

## **Reducing the Symptoms of Children's Attention Deficit-Hyperactivity Disorder by Utilizing Muscular-Neural Coordination Exercises Program**

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**Keywords:** attention deficit hyperactivity disorder (ADHD) symptoms, muscular-neural coordination exercises.

**Abstract:** The study aims to identify the impact of a constructed of muscular-neural coordination exercises program on children with the symptoms of attention deficit hyperactivity disorder (ADHD). The researcher has applied an experimental method with pre- and post-test design. Among 600 participants, sample (N-64) was drawn by using the purposive sampling of children with ADHD from first and second grade's elementary schools. The present study measured ADHD using Vanderbilt-ADHD Diagnostic Parent Rating Scale (VADPRS), and Teacher Rating Scale (VADTRS). Findings showed that the constructed muscular-neural coordination exercises program had a positive effect on reducing the symptoms of the three types of ADHD. Students with combined group of attention deficit hyperactivity disorder were affected more than those suffering from the other two types ADHD., while students with attention deficit only were affected less than those suffering from the other two types of ADHD.

## الحد من أعراض اضطراب نقص الانتباه وفرط النشاط عند الأطفال من خلال استخدام برنامج تمارين التوافق العضلي العصبي

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**الكلمات المفتاحية:** أعراض اضطراب فرط الحركة ونقص الانتباه (ADHD) ، تمارين التنسيق العضلي العصبي.  
**ملخص البحث:** يهدف البحث إلى معرفة تأثير جملة من تمارين التوافق العضلي العصبي على أعراض فرط الحركة وتشتت الانتباه لدى الأطفال الذين يعانون من أعراض اضطراب نقص الانتباه وفرط الحركة (ADHD). قام الباحث بتطبيق المنهج التجريبي من خلال تصميم اختبار ميداني قبلي وبعدي. ومن بين 600 مشارك، تم اختيار عينة البحث بالطريقة العمدية (N-64) من الأطفال المصابين باضطراب فرط الحركة وتشتت الانتباه من المدارس الابتدائية للصفين الأول والثاني بمنطقة الحدود الشمالية مدينة عرعر. حيث تم استخدام مقياس اضطراب فرط الحركة ونقص الانتباه باستخدام مقياس تقييم الوالدين التشخيصي Vanderbilt-ADHD (VADPRS) ، ومقياس تقييم المعلم (VADTRS). أظهرت النتائج أن برنامج تمارين التوافق العضلي العصبي المقترح كان له تأثير إيجابي في تقليل أعراض الثلاثة لاضطراب فرط الحركة ونقص الانتباه. حيث أظهر الطلاب الذين يعانون من اضطراب فرط الحركة ونقص الانتباه مجتمعة تأثروا أكثر من أولئك الذين يعانون من أحد النوعين الآخرين من اضطراب فرط الحركة أو نقص الانتباه. بينما تأثر الطلاب الذين يعانون من نقص الانتباه فقط بدرجة أقل من أولئك الذين يعانون من النوعين الآخرين من اضطراب فرط الحركة أو اضطراب الحركة ونقص الانتباه.

## Introduction

Science has recently tended to intensify researches in order to address problems affecting society, and provide solutions to them. The problem of attention deficit/hyperactivity disorder is considered one of the major problems that affects kids due to the big modification in their lifestyle, nutrition, and genetics.

Some studies applied medical technologies to detect the secrets behind attention deficit/hyperactivity disorders in order to identify the causes of such disorders. Some of them found a close correlation between the nervous system and attention deficit/hyperactivity disorders. Jeoung (2014) showed a significant relationship was found between ADHD tendency and inattention/memory problems, hyperactivity/restlessness, impulsivity/emotional lability.

Yuncheng et al (2016) noted that understanding the conditions and factors that regulate the activity of these neurons is obviously of importance. Tractography technique shows abnormal and asymmetric connections between the striatum and prefrontal lobe in ADHD

Cortese, and Castellanos (2012) proved that Imaging studies with a developmental perspective are revealing the brain correlates of ADHD over the lifespan.

Mirsky (1987) pointed out that attention has several aspects including concentration, persistence, continuity, transformation and accomplishment. Although these aspects are entwined, each of them occurs in different parts of the brain. The defect performance of these aspects is attributed to the damage or injury place in the brain. (17: 89).

