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Effectiveness of Perceptual–Motor Training on Reaction Time and Anticipation Children with Hyperactivity Disorder / Attention Deficit

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ABSTRACT

The purpose of this study was to investigate the effects of perceptual–motor trainings on Reaction time and anticipation children with attention-deficit/hyperactivity disorder. For this purpose, 30 hyperactive children [Mean age, 8/2] were randomly selected. Conner's Parent Questionnaire and Device response time and Coincidence Anticipation Timing were used. After the pretest, the experimental group for 8 weeks, three sessions per week of 45 minutes of exercise such as [balance exercises, strength training exercises, coordination, etc.] did. In data analysis, paired and independent t-test were used to compare the means scores of pre-and post-test. Results indicated that there was significant difference between Reaction time and ticipation pre-test and post-test scores of experimental groups. In regard to results, probably perceptual–motor Trainings, improves Reaction time and ticipation in these children.

KEYWORDS*: Perceptual–Motor Training, ADHD, Reaction Time, Ticipation*

INTRODUCTION

Hyperactivity Disorder is one of the most common problems of children and adolescents and is one of cause of visiting psychiatrists and psychologists of children. This disorder can be considered as misappropriate neglect to growth, Hyperactivity and Impulsivity that is show in the early stages of the age and causes dysfunction in social, academic and motor functioning [1]. Its prevalence is 6 to 9 percent of children in the world [2]. The features of

these children is that most of them have problem in carrying out gross motor skills, spatial, time, physical and navigation perception and other motor skills [such as gentle motor skills] [3] these problems leads to children act fumble in doing things, be weak physically and have poor motor [4] any disruption in the process of moving affects perception system and as a result learning [5]. Undoubtedly, the relationship between perception and movement is important. Without perception, even the simplest move if not impossible, difficult [6] in children who have severe disabilities, increasing the gap over time become deepens and makes inevitable early intervention actions [7]. Several research has been done in conjunction with hyperactive children and interventions have been performed on it. for example, Nike and Patal [2016] in their work investigated Autogenic Relaxation effect on the visual reaction time of hyperactive children and concluded that the reaction time in these children significantly reduced [8]. Jahani et al [2016] examined neurofeedback effect on cognitive skills-motor of hyperactive children and concluded that neurofeedback intervention can have positive effects in improving cognitive-motor skills of children suffering from ADHD [9]. Mirjalali et al [2016] in a research with title of "rhythmic exercises in the gross motor skills Children suffering from Attention Deficit / Hyperactivity" concluded that these exercises is good for improving motor skills of hyperactive children [10]. Gapin et al [2011] examined the effect of physical activity on reducing symptoms in children with ADHD [11]. Jefri et al [2011] concluded that game and physical activity are distinctive approach that can enhance the effects of drug therapy and the development and has considerable influence cognitive function in children with ADHD [12]. Kavsari et al [2012] in a study with the title of the impact of physical activity on the development of fine motor skills in children with ADHD concluded that selected physical activity from the Spark program can improve fine motor skills in children with ADHD [13]. Havri et al [2007] indicated that subjects of the groups regular physical activities selected and combined with medication in bilateral coordination, strength, vision-motor coordination, speed, and agility of upper limb had better performance than therapy group [14]. Drug treatment of this disorder includes central nervous system stimulants. Scientific evidence shows that, although drug therapy is successful in reducing the symptoms of ADHD but the approach of other non-medical interventions, such as behavioral interventions will intensify the positive effects of drug therapy. And in some cases, to reduce the amount of medicine. In addition to behavioral interventions we should seek to interventions and approaches that can overcome these children motor and cognitive problems. Perhaps behavioral problems are a result of motor and cognitive problems [15]. As a credible and coherent programs, we can refer to perceptual-motor training. The term perceptual-motor interpretation, refers to interpretation and individual response to a stimulus [16].

Perceptual-motor training programs, are valid physical education programs which are regulated based on the level of maturity, and have many of the same elements. The purpose of these programs, are increasing academic achievement or progress in school readiness. Increased body awareness, space, and time is as a medium to guide children to the increased motor control and movement ability. Perceptual-motor activities play an important role in the development of the child's motor abilities [17]. On the effectiveness of cognitive exercises - movements in children with ADHD have done some research that revealed the positive effect of these exercises to improve or at least reduce symptoms in children for example Salman et al [2009] in a study investigated the impact of cognitive-motor exercises on improving motor capabilities with developmental coordination disorder .results of this research

