Original Article

Multiple Intelligences Profiles of Children with Attention Deficit and Hyperactivity Disorder in Comparison with Nonattention Deficit and Hyperactivity Disorder

Mostafa Najafi, Shahla Akouchekian, Alireza Ghaderi, Behzad Mahaki[1], Mariam Rezaei[2]

From the Behavioral Sciences Research Center, Isfahan University of Medical Sciences, [1]Department of Biostatistics, Isfahan University of Medical Sciences, [2]Psychologist, Child and Adolescent Mental Health Clinics, Isfahan University of Medical Sciences, Isfahan, Iran

Abstract

Background: Attention deficit and hyperactivity disorder (ADHD) is a common psychological problem during childhood. This study aimed to evaluate multiple intelligences profiles of children with ADHD in comparison with non-ADHD. **Materials and Methods:** This cross-sectional descriptive analytical study was done on 50 children of 6–13 years old in two groups of with and without ADHD. Children with ADHD were referred to Clinics of Child and Adolescent Psychiatry, Isfahan University of Medical Sciences, in 2014. Samples were selected based on clinical interview (based on Diagnostic and Statistical Manual of Mental Disorders IV and parent–teacher strengths and difficulties questionnaire), which was done by psychiatrist and psychologist. Raven intelligence quotient (IQ) test was used, and the findings were compared to the results of multiple intelligences test. Data analysis was done using a multivariate analysis of covariance using SPSS20 software. **Results:** Comparing the profiles of multiple intelligence among two groups, there are more kinds of multiple intelligences in control group than ADHD group, a difference which has been more significant in logical, interpersonal, and intrapersonal intelligence ($P < 0.05$). There was no significant difference with the other kinds of multiple intelligences in two groups ($P > 0.05$). The IQ average score in the control group and ADHD group was 102.42 ± 16.26 and 96.72 ± 16.06, respectively, that reveals the negative effect of ADHD on IQ average value. There was an insignificance relationship between linguistic and naturalist intelligence ($P > 0.05$). However, in other kinds of multiple intelligences, direct and significant relationships were observed ($P < 0.05$). **Conclusions:** Since the levels of IQ (Raven test) and MI in control group were more significant than ADHD group, ADHD is likely to be associated with logical-mathematical, interpersonal, and intrapersonal profiles.

Keywords: *Attention deficit and hyperactivity disorder, intelligence quotient, multiple intelligences profiles*

Introduction

Attention deficit and hyperactivity disorder (ADHD) has been found as common psychological problem during childhood.[1] This problem is reported in 5% of 4–17-year-old children in general population, which is revealed to be 2–9 times more common in boys than girls,[2] and it is reported 5.5%–8.4% among population in Iran. Clinical signs of disease in adults are approximately 1%. ADHD includes developmental disorders in attention, impulse control, restlessness, and directed behavior, which is caused naturally and not as a result of major cognitive, sensory, or emotional disorders.[3] Attention refers to a series of complex mental operations including focus or involvement toward target, tolerance of being alert for a long time, coding stimuli characteristics and shifts the focus from one target to another. It is also considered as a basic problem in socioemotional domains.[4,5]

About 30%–70% of children with ADHD also showed the symptoms of disorder in adulthood.[6] The age for initiation of such disorder is about 3,[7] which is common at early years of school. In adolescents, it is continued as 50%–80% and can reach to 30%–50% in adulthood.[4] The disorder is usually associated with symptoms such as no frustration tolerance, irritability, and mood instability, rejection by peers, and acquaintances backlash.[7]

The disorder is considered as an issue for psychiatrists, psychologists, parents, and teachers because behavioral characteristics of these children including inability to

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Address for correspondence:
Dr. Alireza Ghaderi, Behavioral Sciences Research center, Isfahan University of Medical Sciences, Isfahan, Iran. E-mail: alighaderi1348@gmail.com