Flick (1998) asserted that when he applied the attention processes models, and he found that a child may suffer from one or more difficulties in concentration, retention, replacement, transferring or directing attention to more than one topic at the same time. Another study conducted on a group of children by using the brain CT scan in order to examine the brain activity in ADHD children. This study emphasized the lower activity of the right brain lobe in the orbital prefrontal regions compared with the left lobe of the same person (14: 23).

Group of different studies had indicated the spread of Attention Deficit & Hyperactivity Disorder in different countries. A study by Mohammad & Fatma (2015) of prevalence of ADHD in Egypt showed that Fayoum City was 20.5%, with 33.8% among boys and 6.8% among girls. This entails prompt

concern to this problem in order not to be exacerbated. Meanwhile, Saif Alamri (2014) reported that the hyperactivity in the KSA estimated 15.5% which is considered as a very high rate. Vivian Khamis (2011) indicated that UAE has also showed higher rate of ADHD 12.5% among school-age children. In the other hand, Gretchen B., Keila V., and Ardythe L (1999) reported that the hyperactivity disorder in the USA increased only by 5% in 9 years. In addition, it was diminished in UK by 4% in 8 years as indicated by Suzanne M and others (2012).

This shows that developed countries are more concerned with the hyperactivity problem than Arab

countries. Therefore, it is important to pay attention to that problem in order not to be exacerbated. Several studies have asserted that among the main dichotomies and phenomena of the increased activity is the attention deficit/hyperactivity disorder which negatively affects children with hyperactivity.

Based on academic research in the field of psychology, Saudi ADHD Society (AFTA) (2011) reported that the ADHD problem affects 15.5% of children in Saudi Arabia and lasts with them till an advanced stage of their age. 86% of causes were due to heredity and marriage of relative, 35% of ADHD struggle to continue schools, 20% of them drop schools. In addition, ADHD considered from the most common cases that frequently visited the Nerve Clinics and Psychiatry for children, up to 10% of those children was in primary school. When it is not diagnosed and treated, it will lead to social, behavioral and academic problems, and in some cases, problems could be related to addiction and law.

To determine the problem size and depth, it was proven that the hyperactivity affected child does not necessarily mean that he should be infected with attention deficit. A study by Jamal. H., and others (2008) identified that the spread rate of concurrent attention deficit hyperactivity is 16.7%, while the infection rate of attention deficit disorder only is 16.5%. In addition, the infection rate of hyperactivity and impulsivity is 12.6% among 1287 students enrolled in KSA-based primary schools.

Many studies asserted that most of children with ADHD forms a great difficulty in performing some mental skills, particularly those skills that require certain concentration like mathematics, learning steps, and intellectual function, which lead them to have poor academic achievement in schools and suffer at the age of puberty from social and

emotional disorders (Christina, G. & Weston, MD., 2004).

Kevin Krull (2007) asserted that attention deficit hyperactivity disorder is more spread among boys than girls. The rate of boys' infection according a research paper is 14.2% while the girls' rate is 5.6%. The same study also indicated that the boys-girls proportion at the childhood age is 4:1. This means that there is one in every five girls suffer from ADHD. (16:9-12). Therefore, there is a psychological problem affects a large rate of the society. The study of its characteristics reveals that it is a serious problem which cannot be overlooked. It troubles the life of the individual who feels that he made no mistake or offense. Meanwhile, the society considers such an individual a reluctant person who does not obey orders, is lazy, always complains, is isolated and a troublemaker. They often tend to punish him, particularly if they do not understand the nature of his problem.

Effect of motor behavior on children with ADHD is clearly noticed. Michael S. Wendt (2000) investigated the relationship of physical activity and behavior of 13 subject diagnosed with ADHD. Result indicated that chemical changes occur after the body is exposed to physical activity, which released to the central nervous system and brain, which may impact on the process involving neurotransmitters as well. This finding also confirmed by

John Ratey (2008), they explained that doing sports is considered as one of the important and effective things to stimulate body producing hormones and chemical substances, which responsible for the main brain processes such as concentration and the mood swing, where endorphin represents a fundamental remedy for the ADHD treatment (15:52-55).

It was important; therefore, researcher proposes for this approach; what believes to be suitable in the work field and an effective contribution to solve this problem through a certain constructed rehabilitation program, the Muscular-Neural Coordination Exercises Program (MNCEP). This program is particularly prepared for the category of infected children as a rehabilitation attempt so as they can lead normal life and have better interaction with their society.

