

Keywords: Intelligence, Academic Achievement, Gender

1. Introduction

Is intelligence related to academic achievement? Historically this question has been addressed by researchers. The relationship between measures of intelligence and achievement is significant to research, if there is a strong relation between them, it might be deduced that the intelligence test has an important contribution in connection with other variables for instance the curriculum, study program, the teacher, the characteristics of the school, and others in scholastic performance (Naglieri & Bornstein, 2003).

In current years, several researchers have shown more interest in the relationship between intelligence and academic achievement. Researchers mentioned that there are empirical evidence for a strong association between general cognitive ability and academic achievement, there is still anywhere from 51% to 75% of the variance in academic achievement that is unaccounted for by measures of general cognitive ability alone(Rohde & Thompson, 2007). Additionally, understanding the nature of the relationship between general cognitive ability and academic achievement has widespread implications for both practice and theory(Rohde & Thompson, 2007).

Academic achievement of students in high school strongly correlates (.50 to .70) with intelligence scores(Jensen, 1998), but in another study researchers experienced the hypothesis that the relationship between general intelligence and academic achievement was in large part associated with a mental speed component. At the beginning, the divided variance between general intelligence and academic achievement was nearly 30%(Luo, Thompson, & Detterman, 2003). On the other hand, after controlling for the mental speed component, the shared variance between general intelligence and academic achievement was decrease to approximately 6% (Luo et al., 2003) . This result is strong shows to be true that the items of intelligence (such as mental speed component and maybe other substances) are a significant intervener between intelligence and academic achievement.

In another study, (Watkins, Lei, & Canivez, 2007) stated there has been considerable debate regarding the causal precedence of intelligence and academic achievement. Some researchers view intelligence and achievement as identical constructs. Others believe that the relationship between intelligence and achievement is reciprocal. Still others assert that intelligence is causally related to achievement (Laidra, Pullmann, & Allik, 2007) reported that students' achievement relies most strongly on their cognitive abilities through all grade levels.

Gender differences in IQ have been examined in adolescent and adult samples with respect to different of intelligence measures. (Colom & Garcیa-Lپez, 2002) reported some researchers (Allik, Must, & Lynn, 1999; Hattori & Lynn, 1997; Richard Lynn, 1994; R Lynn, 1998) have challenged the observations that there is no gender difference in intelligence. Their findings are based on the summation of the gender differences in several aspect of intelligence.

Although during the almost period of one hundred years a general agreement has been reached that there is no sex difference in overall general intelligence (Douglas and Rushton, 2006) but several studies have been reported gender differences in intelligence (Furnham et al., 1999). They support gender differences in specific cognitive abilities; some support females and some support males (Hyde, 2005; Lynn et al., 2002) but many of studies find no sex differences in intelligence (Halpern and LaMay, 2000).

Several investigators found gender differences in intelligence. (Deary et al., 2003) studied also the cognitive ability distribution in 80,000+ students. There

were no significant mean differences in cognitive test scores between genders but there was a highly significant difference in their standard deviations. Boys were more at the low and high extremes of cognitive ability (Douglas and Rushton, 2006). Douglas and Rushton (2006) found a point of biserial size of 0.12 favoring males on the SAT, which provides a good measure of general intelligence as manifested through school of learned abilities in high school graduating samples.

Researchers have also examined gender differences in intelligence in 20 countries, studies from China trough to Germany and Scotland have shown males give significantly and higher estimates than females for general over intelligence (Adrian and Buchanan, 2005). Adrian and Buchanan (2005) stated also this difference is consistent across countries and populations although there are wide differences in level. Sophie et al. (2006) investigated whether sex differences observed on the subtests of the intelligence test were attributable to sex difference in general intelligence. Males outperformed than females on 3 out of the 10 subtests (information, arithmetic and matrix reasoning), while females` performance was better than males only on 1 subtest, called digit of symbol substitution.

Wendy and Johnson (2007) investigates 436 (188 males, 248 females) participants (ages were between 18-79 from Australia, Great Britain and North America). Their result have shown that there was a very small gender difference in general mental ability but males clearly performed better on Visio-spatial tasks while females performed better on tests of verbal usage and perceptual speed. Rammstedt and Rammsayer (2000) have been investigated on 105 German students and concluded that male self-estimates were significantly higher for logical-mathematical and spatial intelligences, while female estimates were significantly higher for musical and interpersonal intelligences. Reilly and Mulhern (1995) estimated the intelligence of 125 (45 male and 80 female) of students at Queen`s University using the WAIS. They found there was no gender significant difference in their measured intelligence. However, men in the sample appeared to overestimate their intelligence, while the women were quite accurate in estimating their intelligence. Habibollah, et,. al (2008) reported there were no significance between males and females on intelligence but the result shows males' means are higher than females.