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control motor behavior, attention deficit, impaired memory and thinking, learning disabilities, emotional instability, aggression, academic problems, and arousal and motor restlessness can seriously damage the child's development process, mental talents, and emotional-social skills. During the last few years, scientists have been seeking for theories to explain the disorder appropriately.[6-8] One of the concerns about ADHD is that why the affected children are not able to reach to the expected intelligence level? Most children with ADHD pose at least natural intelligence and even many of them are talented. Their problem is not only lack of intelligence but also in using their intelligence in the routine life. However, there is a significant negative correlation between intelligence and hyperactivity-impulsivity behavior that smarter children showed fewer symptoms.[9]

Some studies considered intelligence as a single unity and some others considered it with various components and categories.[10] Since the concept of intelligence was transferred to the society and relationship between individuals, objects or other issues from laboratory studies and puzzle tests and paper, such concepts as "social intelligence", "interpersonal intelligence," and "emotional intelligence," have attracted the attention of scientists. Intelligences based on its traditional definition have been considered as the major factor of success and academic achievement for a long time.

Francis Galton was one of the first scientists addressed the individual differences academically and used statistical methods such as correlation in measurement of mental characteristics.[10] Traditional intelligence tests make us enable to measure verbal ability, relationships between verbal concepts and mathematical-logical thinking, and not the skills such as new information analysis, new problem solving, creativity, and critical thinking. In addition, they do not provide much insight on human potential development scope.[10] The theory of multiple intelligences was firstly introduced by Howard Gardner in 1983 that changed the traditional view of intelligence and mental abilities in the field of education and cognitive sciences and significantly affected the educational procedures and training programs.[11]

Given the large number of ADHD patients with educational and social problems, it appears that many aspects of their powerful intelligence are not observed and their weak intelligence aspects are usually considered in schools and family. Thus, by justifying parents and teachers for early and timely discovery of weak intelligence aspects of these children and proper planning for their improvement, it is possible to bring them back to the normal intelligence level of their peers. By discovering their stronger intelligence aspects, it is also feasible to recommend programs to parents for increasing intelligence aspects and to specify their future field.[12,13] Moreover, self-confidence can be increased, and disorders such as coping behaviors and conduct disorder may also be prevented. Hence, this study aimed to evaluate multiple intelligences profiles of children with ADHD in comparison with non-ADHD.

Materials and Methods

In this cross-sectional descriptive analytical study, we applied a convenient regular sampling method, and the statistical population were selected from 6 to 13-year-old children suffering ADHD referring to Subspecialty Clinics of Child and Adolescent Psychiatry, Isfahan University of Medical Sciences that have not been received any medical treatment between August and December 2014. Sample size was specified as 50 in each group considering confidence level 0.95 and test power 0.8. It was specified using normal distribution table as 1.96 and 0.84.

Patients entered into the study and inclusion and exclusion criteria were specified by the assistant psychiatrist and psychologist using clinical interview (based on Diagnostic and Statistical Manual of Mental Disorders IV and parent–teacher strengths and difficulties questionnaire [SDQ] questionnaire). The patients with these criteria were included: the lack of ADHD, aged 6–13 years, and willing to participate in research. The patients with mental retardation, association with other disorders such as learning disorders, depression, severe language delay, deafness, blindness, low vision, autism, childhood psychosis, and the age below 6 years and more than 13 years were excluded from the study. The exclusion criteria were: (1) The individuals who refused to fill the questionnaire (2) The individuals who changed their mind and refused to continue while they were filling the questionnaire.

The control group was selected from 50 healthy children with no ADHD from two different primary schools in North and South of Isfahan. Then, the scale for measurement of multiple intelligences were thought to parents and teachers in the separate training sessions by the assistance of psychiatrists and the questionnaire were completed in their presence. Finally, a Raven test was applied by assistance of a psychiatrist, and the findings of this test are compared to the results of multiple intelligences test.