Thus, the purpose of this study is to identify the impact of a set of muscular-neural coordination exercises program on the symptoms of hyperactivity and inattention of the children infected with the ADHD three types, and to ascertain to what extent learned and applied coordinating exercise program can be resulted in an orienting purposeful movement.

## Method

### Participants

A sixty-four students of total 600 participants enrolled at primary schools in the north border region in Arar town, sample was selected by the purpose sampling method from children infected with the attention deficit hyperactivity disorder (ADHD). The infected ADHD children were identified by scale score. They were 64 students classified to three disorder types, the ADHD group including 32 students, the group with attention deficit only comprising 12 students, and the group with hyperactivity disorder only 20 students. (M age =7.4 yr., SD = 1.2)

The increased size of the ADHD group to 50% of the whole sample size is attributed to what some scientific researches and studies referred to. In addition, hyperactivity and attention deficit are highly correlated to the extent that some researchers count them as one problem. However, the sharpness symptoms of one of them do not appear in the way which some researchers view as a problem. On the other hand, other researchers view them as two separated problems because of the lower symptoms of one of them. (2:2-3).

Hypotheses 1. There is a significant relationship between the pre and post-tests for the three types of ADHD.

Hypotheses 2. There are significantly statistical differences between the pre- and post- tests of the experimental group (hyperactivity) in the scores of hyperactivity scale in favor of the post- test as a result of applying the kinetic set.

Hypotheses 3. There are significantly statistical differences between the pre- and post- tests of the experimental group (attention deficit) in the scores of attention deficit scale in favor of the post-test as a result of applying the kinetic set.

Hypotheses 4. There are significantly statistical differences between the pre- and post- tests of the

experimental group (attention deficit and hyperactivity together) in the scores of attention deficit and hyperactivity scale in favor of the post-test as a result of applying the kinetic set.

Vanderbilt ADHD Diagnostic Parent Rating Scale. – The Vanderbilt Attention- Deficit Hyperactivity Disorder Diagnostic Parent Rating Scale (VADPRS) is a 55-item scale developed by Wolraich, M. L., & others. (2003), which used to evaluate children and adolescents for ADHD. The American Academy of Pediatrics and the National Initiative for Children's Healthcare Quality selected this scale for the ADHD Tool Kit. In addition to ADHD symptoms, the VADPRS includes 8 symptoms of oppositional-defiant disorder, 14 symptoms of conduct disorder, and

7 symptoms of anxiety/depression. These symptoms are also counted as present when rated as '2' or '3'. Finally, parents rate their child's performance in 8 academic,s skills, reading, social, and relationships with peers domains. Performance items are rated on a 1 'Problematic' to 5 'Excellent' scale; ratings of '1' or '2' are taken to indicate difficulty in that domain.

Vanderbilt ADHD Diagnostic Teacher Rating Scale. – The Vanderbilt Attention- Deficit Hyperactivity Disorder Diagnostic Teacher Rating Scale (VADTRS) is a powerful source of information developed by Wolraich,

M. L., Feurer, I. D., Hannah, J. N., et al. (1998), which consist of a 43-item scale used to evaluate the child's behaviors, interactions, and academic performance. The American Academy of Pediatrics and the National Initiative for Children's Healthcare Quality selected this scale for the ADHD Tool Kit. In addition to ADHD symptoms, the teacher version of the Vanderbilt ADHD Diagnostic Rating Scale contains 5 subscales. Behaviors are included in the total for each subscale if they are scored as a 2 or a 3. A score of 1 or 2 on at least one question in the performance section indicates impairment. The rules for scoring are as follows: For Predominantly Inattentive subtype, at least 6 of questions 1–9 must score a 2 or 3. In addition, at least 1 of questions 36–

43 must score a 4 or 5. For Predominantly Hyperactive/Impulsive subtype, at least 6 of questions 10–18 must score a 2 or 3. In addition, at least 1 of questions 36–43 must score a 4 or

5. For Combined Inattention/Hyperactivity subtype, at least 6 of questions 1–9 and 6 of questions 10–18 must score a 2 or 3. In addition, at least 1 of questions 36–43 must score a 4 or 5.

The Muscular-neural coordination exercises program. -- It is a set of physical exercises created and instructed by the researcher, which entail moving different body parts (arms, trunk and legs) in different direction. It aims to form an exercise group characterized with muscular-neural coordination between legs, arms and legs and trunk, and arms and trunk. (Appendix IV). The muscular-neural coordination exercise program consists of 14 exercises arranged according to the initial and final positions of each exercise. It forms a set of show whose exercises are muscularly and nervously compatible among different body parts. Students should slowly perform these exercises (the exercise follows: broom) in order to suit his mental and physical abilities. Exercises are designed as

follows: single motor exercise such as (walking in the place) repeatedly for 8 times; and combined motor exercises at two directions with 4 times for each direction and then returning to the initial position.

