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Journal of Educational and Management Studies
J. Educ. Manage. Stud., (1)1: 08-15, 2011
JEMS

# The Effectiveness of Rhythmic Movement Games on Attention in Children with Mental Retardation

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**ABSTRACT:** Children afflicted by intellectual disabilities are the neediest groups deserving to receive such services as games. The importance of games as an intervention (mediator) is significant since research has revealed the effect of games on cognitive, social, emotional and language development, the development of motor skills, creativity and problem solving. This study was to Efficacy of rhythmic play's (dancing) on mentally retarded children's Attention problems in Children at the age group of 9 to 16. The experimental method used in the study from the pretest - posttest control group. For these purpose 20 children with Mentally Retardation that were selected using multistage random cluster sampling (each group consists of 10 children). The researcher gave rhythmically bodily movements (dancing) as an intervening program to experimental (case) group twice a week (45 minutes for each session) for three months. The instrument of this research included Canners neuropsychological test of NEPSY, Raven Colored progressive matrixes for children and Vinland adaptive behavior scale questionnaire. Data was analyzed by Multivariate. The results from the present study showed that rhythmic exercises affected the attention problems on scales of their attention function (focus of attention, constant attention, shift of attention, divided attention and attention span) impartially mental Retardation children who were teachable.
**Keywords:** attention, mental retardation, rhythmic game.

ORIGINAL ARTICLE

## INTRODUCTION

According to internationally different statistical data provided by many studies, approximately 2.5% to 3% out of total population of children and students who are at the school age suffering significantly from intellectually developmental disorders (Carr et al, 2007; Fryers, 2006; Louhiala, 2004). As a result, they are incapable of using normal educational programs. Today, the differences between mentally retarded children and their normal peers have just been confirmed. Mental retardation is a functional interaction between an individual and the environment where s/he lives in rather than a static description which is rooted in an individual's limitations (Kaplan & Sadock, 2007). While intellectual disorder may be interpreted as a lower level of cognitive capacity, intelligence tests provide us with an overall measurement of cognitive capacity in this case. Besides, the intellectual disorders can be diagnosed as having deficits in cognitive abilities such as memory, attention span and learning (Kakavand, 2006). Results from research carried out on many children with mental retardation suggest that major problems in different areas including attention, memory, behavioral control, learning and etc. have been found amongst these children (Halahan & Kaufman, 2006).

Attention is a set of intellectually complex process incorporating focus on or involvement in a goal, retaining or enduring and being vigilant for a very long time, encoding characteristics of a stimulus and shifting the attention from one goal to another one(Sidman,2006). It is problematic to determine the components of attention: First, attention is usually measured in association with some other activities which are difficult to measure. Second, several parts of the brain play role in attention processing (Mirsky, 1996). However, theoretical principle grouped components of attention into alignment of the excitement and care, selective attention, constant attention, attention span or divided attention, inhibition and behavioral control (Mirsky, 1996; Valera & Seidman, 2006 and Meltzer, 2007).Close and careful attention represents the ability an individual possess to direct his/her attention towards a certain stimulus while constant attention indicates the capability of a person to hold his/her attention during a repetitive and continuous activity. Selective attention is the ability to

To cite this paper: Taghi Pour Javan A, Faramarzi S, Hassan Nattaj F and Sabetimani M. 2011. The Effectiveness of Rhythmic Movement Games on Attention in Children with Mental Retardation. *J. Educ. Manage. Stud.,* 1(1): 08-15.

focus on target stimuli and stop producing response to none target stimuli. On the other hand, the ability to redirect the attention from one stimulus to another one is the indicative of the shift (substitution) of attention. Moreover, by studying the divided attention, we can obtain useful information about individuals' processing limitations as well as their attention mechanisms and abilities (Eysenck & Keane, 2002).