The current study reported here suggested studying the relationship between intelligence and academic achievement, especially to see if the relationship could be different for females and males by Catell Culture Fair Intelligence Test. Because few researches have been done on the basis of this instrument and previous research used other instruments, so this instrument has been employed by this research. Another reason for this study is that the previous research studied in certain cultures and researchers stated the need of study in different cultures and nations. So, due to the lack of research in this field on the basis of CCFIT test, in Iranian population, this research addressed this issue in overseas Iranian students by this test. In line with the aim of this investigate, the research questions were as follows: What is the relationship between different aspects of intelligence and academic achievement? Are there any differences for females and males in terms of the relationship between different aspects of intelligence and academic achievement?

2. Methodology

Sample

One hundred and fifty three Iranian undergraduate students in Malaysian Universities (31.4% females and 68.6% males) were recruited as respondents in this study. Their ages ranged from 18-27 years for females and 19-27 years for males.

Measures

Catell Culture Fair Intelligence Test

To evaluate the intelligence, every student was administered by a Scale 3 of the Catell Culture fair Intelligence Test (CFIT-3a & b). Roberto Colom, Botella, & Santacreu (2002) reported that this test is a well-known test on fluid intelligence (GF). Participants completed Cattell's culture fair intelligence test battery to assess individual differences in fluid intelligence. Cattell's Culture Fair Intelligence Test (1971), which is a nonverbal test of fluid intelligence or Spearman's general of intelligence. This test contained four individually timed subsections a) Series, b) Classification, c) Matrices, d) Typology, each with multiple-choice problems progressing in difficulty and incorporating a particular aspect of visuospatial reasoning. Raw scores on each subtest are summed together to form a composite score, which may also be converted into a standardized IQ.

Cumulative Grade Point Average (CGPA)

For the purposes of this study, Cumulative Grade Point Average (CGPA) was used as a proxy of academic achievement. The CGPA was calculated by dividing the total number of grade points earned by the total number of credit hours attempted. A student's academic achievement was based on their mid-year examination results. Academic achievement was the aggregate or the total number of grade points in the mid-year examinations. In these examinations, each university subject was graded along a one hundred (or four) point scale, the best grade point being one hundred (or four) and the lowest being zero. Hence the aggregate would range from 75 to 100 (3 to 4); notably the lower the aggregate, the better the academic achievement. This approach was used because other researchers have used the measure and found it an acceptable one for measuring academic achievement Palaniappan (2007) cited several researchers (Nuss, 1961; Parker, 1979; Taylor, 1958; Wilson, 1968).

Procedure

The students who participated in this study were all undergraduates. The research questions posed for the study required the students to identify and analyze the distributions and correlations of certain

creativity perception were best addressed in the form of a descriptive study. Creativity levels were assessed by self-report instruments and were confirmed by consideration of the results from the administration offices of the universities (described below). They were then divided by gender, with the total scores and subscales calculated for each male and female. The participant sample, women (18-27 years) and men (19-27years), was asked to respond during the regular course time. Both written and oral instructions were given to all participants, and the subjects were ready to answer upcoming questions in the class. Multiple significance tests were conducted, and the data were analyzed by t-test. Participants answered the tests either using their name or anonymously (whichever they preferred). They received no rewards for participating but were advised they would be given information of their results in the form of a self-referenced level of abilities at a later date. Scores for the creativity scale and its factors, were entered into the SPSS statistical program.

3. Result

Descriptive Statistics

The data were analyzed on the basis of the relationship between intelligence and academic achievement among males and females, and the results are reported in the Table and Figure below. SPSS for Windows Version 16.0 was used to conduct the analysis. Table 1 shows descriptive statistics of intelligence (The A form). The finding of this result [intelligence (The A form)] indicated that the females' mean score was not different from the males (male = 104.63, female =104.38, but standard deviation of the males (SD=16.35) were greater than the females' standard deviation (14.35). As it is shown in the table for intelligence (The B form), the males' mean score (100.86) was a little more than the females' mean score (97.54) for intelligence. The standard deviations between females and males were not so high different (15.69 = females & 15.91= Males). This table shows also a descriptive statistical intelligence between genders total of intelligence (Both A & B forms). It shows that males' mean score was higher than the females' on intelligence (Both A& B Forms), but the standard deviations between females and males were a little different, However, we had different results about the Intelligence (A&B forms) scores; the males' mean scores (103.05) were more than the females' mean scores (101.12) for the generally as well as the Intelligence (A& B forms). The standard deviations between females and males were a little different (14.09= females & 14.57 = Males).

Table 3 reveals that the females' mean (2.89) score for cumulative grade point average was lower than the males' mean score (3.00), but the standard deviations between females and males were not very different from each other (males=0.53 & females=0.56).