showed that cognitive-motor exercises improved motor functions in children with developmental coordination disorder [18]. Ahmadi and Shahi [2010] in their study, investigated the effect of perceptual-motor training on motor and mathematic skills in autism the result is that perceptual-motor training as well as improved motor skills of the children who had autism. However, their impact on the mathematical skills [cognitive] was not statistically significant [19] to evaluate the effectiveness of cognitive - motor exercises on motor proficiency Children suffering from hyperactivity disorder and concluded that perceptual-motor training, by strengthening infrastructure, perceptual-motor system, improves motor skills in these children [20]. Afshari [2012] in his study to investigate the effect of exercise on cognitive-motor attention of children with autism spectrum disorders, and came to the conclusion that perceptual-motor training increased cognitive neurological function and improved attention in children with autistic spectrum [21]. Nasseri et al [2015] in their study showed that cognitive-motor training could significantly improve hyperactive children's fine and gross motor skills [2]. Cognitive-motor training focuses on strengthen the areas of balance and coordination of eyes, hand, eye and foot, bilateral coordination of upper limbs and bilateral coordination of lower limbs, coordination of four limbs, muscle strength, agility and speed of limbs and reaction time and the predicted time [2]. Reaction and predict time play an important role in the motion planning and are important criteria in determining neuromuscular status of different people. Successful performance in various movements or athletic skills not only to implement effective and appropriate motor behavior, but also requires a high level of cognitive ability [22].

So, in any activity that a person requires quickly and the right reaction to decide and implement an appropriate move improving forecasting skills and reaction time can be helpful in improving motor control.in fact by measuring above variables, can study the effectiveness various exercises and treatments on the Improving motion control functionality and the central processing before and after the intervention Or it can be compared the effectiveness of different exercises and motor sports on the reaction speed and skill forecasters and the most efficient methods used for this purpose. Hyperactive children, have slow reaction time - the time between the presentation of environmental stimuli and starting evident physical response than their normal peers [23]. Targeted moves require integration between the central nervous system [CNS] and other organs and body systems. In order to be able to identify the motion environment, the perception of sensory input, decision-making and implementation practice in the scheduling and coordination to be correct. In all these activities brain requires the actions, which is called processes information and each step requires a specified time. This time is measured by reaction time [24]. Reaction time is indirect marker to assess the ability of the central nervous system processing and simple means to determine the relationship between the sensory and motor function. Because it requires conflict mechanisms of the central nervous system [25]. Prediction is a strategy to reduce the response time or even reduce the processing steps that is used normally when responding to a stimulus [26]. And adaptive predicting, is an ability to create a motor response, along with stimulating or foreign objects get to the pre-defined point [27]. As we have seen, hyperactivity disorder in addition, sensory- motor problems have impact on all operational domains of a child. And this in turn has caused problems in education, social and personality of these children. And this makes it necessary an implementation of a comprehensive treatment program for these children. However, the interventions that have focused on the children's

cognitive and motor performance are low [28]. Perceptual-motor programs are used as a therapeutic approach in children with various disorders. But given the high incidence of social disorders, personality, and psychiatric which hyperactive children may develop after years they need a more comprehensive evaluation and treatment. It seems that in order to create a complete model for improving children hyperactive disorders motor assessment and interventions to improve motor skills to be useful. According to this the aim of this study was to investigate the effectiveness of Cognitive-motor exercises to improve response and predicted time of children suffering from hyperactivity disorder.

MATERIAL AND METHODS

This research in terms of method is quasi-experimental and in terms of executive has done as field. The statistical population of this research is boys, suffering from ADHD at Jiroft city [2016] which their number is 30 person. The sample considered 30 persons, equal to the population that randomly were divided into control and experimental groups [each n = 15]. existence significant physical, sensory or motor impairment, existence obvious signs of psychosis in children, suffering from chronic diseases and other specific disorders and mental retardation, having a history of seizures and related use of drug therapy were including exclusion criteria of subjects.

Instrument for data collection

Conner's questionnaire form 48-item version of parents: This experimental and standardized questionnaire, is verified and shorter form of the long form of 93 questions that its reliability of re-rest is 0.7 from 0.9.the validity of the test of this inventory is 0.93 Cranach's alpha coefficient and its mean is 21.42 and standard deviation is 38.16. and according to 6 degree [from never to very much] measures the behavior of the child in Six realm conduct problems, psychosomatic problems, learning problems, problems with impulsivity-hyperactivity and anxiety and hyperactivity. These tools are only used for definite diagnosis of attention deficit disorder – ADHD of the participants.

System reaction time: The device includes 4 color lamp at the top 4 parallel keys with light bulbs at the bottom which subjects must by lighting each lamp, press parallel key at the bottom. And a key embedded in the middle part that the subjects should by hear beep sound reply to [pressing the appropriate key] desired response. Stimulating is created by testing receptors and the length of time that subjects spend to the appropriate response by a timer the reaction time that is connected to reaction time devices, is measured by time accuracy of millisecond.

