



Research Article

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Mental Ability of Deaf and Non-Deaf Students on the Raven's Progressive Matrices of Mental Abilities: A Comparative Study

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Abstract

The study aimed to compare the mental ability performance of deaf and non-deaf students on the Raven Progressive Matrices test of mental ability and its relationship to the variables of gender and age group. The study sample consisted of (307); (188) non-deaf and (119) deaf, and to achieve the goal of the study, the Raven's Progressive Matrices Test was used to measure mental ability, which is standardized on the Jordanian environment. The results indicated that the averages were in favor of the non-deaf, as the average performance of the deaf was (19.67), while the non-deaf children was (28, 91), and the result related to the gender variable indicated that there was no difference between deaf males and females on the test, While there is a significant difference between non-deaf males and females in favor of males. The results also indicated that there were statistically significant differences between the deaf and non-deaf for the age group variable in favor of the older age group.

Keywords: deaf, Raven's Progressive Matrices, mental ability

1. Introduction

Intelligence is one of the mental processes that educators have been interested in in the field of psychology and measurement, but this concept has differed in its educational definition, as Wechsler (2003) defined it as the total ability to think and the purposeful behavior that has an effective influence in the environment.

In 1995, McCay Veron prepared a scientific paper finding biases in the IQ assessment of deaf children resulting from inappropriate testing methods. This paper had a great impact in clarifying ideas about the deaf being a heterogeneous society, and the paper indicated how hearing affects cognition and psychological characteristics (Veron, 2005), (Uno, 2005)

Nearly (50) studies have been conducted to compare the mental abilities of the deaf and hard of

hearing since the advent of intelligence tests, and this indicates the importance of intelligence in the life of the deaf and hard of hearing. Both Printer and Patterson (1915-1917) conducted intelligence tests on deaf children, and researchers found that the verbal intelligence measures used show their performance on intelligence tests at the level of mental retardation, Then the researchers realized that the language deprivation associated with the deaf is the reason for the low mental ability, so they developed the non-verbal tests to be able to measure intelligence independently of language, and the results of using the test indicated that deaf children are less than normal in mental ability (Veron, 2005).

During this period, Reamer, 1912, selected (2,500) deaf children using six non-verbal tests. The results indicated a delay in the mental age of about two years for the deaf sample, whose ages ranged between (12-21), as indicated to the same result by Later, Fusfeld and Pinter, 1928 (Bauman, 2008).

(Al-Khatib, 2013) and (Zureikat, 2015) indicate that the mental performance of the deaf is similar in its distribution and prevalence to the intelligence of ordinary people, and they do not have low intelligence, and there is no evidence that their cognitive development and intelligence is less than the hearing, and that the deaf perform mental function within the normal range of intelligence.

Also (Braden , 1992) found two reasons for the low mental ability with the deaf, recommended by experts of performance intelligence tests to be used with deaf people. Performance intelligence tests reduce the linguistic aspect, as some misconceptions about the hearing-impaired were spread in the past, as they were considered uneducated individuals and that they were stupid, Their inability to speak was taken as evidence of their abnormality, They have been described as dumb and deaf, and this is an illogical link between hearing loss and low mental ability, which is wrong thinking because it considers speech impairment a disability in cognitive abilities.. One of the common problems that is constantly raised is whether deafness is related to intelligence, and this problem has been of interest to researchers for a long time. (Reesman, 2014), and because "Bennett" mentions in one of his early definitions of intelligence that understanding instructions is an essential part of the components of the intelligence of the examinee, and hearing disability in these circumstances becomes an obstacle to the arrival of verbal instructions to perform complex actions appropriately for the child at this early age stage, and this results in a noticeable decrease In the verbal test score. Many studies have contradicted in determining the effect of hearing loss on the mental abilities of the hearing-impaired. Some have referred to the effect of hearing loss on the general mental abilities of the child as according to Bolton (1978), and Al-Damiati (2002) confirms this, Where he indicated that ordinary students outperform their deaf peers of the same age group in mental development, while Youssef (2010) showed that it is scientifically proven that people with hearing disabilities are moderately distributed in relation to intelligence. And the reason for showing their mental retardation may be that most intelligence tests depend mainly on verbal language skills, and therefore these tests will not be able to show their true ability unless they are devoid of the verbal factor, as indicated by the results of Bond study (1987), which aimed to reveal that the performance of hearing-impaired children with the performance of normal children in the number of non-verbal cognitive skills. The study sample consisted of 40 hearing-impaired and non-hearing-impaired children their ages range from two and a half to five and a half years, McCarthy scale was used, The results showed that there were no significant differences between non-deaf and deaf children in the nonverbal cognitive tasks. The study of Moussa 1992 aimed to reveal the differences between the deaf and the non-deaf children in nonverbal intelligence , on a sample of 90 deaf children and 100 non-deaf children, a non-verbal intelligence test was used, and the results showed that there was no significant effect of the variable of hearing loss and gender on verbal intelligence. The results of (Howedy, 1994) study showed a comparison of the performance level of ordinary students on the non-verbal intelligence tests used in the study, whose ages ranged between (7-12). The results indicated that there are no statistically significant differences between deaf and non-deaf students in mental abilities.