TABLE 1. Descriptive Statistics CGPA

Variables	N	Mean	Std. Deviation
CGPA	153	2.97	0.54
Male	105	3	0.53
Female	48	2.89	0.56

TABLE 2. Descriptive Statistics Intelligence

Variables	N	Mean	Std. Deviation
Intelligence (The A Form)			
Total Score	153	104.54	15.70
Male	105	104.63	16.35
Female	48	104.38	14.35
Intelligence (The B Form)			
Total Score	153	99.82	15.87
Male	105	100.86	15.91
Female	48	97.54	15.69
Intelligence (The A & B Form)			
Total Score	153	102.45	14.40
Male	105	103.05	14.57
Female	48	101.12	14.09

TABLE 4. Pearson Correlation Results a

Variables	r	p	N
Intelligence (The A Form)	.101*	.213	153
Intelligence (The B Form)	.011*	.889	153
Intelligence (The A & B Form)	.063*	.438	153

Dependent Variable; CGPA. * Correlation is not significant at the 0.05 level (2-tailed).

TABLE 5. Pearson Correlation Results for Males a

Variables	r	p	N
Intelligence (The A Form)	.088*	.372	105
Intelligence (The B Form)	- .032*	.749	105
Intelligence (The A & B Form)	.034*	.731	105

Dependent Variable; CGPA. * Correlation is not significant at the 0.05 level (2-tailed).

TABLE 6. Pearson Correlation Results for Females a

Variables	r	p	N
Intelligence (The A Form)	.133*	.368	48
Intelligence (The B Form)	.074*	.619	48
Intelligence (The A & B Form)	.109*	.461	48

Dependent Variable; CGPA. * Correlation is not significant at the 0.05 level (2-tailed).

Data Analysis

Pearson Correlation

This part presents the results from Pearson Correlation of intelligence and academic achievement variables for the males and the females, respectively. Table 3 shows the relationship between intelligence with academic achievement and the differences between males and females. Analyses of the relationships between intelligence and academic achievement among students were undertaken using Pearson Correlations for males and females. These correlations were not significantly related to Academic Achievement for [intelligence (The A&B forms)] (r=.101, p>0.05), [intelligence (The A form)] (r=.011, p>0.05), on the other hand, the [intelligence (The B form)] were not also significantly but negatively related to Academic Achievement (r=- .063, p>0.05).

Males: These correlations were not significantly related to Academic Achievement for [intelligence (The A&B forms)] (r=034, p>0.05), [intelligence (The A form)] (r=.088, p>0.05), on the other hand, the [intelligence (The B form)] were not also significantly but negatively related to Academic Achievement (r=- .032, p>0.05).

Female: These correlations were not significantly related to Academic Achievement for [intelligence (The A&B forms)] (r=.109, p>0.05), [intelligence (The A form)] (r=.133, p>0.05), on the other hand, the [intelligence (The B form)] were not also significantly related to Academic Achievement (r=- .074, p>0.05).

4. Discussion and conclusion

The majority interesting finding of this research is that when student's intelligence was measured by three of intelligence test, the result imply that there existed no significantly relation between males and females regarding which aspect of intelligence related to academic achievement, although intelligence was shown not be related to academic achievement for both genders. Hence, different aspect of intelligence and academic achievement doesn't matter for males and females when looking at the relation between intelligence and academic achievement. This could be one reason previous study yielded not decisive results respecting the relation between intelligence and academic achievement. One possible interpretation for this result is that males and females which has not been excelled in different aspect of intelligence.

Findings from this study are consistent with those of others (Deary et al., 2003) Wendy and Johnson (2007) Mulhern (1995) Habibollah, et. al (2008). The present study challenges strong statements by several researchers and psychologists. Adrian and Buchanan (2005) noted that there is gender difference on intelligence. Their result has been shown males give significantly and higher estimates than females for general over intelligence. Study's Sophie et al. (2006)

also revealed sex differences on the subtests of the intelligence test were attributable to sex difference in general intelligence. Males outperformed than females on subtests (information, arithmetic and matrix reasoning), while females` performance was better than males only on digit of symbol substitution. Of course, this research has some limitations. One is the measure of academic achievement. Measure of academic achievement for this study was cumulative grade point average. Another limitation was the number of this study's subjects there were 153 Iranian students only. To conclude this study shows that the relation between intelligence and academic achievement is complex. It may vary by gender and by the intelligence masseur used. If could be, follow-up study must look at other issues that are significant for a improve understanding of intelligence.

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Corresponding Authors:
Dr Rohani Abdullah
Department of Human Development & Family Studies
University Putra Malaysia, Serdang 43400, Malaysia
Email: naderihabibollah@yahoo.com
Tel; +6038946538

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