An initial questionnaire was completed with presence of the plan assistant in specialty clinics of child and adolescent psychiatry for 6–13-year old children with initial diagnosis of ADHD by the child and adolescent psychiatrist. The questionnaire included following items: name, age, level of education, grade of education, number of children, history of psychiatric disorders, and physical, social, and economic problems. According to the ethical principles, the goal of the plan and all the stages of the project were explained to the patients.

The methods used in this study includes: (i) Raven intelligence quotient (IQ) test. This test is one of the nonverbal intelligence tests. Currently, three forms of this

test are available for measuring intelligence of individuals at all levels of ability from 5-year-old children to adults. Normalization of this test was done in Islamic Azad University Khorasgan Branch, and its results showed reliability and validity of the test as 0.91 and 0.73, respectively. In this test, the number of correct answers of the subject is calculated. Then, IQ is achieved based on leveled scores. The score below 70 or two SD below average denotes to mental retardation, score between 90 and 110 denotes to the average IQ, and score above 130 or with two SD above average denotes to smart.[14] Demographic questionnaire included age, gender, educational grade, educational level and occupation of parents, number of children, and students in family. Multiple intelligences scale identified and estimated eight intelligence categories including linguistic, logical-mathematical, spatial, physical, interpersonal, intrapersonal, musical, and naturalistic intelligence. Validity of this scale was reported as acceptable using factor analysis. Coefficients of reliability for intelligence categories were reported from 0.67 to 0.89 using Cronbach's alpha,[15] SDQ, which includes two questionnaires for parents and teachers with 25 items. Each item provides scores between 0 and 2 including the options such as true, somehow true, a little true, and surely true. Each option is scored between 0 and 2. However, for items 7, 11, 14, 21, and 25, it is vice versa. That is, 2, 1, and 0 for not true, a little true, and surely true. In this questionnaire, we had five different scale such as (each scale with 5 items), a) emotional symptoms (items 3, 8, 13, 16, and 24), b) behavioral problems (items 5, 7, 12, 18, and 22), c) hyperactivity (items 2, 10, 15, 21 and 25), d) problem with peers (items 6, 11, 14, 19 and 23), and e) social scale (items 1, 4, 9, 17, and 20). Sum of first four scales gives general problems, which is scored between 0 and 40. Data analysis was done using a multivariate analysis of covariance (MANCOVA) using SPSS version 20 software (Chicago, IL 60604).

Results

At first, two groups were compared according to their demographic variables [Table 1]. Then, using Chi-square test and *t*-test, sex of children and the education of mother and the age and the number of family's members were compared. As it can be seen in Table 1, a significant difference among all these variables ($P < 0.05$).

Due to correlation between profiles of multiple intelligences, the profiles in ADHD and control groups were compared using MANCOVA. In comparisons, role of age, gender, mother education, and number of family member variables were balanced. The results suggested a significant difference among two groups in terms of general status of profiles of multiple intelligences. The individual profiles of multiple intelligences also varied significantly for interpersonal, logical-mathematical, intellectual, and internal intellectual among two groups ($P = 0.002$, 0.040, and 0.019, respectively). However, it was not seen any significant difference on the other kinds of multiple intelligences between these two groups ($P > 0.05$) [Table 2].

On the other side, according to the IQ (Raven) score analysis, it was observed that IQ average score of control group, 102.42 ± 16.26, was more than this score in ADHD group, 96.72 ± 16.06. However, this difference was not statistically significance ($P = 0.072$).

The relation analysis among kinds of multiple intelligences in Group 1 showed that there is a weak and nonsignificance relationship between verbal and naturalist intelligence ($P > 0.05$), but in other kinds of multiple intelligences, there were direct and significant relations ($P < 0.05$). On the other hand, different profiles interact with each other so that it can be said increasing in one kind of multiple intelligence causes increase in other kinds too. Maximum relations relate, respectively, to the relation between "spatial" intelligence with "mathematical" and "kinesthetic/physical" intelligence with 0.705 and 0.70. In contrast, for Group 2, there is a weak and nonsignificant relation between naturalist intelligence and intelligences of verbal, mathematical, kinesthetic/physical, spatial, interpersonal, and intrapersonal ($P > 0.05$). In other words, there is a significant and direct relation just between spatial intelligence and "musical intelligence." Moreover, multiple intelligences showed direct and significance relations with