One of the most prevalent problems amongst students studying at schools is the lack of attention which reduces their effectiveness in their schools' work. Bergen & Mosel (Bergen & Mosley, 1994) studied attention process and its change among normal and mentally retarded people (based on Stroop test). They concluded that mentally retarded individuals are more likely to be affected by this test and make more mistakes when it comes to shifting their attention that requires unconscious skill in their abilities so that they are able to give correct answers as compared to their normal counterparts. Several well-known scholars, based on the basic research and formulations by Zeaman&Hause (1963), claimed that individuals' most cognitive problems can be attributed to the lack of attention. Kazemi and Abedi (2001) investigated the efficacy of aerobic activities on performance function and attention in the children with neuropsychological learning problems. Their findings showed that to teach the aerobic movements to children with neuropsychological learning problems has an effect on improving their performance functions and attention. Brown (1967), with the aim of studying the effect of isometric movements and exercises on mentally handicapped children, categorized randomly 40 boys at the age of 12 into two groups - one was control group and the other was experimental group. A special program has been carried out on two groups for six weeks. He assumed that sporting activities and bodily games can improve mentally disabled children's mental requirements and necessities through intervening in their attention, memory and process reasoning as well as the control of their behavior and movements. Yukeslen et al (2008) examined the effect of physical exercises on mentally disabled children's motor skills. 12 children ranging in age from 3 to 6 have participated in 26 practice sessions. The results from their survey indicated that there was a meaningful difference between balancing, running, jumping in pre-test and post-test in the participants. Consequently, their findings support the positive effect of practice for basic motor skills in developing mentally disabled children's bodily movements.

In an attempt to find the most effective way, a great variety of researches have investigated the efficiency of alternative methods (Farmer & et al, 2002) and among them, game has seemed, with the evidence proving its effectiveness, to be a way of treating a wide range of disorders and problems offered by different researchers and psychologists during several decades (Bratton& et al, 2005). Some experts have examined games for their effectiveness on different aspects of social life while some other researchers looked at their efficacy on emotional development. Several scholars tried to investigate how effective a game can be on mental and physical as well as cognitive development in children. By the same token, a number of investigators have studied the effectiveness of aerobic exercises and rhythmically bodily movements on children's performance function, attention and memory, especially children with developmental and neuropsychological disabilities. But one aspect which has hardly caught researchers' interest is the balanced movements (rhythmic exercises) that are presented to children with mental disabilities in the form of a game.

Children afflicted by intellectual disabilities are the neediest groups deserving to receive such services as games. The importance of games as an intervention (mediator)is significant since research has revealed the effect of games on cognitive, social, emotional and language development, the development of motor skills, creativity and problem solving (Hamm, 2006). It is of highly significant to consider this certain attribute, i.e. the suitable use of good chances of and opportunities for playing a game in order to convey educational messages, expand cognitive acts, develop motor skills, deepen social responsibility and control behaviors. Not only does a game have an effect on the development of cognitive abilities among children but it also affects the physiological structure of their brain (Campbell, 2008; Papalia & Olds, 1992, and Zigler, 1998). Rhythm, especially in the form of music and games, plays an important role as a part of different cultures and human education (Michalowski & Kozima, 2007). Today, particular scientific studies have demonstrated the effect of games and rhythmic exercises (Kenya & Masal, 2004). Besides, to play such games in a group and in the form of rhythmically pre-determined movements (dancing) can strengthen group behaviors and control mentally disordered children's behaviors too (Kazemi & Abedi , 2001).

## MATERIALS AND METHODS

The research method used in this study was an experimental type and had a pre- test and post- test design accompanied by a control group. Statistical population of the research comprised all mentally retarded students studying in elementary schools in the city of Esfahan in the academic year 2011-2012. To collect the required sample, 20 children with mental impairment were selected based on random multi- step sampling. That is, two special schools among five educational districts were chosen through. Moreover, 10 students, homogeneous in sensory and motor skills, were selected amongst all mentally disordered students as a sample. Participants in this sample were divided into two groups- control and experimental- and each group was randomly consisted of 10 students. To collect data, Raven IQ test, Vinland adaptive behavior scale questionnaire, Canners neuropsychological test were used. Replication was applied to the given sample based on Raven IQ test, Vinland adaptive behavior scale questionnaire. Having obtained the above children's parents' approval, the researcher gave rhythmically bodily movements (dancing) as an intervening program to experimental (case) group twice a week (45 minutes for each session) for three months. 8 rhythmic games were used in this research. Also, adaptive principles and going from simple to difficult were considered as these games have been presented. After the type of music and the kinds of songs were chosen, they have been approved by three experts or university professors and then performed with the help of physical education teachers in schools. The following are some of rhythmic movements briefly:

1) Rhythmic line game: in this game, the child should run on a straight line based on the rhythm and the melody of the music and should follow the instructions presented in the song (such as jump, sit down, hop, skip and ext).

2) Lozenge movement: the kid should move on the color-coded lines of lozenge according to the pattern which has been shown by his/her teacher and this game is also accompanied by music. At first, the child should perform this movement without music but with a song singing by himself/herself.