1.1 *The effect of hearing loss on Mental Ability*

Hearing loss affects the mental activity of the hearing impaired in the following areas:

1.1.1 *Academic achievement*

Studies indicate that the general level of achievement of deaf students is maintained, and their performance on mathematical skills is better in academic tasks that require the use and employment of language.

In this regard, the results (Maatouk, 1999) (Abdul-Wahab, 2000) indicated that the hearing-impaired were 3-4 years behind their normal peers in all teaching courses.

1.1.2 *Memory*

The study of (Abdel Kafi, 2001) indicated that students with hearing disabilities suffer from a clear deficiency in the ability to abstract in linguistic aspects, and they are not able to process information, and this is due to the low linguistic development and lack of experience, because language plays an important role in activating latent mental abilities.

- **Acquisition of concepts**

Studies have shown that students with hearing disabilities acquire concepts in the same sequence and manner with ordinary students, but they face a problem in acquiring contradictory or similar concepts (Moore, 1996).

- **Information analysis**

The environment in which the hearing-impaired grows is what shapes and develops the information analysis strategy, and the communication method used by the handicapped affects the information analysis strategy (Moore, 1996).

1.2 *Study Questions*

The questions of study are to are:

1. Are there statistically significant differences between the performance averages of deaf and non-deaf people on the total score of the Raven Progressive Matrices scale?
2. Are there significant differences in performance averages of deaf and non-deaf people on the total score of the Raven Progressive Matrices scale due to the gender variable (male/female)?
3. Are there significant differences in performance averages of deaf and non-deaf people on the total score of the Raven Progressive Matrices scale due to the age?

2. **Methodology**

The study depend on comparative analytical approach is followed, which is consistent with our study, which depends on a set of procedures through data collection with measurement tools, analysis and comparison with the study sample.

2.1 *Study sample*

The study sample members were randomly selected from the central region in Jordan. Table No. (1) shows the study sample members.

Table 1: Distribution of the study sample

		Age		Gender		Total
		1	2	Male	female	
Category	normal	84	35	92	27	119
	deaf	97	91	113	75	188
Total		181	126	181	126	307

2.2 Study tool

The standardized Raven progression matrices were used on the Jordanian environment, The scale was codified on the Jordanian environment by (Alyan & Al-Smadi, 1989).

Scale description:

Colored Progressive Matrices : It is designed for children from 5 to 11 years old. This test consists of thirty-six items divided into three groups: (A, AB, B), Groups A and B are similar to those in the normal Raven test. As for group (AB), its difficulty ranges between the difficulty of groups (A, B), it is more difficult than the items of group (A), and less difficult than the items of group (B). This test was first published in 1947 and modified in 1956. This test can be used with ages from six to eleven years, with the mentally retarded, the elderly, and with people with disabilities that affect language achievement, such as the deaf (Rushton, , 2004).

2.3 The nature of the items that make up the Raven tests:

Looking at the items that make up the three Raven tests, it becomes clear that each item is a picture or a basic shape, part of its parts is deleted, and the examinee must select this part from among a group of six to eight alternatives located under the basic shape,

The forms that make up the items differ in terms of their content, as there are three patterns of them:

First pattern:

The basic shape contains one geometric design that fills all the area of the shape, a part is cut out and placed in six alternatives under the basic shape. This pattern represents the items of group (A) in both the standard and colored Raven tests.

Second pattern:

The basic shape contains four geometric designs that have a certain relationship on the horizontal and vertical level. One of these four designs was deleted and was placed among six alternatives under the basic shape. This pattern represents the items of group (B) in the standard Raven test, and items distributed on (Ab, B) in the colored Raven test.