Table 1: Demographic variables of the two groups

Variable	Group	Frequency (%)	*P*
Sex (Boy)	ADHD	13 (26)	<0.001
	Control	34 (68)	
Mother educational level (Under diploma)	ADHD	20 (40)	0.004
	Control	5 (10)	
Age (Mean±SD)	ADHD	8.68±1.93	<0.001
	Control	9.85±1.21	
Family number (Mean±SD)	ADHD	3.85±0.81	0.015
	Control	4.19±0.59	

Table 2: Results of multivariate analysis of covariance test for comparing multiple intelligence profiles in two groups of attention deficit and hyperactivity disorder and control

Multiple intelligence profiles	Mean±SD		*F*	*P*
	ADHD	Control		
Lingual intellectual	36.2±14.19	39.5±7.66	0.061	0.805
logical-mathematical Intellectual	34.41±9.15	40.85±5.69	10.584	0.002
Spatial intellectual	34.8±7.51	38.83±5.91	2.276	0.135
Physical intellectual	39.35±7.12	39.4±6.9	0.002	0.961
Musical intellectual	34.35±8.64	36.58±8.97	0.773	0.381
Interpersonal intellectual	34.37±8.72	39.58±7.74	4.332	0.040
Internal intellectual	33.35±8.3	39.25±5.86	5.655	0.019
Natural intellectual	38±8.76	38.92±6.12	0.080	0.778

ADHD: Attention deficit and hyperactivity disorder, SD: Standard deviation

each other ($P < 0.05$) so that maximum relations relate to the relation between spatial and musical intelligence ($P = 0.621$) and the relation between interpersonal and verbal intelligence ($P = 0.653$). Finally, it should be said that IQ does not interact directly and significantly with multiple intelligences ($P > 0.05$) [Table 3].

Discussion

ADHD typically presents during childhood and is characterized by persistent pattern of inattention and hyperactivity/impulsivity. The present study was conducted on a sample consists of 50 children (aged 6–13 years) referred to Subspecialty Clinics of Child and Adolescent Psychiatry in Isfahan, Iran.

The results revealed that the factors such as sex, mother educational level, and age should be considered and adjusted in comparison with multiple intelligences profiles; regarding the high number of profiles and the effects of confounder variables on the results, comparison between the both groups with larger sample size would make it possible to control the role of these kinds of variables. Further, the finding in some cases varied depending on the intellectual ability or gender that rise concerns regarding the extent to which developmental and cultural contexts as well as gender should be considered in the diagnostic process. These findings may explain the equivocal findings across studies and highlight the need for further research to examine the gender differences and limited (or helping) effects of cognitive ability in the manifestation of ADHD in varying contexts.[16]

The current study showed that there was no significant relationship between Raven IQ scores in the study group (with ADHD) and control group (healthy children). Furthermore, there was no significant relationship between IQ score and each component of multiple intelligences in healthy and unhealthy children. Given the components of multiple intelligences, there was a significant relationship between the interpersonal, intragroup, mathematical, and logical-mathematical intelligence components of the groups implying that only the IQ value is not an accurate and proper measure for the implementation of educational practices and realization of individual talent. In children with ADHD, the lack of attention to stronger components of multiple intelligences can cause a negative impact on teaching and learning as well as adverse effects on their lives and future. In children, with an emphasis on ways of improving intelligence in interpersonal, logical, and intrapersonal relationships, there is the possibility of remission of symptoms related to other problems because according to numerous studies, there is a direct relationship between the components of multiple intelligences, and improving one component advances other components.