3) Sound game: children will demonstrate or simulate the movement of objects when they hear their sound in their surrounding area. For example, as soon as they hear the sound of a plane or a train, they start moving like one of them.

4) Colored sphere (ball) game: In this game, first colored strips in different sizes are spread on the ground and then spheres (small balls) having the same colors as strips are placed along the strips at different distances. When the song or music start playing, the child should pick the one small ball (sphere) up whose color is being mentioned in the song and then hop along the strip and finally throw the ball into the basket placing at the end of each strip. The number of balls that the child should pick them up can be added to the song or music in this game.

5) Game of shapes on the ground: different shapes (circle, square and .....) are put in different parts of the ground. While the child is singing the song playing in the recorder, s/he should move towards the shape mentioned in the song simultaneously. Animal shapes can be used in this game.

6) Chess board game: the child is asked to stand on a chess-like board and then s/he start hopping or skipping with two legs in different directions by hearing the instruction given in the recorder through music and song(two squares up, three squares right and ext).

7) Number table game: colored numbers are set inside the perimeter of a square randomly. As soon as the numbers have been mentioned in the song by using the name of animals or flowers, the child should run towards or leap into the required number.

8) Strip-shape game: the child are asked to walk on the strip and to do the required activity when s/he gets to the point where different shapes are placed based on this/her teacher's instruction(clapping). The number of the shapes will be gradually increased in this game.

Post-test has been carried out on both groups by means of Canners neuropsychological test. The obtained data were transferred to SPPS spread sheet for descriptive and multi-variable covariance (Moncova) analysis of data.

**INSTRUMENTATION**

**Raven Colored progressive matrixes for children:**

This test has been revised by Raven in 1956. The test has been designed to measure the reasoning ability in children in the age ranging from 3 to 11. It includes 36 geometric shapes grouped in three sets as AB, B, A. In fact, it is a none verbally reasoning test that is defined as a criterion for assessing the competence of logically developmental level (Raven & Summers, 1986). Raven's test for children had the score of zero and one. Actually, the minimum score that a child can get in this test is zero and the maximum one is 36. Coe & et al (2006), reported the reliability ratio of split- half of the test for the age group of 6 to 14 that has been set at 0.46 to 0.92. Likewise, Raven & Summers (1968) reported the retest ratio of his revised test for children at the age of

6.5 to 9.5 during one year which seemed to be 0.60 and 0.80. The results from Raven's work indicated that the test was sensitive to the fluctuations in outputs of intellectual activity which was happening at childhood. Amire (2002) has reported the ratios of internal constancy of Raven test between 0.89 and 0.97 with 5000 participants.

**Vinland adaptive behavior scale questionnaire**

Dall has published this scale in 1965 for the first time. Then, Sparrow and his colleagues revised the original one in 1984(Van de Winckel, 2004). The scale comprises 117 items categorized into annual groups. The required information is obtained from either well-informed people or the participant herself/his self rather than collected from test conditions. This scale is based on the fact that what a person is able to do in his/her daily life. The symbol (+) indicates that the child has managed to do the given job successfully and consequently s/he will get a positive mark. In contrast, the symbol (-) is an indicative of child's failure to do the activity and therefore no mark is given to the child. The symbol (No-) shows the lack of opportunity and person's ability to do the job. In these cases, if the answer of above question is positive but of the following question is negative, the child will get a half mark otherwise no mark will be given to him/her. (F+) suggests the child's irreversible excuse. As a result there is no mark here as well. (-+) implies that the child sometimes does the job and sometimes does not. So s/he will receive a half mark. Farmarzi and his colleagues reported the reliability of 0.93 for sub-scale of this test based on $\propto$ - Krounbakh method. Annstazi and Barahami (1976) reported the validity of 0.81 and reliability of 0.71 for this scale. They believed that the related validity and reliability were deemed to be stronger in early age especially in mentally retarded groups.

**Canners neuropsychological test:**

Canners designed this test in 2004 to assess neuropsychological skills such as attention, memory, sensation and motor activities and spatial –visual processing across four spectrums (invisible to very rich) and it is used for children at the 5 to 12 age groups. Jadidi and his co-workers (2011) translated this questionnaire into Persian language and extracted its norm in 2011. Internal reliability ratios ranged from 0.75 to 0.90 while the validity ratio of re- test with an eight-week interval was reported to be 0.60 to 0.90. To assess the construct validity of Canners questionnaire, all items were analyzed. Similarly, their differential validity were strongly confirmed by statistically analyzing the quality of the questionnaire as a tool for differentiating people with ADHD from those who are normal and other clinical groups. Jadidi and his colleagues (2011) stated that its construct validity is assessed as being good. Also, the reliability of this tool seemed to be 0.72 by using $\propto$ - Krounbakh method.