Third pattern:

In which the basic shape contains nine geometric designs that have a certain relationship between them on the horizontal and vertical levels, and one of these nine designs was deleted and placed among eight alternatives under the basic shape, and this pattern represents the items of groups (c, d, e) in the standard Raven test. , and all sections of the Raven Advanced Test.

The examiner identifies the deleted part after determining the relationship between the set of geometric designs in the basic form, which requires a different type of response, including:

1. Completing a design or an incomplete space.
2. Completing similar or identical geometric designs.
3. Regular change in geometric designs.
4. Rearranging or changing the geometric design in a regular manner.
5. Analyzing geometric designs into parts on a regular basis and realize the relationship between them

2.4 Validity of scale

The scale was applied to an pilot study of (50) male and female students, (30) normal and (20) deaf. The validity indications were verified by constructing the validity correlation with the dimension, and the stability was verified by the internal consistency method, Cronbach's alpha equation.

To verify the Indications of the validity of the scale, it was verified in several ways:

2.4.1 Construct Validity:

By calculating the correlation coefficients between the item and the total score , on the study sample members (n = 312). Table No. (2) shows the correlation coefficients between the item and the dimension

Table 2: Correlation coefficients between the item and the total score on the Raven Mental Abilities Scale

No.	correlation coefficient	Item	correlation coefficient	Item	correlation coefficient	Item	correlation coefficient
1	0.81	10	0.86	19	0.89	28	0.80
2	0.82	11	0.83	20	0.84	29	0.84
3	0.86	12	0.81	21	0.71	30	0.81
4	0.87	13	0.85	22	0.78	31	0.84
5	0.88	14	0.75	23	0.83	32	0.73
6	0.86	15	0.72	24	0.84	33	0.74
7	0.71	16	0.70	25	0.64	34	0.65
8	0.78	17	0.73	26	0.65	35	0.61
9	0.79	18	0.69	27	0.69	36	0.70

Table (2) shows the correlation coefficients between the item and total score of the Raven Mental Abilities Scale. The results indicate that the scale has an acceptable degree of validity, as the correlation coefficient ranged between (0.61 - 0.89).

2.4.2 Scale stability indications

The indications of the scale's stability were verified through the two methods of internal consistency using the Kurd Richardson equation - 20 and the application and re-application, as the test was re-applied to the members of the exploratory sample.

Table 3: Indicates the stability coefficients of the two methods on the total score

Stability method	internal consistency (Kurd Richardson- 20)	stability by repetition
correlation coefficient	0.92	0.89

The stability results indicate that the scale has acceptable indications, as the reliability coefficient of the Cronbach method reached (0.92), While the stability by repetition (0.89).

2.5 Data collection

1. Verification of the significance and validity of the scale through the exploratory sample.
2. Applying the scale to a sample of ordinary students and explaining how to answer on the answer page.

3. Deaf students' teachers have been asked to translate the instructions for applying the scale into sign language.
4. Data were recorded and results extracted

3. Results

1. Are there statistically significant differences between the performance averages of deaf and non-deaf people on the total score of the Raven Progressive Matrices scale?

The arithmetic means, standard deviations, and t-values were calculated to indicate the differences in the mean between the sample of non-deaf and deaf students.

Table 4: Shows the means, standard deviations, and the results of the t-test.

Category	N	Mean	Std. Deviation	Std. Error Mean	F	Sig
Normal	119	28.9160	4.73462	.43402	78.95	0.00
Deaf	188	19.6702	8.87692	.64742		

Means, standard deviations and coefficient values (T) for the differences between the means on the group variable (non-deaf / deaf)

It is noted from Table No. (4) that the average performance of non-deaf students is higher than the deaf students, with a difference of (9) degrees in favor of the non-deaf students, as the average of the deaf students reached (19.67) while the non-deaf students (28.91), The results also indicated that there were significant differences between of deaf and non-deaf students in their performance of scale. This can be explained by the fact that students with hearing disabilities suffer a deficiency in the ability to abstract in linguistic aspects, and they are not able to process information, and this is due to the low linguistic development and lack of experience, The weakness in acquiring concepts is reason for the low performance on mental ability tests, as they face a problem in acquiring contradictory or similar concepts, and this can explained by the ability of children to analyze information as the method of communication used by the deaf affects the strategy of information analysis.