In fact, the ability to observe the world with care and recreation and transformation of aspects of it (spatial intelligence) can interact directly with subtle skills in clever use of the body to manipulate objects and the ability to manipulate a series of arguments and recognize patterns and classes. Evaluating the role of space intelligence predictability may be remarkable in increasing other aspects of multiple intelligences profile, and future research is needed to investigate this relationship. These results are compatible with the results obtained by Benjasu *et al*., who found students with ADHD had lower score on intellectual than the group without ADHD, and they are at risk for academic and behavior problems.[17]

In conclusion, students can learn when they are trained according to the type of intelligence.[18] It should be particularly considered in children with ADHD, 42% of

Table 3: Results of Pearson correlation coefficient for analyzing correlation among different multiple intelligence profiles and also with intelligence quotients Revan score in each group

Group	Profile	IQ	Lingual	Logical	Spatial	Physical	Musical	Interpersonal	Internal
Group 1	Lingual	−0.236							
	Logical	0.256	0.480**						
	Spatial	0.029	0.503**	0.705**					
	Physical	−0.100	0.421**	0.558**	0.707**				
	Musical	−0.207	0.528**	0.547**	0.699**	0.687**			
	Interpersonal	−0.007	0.560**	0.584**	0.597**	0.456**	0.589**		
	Internal	0.038	0.400**	0.540**	0.679**	0.497**	0.621**	0.670**	
	Natural	−0.066	0.238	0.469**	0.584**	0.521**	0.566**	0.467**	0.446**
Group 2	Lingual	−0.050							
	Logical	0.209	0.542**						
	Spatial	0.119	0.566**	0.559**					
	Physical	0.008	0.295*	0.361**	0.559**				
	Musical	−0.131	0.470**	0.318*	0.621**	0.606**			
	Interpersonal	0.08	0.597**	0.542**	0.579**	0.430**	0.517**		
	Internal	0.025	0.653**	0.508**	0.542**	0.305*	0.510**	0.614**	
	Natural	0.063	−0.007	0.054	0.268	0.226	0.306*	0.152	0.177

*Significant level <0.05, **Significant level <0.001. IQ: Intelligence quotients

them facing family, and training problems experience lower self-esteem, school dropout, addiction, unemployment, delinquency, and prison. Inspired by the concept of diversity and the fact that people have different intelligence profiles, innovative training methods can be created developed during the course development.[19]

The most common and important application of the theory of Gardner is focusing on one of the complex aspects of human beings and difference between human beings. Although differences in intelligence have been present in the light of the traditional readings of the human potentiality, the dimensions of difference and diversity as reflected in the theory of multiple intelligences were not recognized, and second, because of the lack of understanding of this aspect of human existence, its effectiveness domain was considered very limited on education.[20]

Therefore, one of the most beneficial achievements in the theory of multiple intelligences in the area of education is enlightenment and the creation of vision in the scope and implications of the phenomenon of individual differences, especially in children with ADHD. The more important objective has to be looked for behind this specific theory and in this critical thinking that those involved in education and training systems, to better perform their critical responsibilities, must repair their mentality and understanding of the concept of human talent.[21]

In other words, recognizing the diversity of or multiple intelligences, whether crystallized in the form of Gardner's theory or otherwise can be the basis for an appropriate theory, to be given to administrators, for contemplation on amendment of the education of children with ADHD; in light of this, developing and directing talents of this group of children can be effectively implemented in a more comprehensive, equitable, realistic, and effective manner.[22]

The main question that education systems are faced with is that which understanding of human intelligence may be applied as the guide to curriculum and training programs. Thus, from the standpoint of multiple intelligences, it should be maintained that unfortunately incomplete and limited implication of the concept, nature, and range of human intelligence inspires and guides most training programs in most education systems.[23]

It is worth mentioning that different categories of students in the field of intelligence do not mean that they should be kept at the determined levels, specific of their intelligence areas. Every person can improve his IQ level as long as enjoying adequate training. Coordinating courses with students' needs and preferences, learning is optimized. When teachers coordinate their lessons with a variety of intelligences, students' scores improve.[24]