### Procedures

The training program was designed (a set of muscular-neural coordination exercises) according to the early-mentioned determinants in terms of exercises types and appropriateness to age stage. The program design, was sent to exercise experts in the physical training and exercise developers to determine exercises appropriateness for age and physical ability. The proposed exercises obtained higher than 70% of the experts' views. Then, the program was modified according to the experts' views and was finally formulated.

The proposed exercises set was photographed and published in the shape of a guiding form where the exercises were written before the pictures. Thus, there is a guiding booklet for students and teachers during the training period. The booklets were distributed to the students (research sample) and the trainers also (physical education teachers).

Research assistants were selected and trained for the exercises and the scale application mechanism. They were assistant teachers in schools (51 assistant's teachers) besides the school's physical education teachers (8 teachers). The ADHD measure was applied to 3 primary schools included all students at grades (one, two and three). The test was administered to 766 students as every pupil was given two tests; one for his parents (Appendix I) and the other for his class teacher (Appendix II).

**Validity & Reliability** - The scientific coefficients of the ADHD scale were conducted using a pilot sampling of study population. They were 15 students; every pupil was given two measures; one for parents and the other for teacher. The internal validity was verified in terms of measuring what is supposed to measure with  $r = (0.86 - 0.95)$   $p < 0.05$ . The application was reapplied to the same sample to compute the reliability coefficient through the application method. It was reapplied after 15 days as the  $r = (0.91 - 0.99)$   $p < 0.05$ , which indicates the reliability measure.

**Contest Form** - Approval written contest form was maintained from parents to engage their children as subject for this research. They were provided a verbal account of the nature and purpose of the study. Then, permission to conduct the study from the Institutional Review Board was obtained. Prior to data collection, parent, class teachers, PE teachers, and children themselves were provided an opportunity to ask questions about the study. They were informed that they could discontinue their involvement in the study at any time without penalty, and that the university had approved the study.

**Data collection** – data collected from parents and teachers as the research sample was identified according to the pre measure application. The sample was divided into three categories according to their responses as follows:

-The combined (attention deficit + hyperactivity) ADHD group contained 32 students selected in terms of their scores in the first 18 statements of the test. The scores were counted as infected with ADHD when he

scores 2, 3 or more in six statements items from (1-9).

-The attention deficit AD group was obtained based on child diagnosis score, which represent the existence of the sharp attention deficit symptoms, where; minimum score is 12, and 27 score is the pupil scored the highest mark in the statements indicating the attention deficit.

-The hyperactivity group HD was identified when child is considered as infected with hyperactivity. Scores 2 or 3 in 6 or more statements items from (10-18), where; minimum score is 12, and 27 is indicating the very sharp existence of the hyperactivity symptoms.

Scores were assessed based on Vanderbilt's ADHD Scale prepared by the American Academy for pediatrics (Appendix III).

The research sample was daily trained in schools after allocating the physical education lessons besides training during leisure times at the school day. The training time was determined in the last month of the second term 2013/2014 to have adequate training times. The students' training period on the statements ranged from 26 to 30 days which is a relatively long period. This was accounted because the training included one exercise daily accompanied with revision at the weekend. Training students on 14 exercises and their revision lasted for 26 days. Some skills which need certain mental concentration and successive linked to motor control requirements lasted for longer period to be achieved as confirmed in some scientific studies (1,6,10,12,19 and 20).

The ADHD-Parent & ADHD-Teacher scales were distributed after the completion of pupil's training on the motor set. Both scales were conducted concurrently regardless of students' different assimilation, degrees, age and pre-test score of ADHD. Notably, the hyperactivity group was the fastest in memorizing response of the motor set, while; the least group was the combined ADHD. The measure was assessed every pupil immediately once he memorized the statement. The criterion for a pupil memorization of the statement was his 3 times successive performance without mistakes. A pupil was given a previously agreed upon reward as motivation of participation.