**RESULTS**

Descriptive and inferential statistics were used to analyze data. In view of the fact that the values of variances are equivalent in Lambda – Vilkez test and the data from the research were normal, parametric tests were applied to the research data.

As it is shown in table 1, the means of scores of selective attention, constant attention, the shift of attention, divided attention, attention span and total attention from pre-test and post-test in experimental group have increased from 3.00 to 2.20,5.10 to 3.10, 5.50 to3.70,6.80 to3.60,7.00 to4.20 and 27.40 to 16.80 respectively indicating the improvement in experimental group's performance in attention scales and total attention.

As we see the pre-hypothesis about equivalency of variances for both groups related to two variables – memory function and learning- is confirmed. Moreover, the values of variances for both groups are equal in the society and there is no meaningful difference between them. Consequently, having considered the Laven's pre-hypothesis, the researcher can apply co-variance analysis on research results to study the research hypotheses.

The difference between the means of post-test scores of children's attention problems was found significant ($P \leq 0.05$) for both control and experimental groups when the effect of per-test has been controlled. So, based on data in table 3 and considering the pre-test scores as supporting(auxiliary) variable, it can be inferred that rhythmic exercises can effectively reduce the attention problems associated with scales of attention function(focus of attention , constant attention, shift of attention, divided attention, attention span) and the total(whole) attention in mentally retarded children in the elementary school. The values of eta square roots and effectiveness of rhythmically bodily games have shown that 58 percent of these changes resulted from the effect of rhythmically bodily games of attention problems in experimental group.

**Table 1:** descriptive criteria showing Attention function for both control and experimental groups obtained from pre-test and post-test.

| Function of attention | Groups | numbers | Pre-test | | Post-test | |
|---|---|---|---|---|---|---|
| | | | Mean | Standard Deviation | Mean | Standard Deviation |
| **Selective attention** | Experimental | 10 | 3.30 | 1.59 | 2.20 | 1.16 |
| | control | 10 | 3.20 | 1.54 | 3.00 | 1.21 |
| **Constant attention** | Experimental | 10 | 5.10 | 2.78 | 3.10 | 2.31 |
| | control | 10 | 5.20 | 2.33 | 5.30 | 1.41 |
| **Shift of attention** | Experimental | 10 | 5.50 | 1.85 | 3.70 | 1.91 |
| | control | 10 | 5.40 | 1.75 | 5.20 | 1.62 |
| **Divided attention** | Experimental | 10 | 6.80 | 1.44 | 3.60 | 1.34 |
| | control | 10 | 5.40 | 2.06 | 5.30 | 2.18 |
| **Attention span** | Experimental | 10 | 7.00 | 1.74 | 4.20 | 1.55 |
| | control | 10 | 6.80 | 2.41 | 7.00 | 2.32 |
| **Total attention** | Experimental | 10 | 27.40 | 9.35 | 16.80 | 8.25 |
| | control | 10 | 26.00 | 10.05 | 25.80 | 9.70 |

**Table 2:** Results from Laven test showing pre-hypothesis about equivalency of variances for both groups.

| variables | F | Freedom of denominator | Freedom of numerator | meaningfulness |
|---|---|---|---|---|
| **Memory function and learning** | 0.843 | 1 | 18 | 0.371 |

**Table 3:** results from Mancova analysis showing the effect of rhythmic exercises on children's Attention function for both control and experimental group.