Students with ADHD, having limitations in specific intelligences, which are the cause of their lack of success, can bypass these obstacles through the use of methods that can lead to their developed intelligence aspects. In other words, ADHD has a significant impact on mathematical, interpersonal, and intrapersonal intelligence of children.[25]

The results of a study by Van Niekerk showed that in terms of self-rating of intellectual ability, there is no important dependence between group (ADHD and non-ADHD) ratings of intellectual ability and the different scales of the Multiple Intelligence Developmental Assessment Scale-KIDS. However, a visible relationship existed between group ratings and the linguistic and intrapersonal scales, where the non-ADHD group rated their abilities higher on the linguistic and interpersonal scales than the ADHD group rated their own. Conversely, it can be observed that the ADHD group rated their linguistic and intrapersonal abilities lower than the non-ADHD group rated their own which is similar to our results regarding interpersonal profile.[16]

Children with ADHD are often poor learners that can be attributed to their inattentiveness and inability to attention to details. They are often not visually aware of patterns in words, and they often make careless mistakes in their spelling and writing which is difficult to read and understand.[26]

As long as ADHD disorder is not treated in the society, it may lead to increasing the some other disorders such as coping behavior, conduct disorder, and vulnerability of children for accepting mental and social harms in adulthood.[27] Due to the lack of attention to the targeted activities and the need of being focused and impulsive as well as the paucity of self-confidence, the ADHD children usually showed the lower function compared to the healthy children. Considering large number of ADHD patients with educational and social problems, it seems that many aspects of their powerful intelligence are not observed and their weak intelligence aspects are usually considered in schools and family. Thus, by justifying parents and teachers for early and timely discovery of weak intelligence aspects of these children and proper planning for their improvement, it is possible to bring them back to the normal intelligence level of their peers. By discovering their stronger intelligence aspects, it is also feasible to recommend programs to parents for increasing intelligence aspects and to specify their future field.[28] Moreover, self-confidence can be increased, and disorders such as coping behaviors and conduct disorder may also be prevented.

It was found by Gani that ADHD children have lower intelligences in these areas, i.e., naturalistic, musical, spatial-visual, logical-mathematical, interpersonal, and intrapersonal intelligences than linguistic and bodily kinesthetic. The results of this study are according to the obtained results of the present study in these three profiles: logical-mathematical, interpersonal, and intrapersonal intelligences.[28]

Using subjective multiple questionnaires to measure intelligences may be noted as the limitations of the current research, and currently, there is not an objective questionnaire for this purpose. Moreover, the results of the test should be considered separately for two gender groups, implying the need for further researches. Given the high prevalence of ADHD, the need to repeat the study with a larger sample and in both genders is felt to report and generalize results with greater certainty. Implications or practical applications of multiple intelligences theory are not limited to the presented issues in this article, and on the basis of knowledge and awareness, innovative practices of teachers, educators, and planners are expected.

Importantly, it should be noted that in terms of performance in the field of monitoring efforts to diversify programs and activities in the educational system is providing an environment that breeds field for all kinds of intelligence based on the limited resources of the school that may seem difficult and perhaps impossible. Hence, what is expected of educational institutions is to manage using the potential and actual educational resources of the community, and especially the local community in which there is a special place for outside the school learning opportunities and calling on all the opportunities in the community, schools are more likely to develop the capability to adapt to a variety of students with ADHD and learning environments. The use of new technology places a rare capacity and potential in service of educational systems to extend information and communication and develop and diversify learning methods tailored to different types of intelligence which must be used wisely.

Conclusions

We demonstrate that the levels of IQ and MI in control group were higher than ADHD group as we can say that ADHD is associated with logical-mathematical, interpersonal, and intrapersonal profiles. There was no significant relation with IQ level and MI profiles in any studied groups, but almost all of the profiles had interaction with each other which was stronger between spatial with logical-mathematical and physical profiles in normal group and in ADHD group between spatial with musical and interpersonal with linguistic profile.

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Conflicts of interest

There are no conflicts of interest.

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