**Statistical analysis** – Data analysis was conducted with the SPSS statistical package, version 17.00. Researcher followed the practical of statistical analysis and data presentation that recommended by Ana-Maria Simundic., (2012). Therefore, at the baseline Fisher's exact probability tests were used to evaluate the ability of each test to classify ADHD versus non-ADHD participants. t-tests, repeated measures ANOVA, and correlations were used to analyze the probabilities of ADHD computed at and after each test of the combined assessment. A descriptive statistic was conducted for main (M) and stander deviation (SD) to compare the three groups' associated ADHD in the follow-up, correlation coefficient between teachers' and parents' scores in the pre- and post-tests of the combined group (ADHD)  $N=32$  (Table 2), correlation coefficient between teachers and parents scores in the pre and post- tests of the (AD) group  $N=12$ , and correlation coefficient between teachers and parents scores in the pre and post-tests of the hyperactivity group (HD)  $N=20$ . A t-test was used to find out the significant differences between pre and post-test for all groups.

## Result

The researcher attempts to display, interpret and discuss results to realize the research aim and verify its hypotheses in the limit of data statistical analysis.

A- Results of the combined attention deficit hyperactivity group ADHD:

**Table (1). Correlation coefficient between Teachers' and Parents' scores in the pre- and post-tests of the combined group (ADHD) N=32 .**

Serial no.	Variable	Mean Score	Standard Deviation	Correlation Coefficient
1	Teacher's pre measure	43.5	1.17	0.64
2	Parents' pre measure	41.63	1.75	
3	Teacher's post measure	15.38	0.98	0.85
4	Parents' post measure	14.66	0.54	

R Value at 0.05 level = 0.349

**Table (2). Differences significance between the pre and post Tests of Teachers and Parents of the combined group (ADHD) N=32.**

Serial no	variable	Pre test				Improvment rate	T Value
1	Teachers	43.5	1.17	15.38	0.98	182.83	102.59
2	Parents	41.63	1.75	14.66	0.54	183.97	81.99

R Value at 0.05 level = 2.042

Table 2. indicates that there are significant differences at the 0.05 level between the pre and post-tests of the teachers' scores in the group characterized by combined attention deficit and hyperactivity. They are in favor of the post-test as the computed T-value equals (102.59). this indicates that the ADHD group was affected due to its training on the investigated exercises sets.

There are also significant differences at the level 0.05 between the pre and post-tests of the parents' scores at the same group in favor of the post-test as the computed T-value equals (81/99). It indicates that the ADHD group was affected due to its training on the investigated exercises sets.

### B. Result of Attention Deficit Group AD:

also significant correlation at the level 0.05 between teachers' and parents' post-tests estimated (0.67).

**Table (3). Correlation Coefficient between Teachers and Parents Scores in the pre and post-tests of the AD group N=12**

Serial no	Variable	Mean Score	Standard deviation	Correlation Coefficient
1	Teachers' pre test	22.25	1.01	0.79
2	Parents' pre test	22.25	1.65	
3	Teachers' post test	5.83	0.87	0,67
4	Parents' post test	6.08	0.91	

R Value at 0.05 level = 0.576

Table 3. indicates that there is significant correlation at level 0.05 between teachers' and parents' pre-tests estimated (0.79). It indicates that there is compatibility between teachers' and parents' view in the pre-test score which indicates that the AD group included children suffer from attention deficit. There is significant correlation at 0.05 level between the teachers' pre measure and the parents' pre measures estimated (0.64). This proves that there is compatibility between the teachers' and the parents' view at the pre-test score which indicates the symptoms of ADHD. It also indicated that there is a significant correlation at the 0.05 level between the post measures of both teachers and parents estimated (0.85).

**Table (4). Differences significance between the pre and post-tests of teachers and parents of the attention deficit group (AD) N=12**

Serial no	Variable	Pre test				Improvment rate	T Value
1	Teachers	22.25	1.01	5.83	0.87	281.65	40.85
2	Parents	22.25	1.65	6.08	0.91	265.95	28.46

R Value at 0.05 level = 2.228

Table 4. indicates that there are statistically significant differences at level 0.05 between the pre and post-tests of teachers' scores in the group which is characterized by attention deficit. They are in favor of the post test as the computed T-value equals (40.85). This indicates that the attention deficit group was affected due to its training on the muscular- neural coordination investigated exercises sets. There are also statistically significant differences at the level 0.05 between the pre and post-tests of parents' scores at the same group in favor of the post-test as the computed T-value equals (28.46). This indicates that the attention deficit group was affected due to its training on the investigated exercises sets.

### C. Results of hyperactivity group HD:

Table (5). Correlation Coefficient between Teachers and Parents Scores in the pre and post-tests of the hyperactivity group (HD) N=20.