| Criteria | Change references | Sum of the square roots | Degree of freedom | Mean of square roots | F | Meaningfulness | Effectiveness | Statistical powers |
|---|---|---|---|---|---|---|---|---|
| **Post-test** | Attention focus(center) | 8.322 | 1 | 8.322 | 29.814 | 0.00 | 0.55 | 0.56 |
| | Constant attention | 25.012 | 1 | 25.012 | 24.210 | 0.00 | 0.60 | 0.63 |
| | Shift of attention | 26.365 | 1 | 26.365 | 18.096 | 0.01 | 0.43 | 0.62 |
| | Divided attention | 8.844 | 1 | 8.844 | 7.241 | 0.02 | 0.65 | 0.68 |
| | Attention span | 20.992 | 1 | 20.992 | 11.236 | 0.00 | 0.62 | 0.90 |
| | Total(whole) attention | 421854 | 1 | 421854 | 27.548 | 0.00 | 0.65 | 0.99 |
| **Group membership** | Attention focus(center) | 1.312 | 1 | 1.312 | 4.586 | 0.04 | 0.69 | 0.98 |
| | Constant attention | 6.146 | 1 | 6.146 | 5.645 | 0.03 | 0.85 | 0.99 |
| | Shift of attention | 1.566 | 1 | 1.566 | 1.521 | 0.01 | 0.76 | 0.99 |
| | Divided attention | 16.854 | 1 | 16.854 | 12.052 | 0.00 | 0.70 | 0.86 |
| | Attention span | 26.370 | 1 | 26.370 | 11.542 | 0.00 | 0.83 | 0.90 |
| | Total(whole) attention | 318.953 | 1 | 318.953 | 20.375 | 0.00 | 0.84 | 0.99 |

**DISCUSSION**

The results from the present study showed that rhythmic exercises affected the attention problems on scales of their attention function (focus of attention, constant attention, shift of attention, divided attention and attention span) and total attention in mentally disabled children who were teachable. The existing theories on attention deficit are rooted in the fact that because mentally retarded individuals' attention span are mainly at the lower level, they are unable to either shift their attention to different phenomena or pay attention to the different aspects that exists in a task. These findings were in the harmony with those conducted by Shalev, Yehoshua & Merorach (2007), Davis & et al (2007), Piek& et al (2007), Kaplan & Steele (2005), Van &Winkel (2004), Geregory (2002), Robb (2003), Kazemi & Abedi (2001) and Whitley & Ball (2002). Robb(2003), based on the study on 12 pre-school children, reached the conclusion that children attention were significantly at the higher level in musical sessions than game sessions. Studies by Massion (2006) revealed that there is a positive link between students' game and their learning. In the same way, game can improve attention, planning skill, creativity, and divergent thinking (Barrett, 1975).

Keita Kamijo& et al (2008) investigated the effect of rhythmic movements on teenagers' cognitive function in their study. As a matter of fact, their study indicated that cognitive functions, especially attention and memory level, in children can promote by doing rhythmic movements and exercises. Leisman & Melillo (2010) on their study inferred that continuous teaching of physical movements and exercises can positively impact on the improvement of attention amongst children with hyper-activity /attention deficit. Also, Moor (2000) showed that it is possible to improve attention and concentration in hyper-active children suffering from attention problem too. These researches were in accordance with the present study. Zhu & et al (2008) studied the positive effect of music on visual attention.

To clarify this assumption, it is believed that there is a link between the improvement of child's attention and child experiences to a large degree. Hence, by enriching the environment and preparing a suitable ground for physical and group games, on one hand, probably we make it possible for mentally retarded children to grow and improve and on the other hand, due to the significant role music plays in the context of the rhythmic games, attention improvement is likely to take place as a result of musical functions and its effectiveness on the attention level. Since the teaching of music has a great effect on the form and activity of the brain cortex and since there exist different sensory pathways- part of which is the consequence of neurological limitations- in mentally retarded children, the use of music and rhythm in the form of rhythmically bodily games can increase and expand the nerve branches at the same time. That is, long sensory stimulation increases the brain synopses contributing to the sensory perception at higher levels. Net -like activating system is an area that plays an important role in brain functions. It is located at the lower part of the brain and makes our brain aware and ready to receive information. This system plays great role in the control of constant attention, inhibition, programming, organization and behavioral classification. Study on base ganglions showed that muscular and conscious movements can improve the function of this organ in different groups (Alizadeh, 2004). As a result, rhythmically bodily games can help to enhance the function of this organ and provide more coordination through activating the mentally disabled child's conscious movements and finally leads to promote the function of attention criteria in given person.

According to the above results, it can be said that rhythmically physical activities, a powerful therapeutic intervention (mediator), have a high potentiality to improve the memory and attention in mentally retarded children who are teachable and as they are accompanied by music and song, they are more exciting and attractive to the mentioned children. So, they can simply be included in educational and rehabilitation programs. They are important because they informally affect the quality of these children and promote the memory and attention which are the underlying assumption of learning process. It seems that the use of rhythmically physical activities is a new way of the early mediators in developing mentally disabled children's skills in such a way that it can impact on cognitive, behavioral, emotional- affective skills. As an implication, therefore, it is better to investigate the effect of rhythmically physical games in pre-elementary levels.

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