Second question:

Are there statistically significant differences between the performance averages of deaf and non-deaf people on the total score of the Raven Progressive Matrices scale due to the gender variable (male/female)?

Table 5: Arithmetic means, standard deviations and coefficient values (t) for the differences between the means on the gender variable (male/female).

Category	Gender	Mean	Std. Error	F	Sig
				4.83	0.02
Non Deaf	Male	31.097	1.54		
	Female	30.7037	1.44		
Deaf	Male	19.89381	0.706604		
	Female	19.33333	0.86733		

It is noted from Table No. (5) that the average performance of males is higher than females. The average performance of non-deaf males was (31.5) while non-deaf females (30.70), as for the deaf sample, the averages were very close, as the arithmetic mean reached (19), which indicates that there are no significant differences between the performance of the deaf due to the gender variable.

Third question:

Are there statistically significant differences between the performance averages of deaf and non-deaf people on the total score of the Raven Progressive Matrices scale due to the variable age group (7-9 and age group 9-11)?

Table 6: Arithmetic means , standard deviations, and coefficients (t) values for the differences between the means on the age group variable.

Age	N	Mean	Std. Deviation	Std. Error Mean	F	sig
7 - 9	181	22.2707	9.49612	.70584	17.49	0.00
9 - 11	126	24.6667	7.45761	.66438		

It is noticed from the table (6) that the average age group (7-9) reached (22.2), while the averages are higher for the age group (9-11) (24.6).

Table 7: Means & STDs of Sample according to age.

Category	Age	Mean	Std. Deviation	F	Sig
Non deaf	7 - 9	60.28	5.19	17.49	0.00
	10 - 11	02.29	3.45		
	Total	28.92	4.73		
Deaf	7 - 9	16.40	8.41		
	10 - 11	23.15	8.03		
	Total	19.67	8.88		
Total	7 - 9	22.27	9.50		
	10 - 11	24.67	7.46		
	Total	23.25	8.78		

It is noted from Table No. (7) that the averages increase with age, as the average of non-deaf students for the age group (7-9) reached (28.60), while for the age group (10-11) was (29.20), while for the deaf students, the arithmetic mean of performance was (16.40). As for the age group (10-11) (23.15), The results show differences between the averages also show that there are significant differences for the age group variable in favor of the higher group, and this can be explained by the fact that mental development develops with age, This age period is considered the peak of human mental development, and it develops naturally with deaf and non-deaf people, but the results indicate differences in the average between them, and this is due to the deficiency of deaf people in processing information.

4. Recommendations and Conclusion

Conducting more studies comparing the mental performance of the deaf with the non-deaf on other tests such as the Binet test in its fifth edition, It is also necessary to direct teachers to train deaf people and enrich their experiences to improve their ability to process information, and the current study recommends the standardization of the Raven scale on the deaf Conducting more studies comparing the mental performance of the deaf with that of the non-deaf on other tests such as the Binet test in its fifth version, and it is also necessary to guide teachers to train the deaf and enrich their experiences to improve their ability to process information The current study recommends standardization of the Raven Scale for the deaf Here, it is necessary to intensify the efforts of teachers to develop the mental abilities of deaf children through sign language and sensory methods that help the deaf to acquire more language and terminology to complement their experiences. It is possible

for teachers to teach deaf students the synonyms of the word to increase their linguistic stock, because studies indicate the correlation relationships between language development and their intelligence abilities. The improvement in language ability is positively reflected on intelligence. Conducting more studies comparing the mental performance of the deaf with the non-deaf on other tests such as the Binet test in its fifth edition, It is also necessary to direct teachers to train deaf people and enrich their experiences to improve their ability to process information, and the current study recommends the standardization of the Raven scale on the deaf Conducting more studies comparing the mental performance of the deaf with that of the non-deaf on other tests such as the Binet test in its fifth version, and it is also necessary to guide teachers to train the deaf and enrich their experiences to improve their ability to process information The current study recommends standardization of the Raven Scale for the deaf Here, it is necessary to intensify the efforts of teachers to develop the mental abilities of deaf children through sign language and sensory methods that help the deaf to acquire more language and terminology to complement their experiences. It is possible for teachers to teach deaf students the synonyms of the word to increase their linguistic stock, because studies indicate the correlation relationships between language development and their intelligence abilities. The improvement in language ability is positively reflected on intelligence.

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