**Table (5). Correlation Coefficient between Teachers and Parents Scores in the pre and post-tests of the hyperactivity group (HD) N=20.**

Serial no	variable	Mean Score	Standard deviation	Correlation Coefficient
1	Teachers' pre test	24.95	1.36	0.68
2	Parents' pre test	27.15	1.85	
3	Teachers' post test	5.95	0.82	0.54
4	Parents' post test	6.35	0.14	

Table 5. indicates that there is statistically significant correlation at the level

0.05 between the pre-tests of teachers and parents estimated (0.68). it indicates there is compatibility between teachers' and parents' views in the pre-test score and children belong to that HD group suffer from hyperactivity. There is also statistically significant correlation at the level 0.05 between the post tests of both teachers and parents estimated (0.54).

**Table (6). Differences significance between the pre and post Tests of Teachers and Parents of the hyperactivity group (HD) N=20 .**

Serial no	Variable	Pre test		Post test		Improvement rate	T Value
1	Teachers	22.95	1.36	5.95	0.82	319.33	52.15
2	Parents	22.85	1.85	6.35	0.14	327.56	48.87

Table 6. indicates that there are statistically significant differences at the level 0.05 between the pre and post-tests of the teachers' scores at the group characterized by hyperactivity in favor of the post-test computed T-value equals (52.15). It indicates that the hyperactivity group was affected due to its training on the investigated muscular-neural coordination physical exercises sets. There are also statistically significant differences at level 0.05 between the pre and post-tests of the parents' scores at the same group in favor of the post-test computed T-value equals (48.87). It shows the hyperactivity group was affected due to its training on the investigated exercises sets.

### Discussion

The correlation coefficients of the pre and post-tests of the three groups (ADHD, AD, and HD) indicate that there are statistically significant correlation values between the scores of teachers and parents in the pre and post-tests at the three groups. These differences were not all large, this due to information processing delays experienced by children as some researchers previously indicated (Reid & Borkowski, 1984; Whitmont & Clark, 1996; Yan & Thomas, 2002).

There are also differences among them when comparing the highest significant value of the post test at the attention deficit AD group estimated (0.846), while the least significant value of the post test at the hyperactivity HD group estimated (0.542), it is not a simple difference, but all results values are statistically significant at level 0.05. The statistically significant values recorded for the correlation coefficients in the pre and post-tests of the

three groups, which indicates that responses of teachers and parents were not largely random or illogical.

All values included in the previous tables showed the mean scores of teachers and parents recorded in the pre and post-tests of the research sample, which display statistically significant differences in the T-Test of the independent variables at  $P= 0.05$ . All values express the change in pupil's score according to the views of teachers and parents that reflects the extent of which the group was affected by the proposed training program (the muscular-neural coordination exercises set).

The tables also indicated that the highest change value occurred in the combined attention deficit hyperactivity group ADHD in the scores of teachers and parents (28.25 for teachers and 27.0 for parents). This is due to the effect of the coordination exercise program, which could be directed motor sense and increased children concentration as outcome of the constructed program. It is also noted from the tables that the least difference between the pre- and post-tests was obtained by the AD group for both teachers and parents. This may indicate that the intervention had a higher effect on the hyperactivity HD group than on the AD group, and that the group that was affected most was the combined group ADHD.

### Conclusions

In the light of the study findings and the limitations of the examined sample and based on the discussed findings, the researcher has concluded the following:

- 1.The proposed investigated muscular and nerves exercises program has a positively effective impact on reducing the symptoms the three types of attention deficit/hyperactivity disorder ADHD.
- 2.Students infected with the combined type of ADHD are more largely affected by the intervention than those infected with the other two types (AD and HD).
- 3.Students infected with AD are less affected from the other two types (Ad and ADHD).

### Recommendations

Within the limitations of the research population, selected sample and in the light of the research objectives, hypotheses and results, the researcher provides the following recommendations:

- 1.The inclusion of physical motor programs characterized with muscular-neural coordination within the treatment program for the ADHD affected children.
- 2.Conducting a survey of all schools' students in order to identify the spread extent of the ADHD among them.
- 3.Allocating separate groups of ADHD children and training them in part of the physical education lessons on the muscular-neural coordination exercises including the physical exercises components or the warming up during the school physical education lesson.
- 4.Training the infected children on the muscular-neural exercises at home as a part of treatment provided that it should be associated with an incentive chosen by the child.

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