Hardware and software to timing of adaptive predict. This tool includes two parts: software and hardware. Hardware sector includes keys for answering and a laser device**.** The subject takes a handle that a key located on it and responses to the stimuli by pressing it. Laser devices is installed on a stand and simultaneously with crossing the hand of the subject from its range space the moving light stimulus on the screen using the software is designed is stops. This tool has the ability to change many variables affecting the forecasts used to move people and the ability to reprogram. The validity of this application estimated using concurrent validity and by Basin predictive timing devices by using 30 subjects which the value of correlation obtained 0.83. To determine the reliability of the device

test - retest was used and during which, from a total of 100 subjects were assessed in two stages the reliability of this device is 0.87.

The method of conducting research

Perceptual-motor training, intervention programs developed by Dehghan [2010] which consists of nine main axis. These 9-axis including: Balance, hand-eye coordination, eye-foot coordination, coordination of bilateral upper limb, coordinating bilateral lower extremities, tetrapod coordination, muscle strength, upper extremity dexterity and speed and reaction time.

After giving information to parents of the subject and nature of research and taking the consent of their parents. Children were randomly divided into two groups: 15 patients [control and test].then the pilot phase of this research in the form of holding three sessions of 45 minutes per week and a total of 24 sessions [within 8 weeks] was conducted on the experimental group .in each session the children did exercises including being in a kneeling position and balancing on a wobble board [with open and closed eyes] walking with open and closed eyes on the balance beam, receive and throw the ball, draw a circle in the air with both hands while his legs hit the ground. After the intervention, related tests were conducted on both groups.

Data Analysis

To describe the data descriptive indicators such as central tendency [mean] and dispersion [standard deviation] were used. Tables and graphs were plotted with the help of EXCEL software. After ensuring normal data using Kolmogrov-Smirnov [K-S], the t correlated test was used to investigate the within group changes from pretest to posttest also to compare the means of the control and experimental groups to determine the effect of exercise intervention, independent t test was used. The analysis was performed using SPSS software version 20.in all cases the significant level was considered 0.05.

RESULTS

To compare the scores of subjects of the two groups the t independent test and to investigate the reaction time before and after the intervention in control and experimental groups correlated t-test was used. Given the amount of t obtained in Table 1 before the exercise program, there was no significant difference between the experimental and control groups [0.755]. But two months after the implementation of perceptual-motor training in the experimental group, the difference was significant between the two groups [0.001] [P<.05] Also correlated t-test results indicate a significant difference before and after the intervention in the experimental group [0.001] [P<.05]. While the difference was not significant in the control group [0.615].

Table-1: Results of independent correlated t test to compare reaction time in two experimental and control groups

Group	Pretest	Posttest	T	Significance level

Experimental	80.45 ±548.13	73.41 ± 381.73	8.457	0.001
Control	90.88 ± 538.27	90.73 ± 536.93	0.515	0.615
Significance level	0.775	0.001		

Also, to compare the scores of the subjects of two groups the t test and to study predicting skill before and after intervention in control and experiment groups, the correlated t test was used. Given the amount of t obtained in Table 2 before the exercise program, there was no significant difference between the experimental and control groups [0.964]. But two months after the implementation of perceptual-motor training in the experimental group, the difference became significant between the two groups [0.004] [P<0.05] also the results of correlated t-test revealed a significant difference before and after the intervention in the experimental group [0.001] [P<.05]. While the difference was not significant in the control group [0.989].

Table-2: Results of independent and correlated t test to compare prediction in two experimental and control groups

Group	Pretest	Posttest	T	Significance level
Experimental	75.277*±94.40	2.846±33.60	3.504	0.004
Control	59.938±95.53	48.537±95.40	0.14	0.989
Significance level	0.964	0.001		

Discussion And Conclusion

The purpose of the present research was to study the 8-week effect perception-motor exercises on the reaction and prediction time of children suffering Attention Deficit Hyperactivity Disorder. Results obtained of this research showed that doing 8-week perception-motor exercises can improve reaction and prediction time in hyperactive children, significantly.in other words, the reaction and prediction time from pretest to posttest in experiment group in contrast to control group had meaningful change. Also in the posttest, revealed significant difference between reaction and prediction time of two control and experiment group.

The obtained results were consistent with findings of [9-11,16-19] The fact that perceptual-motor training plays an important role in the plasticity of the nervous system, has been proved well [29]. However, most researches conducted on ordinary people, or people with other disorders. In fact, perceptual-motor training through facilitate neural plasticity, creating new synaptic structures, decline of cognitive disorders [30], increasing visual perception by increasing visual signal productivity [31], improving cognitive and neurological health, increasing the performance of data processing , increasing the efficiency of neurotransmitters, neural adaptations, behavior and emotion regulation performance recovery [21] can improve productivity of neurophysiological, development of the brain and motor development and enhance nervous system function and cognitive performance [30]. And probably this issue is a cause to improving reaction time and prediction skills in children with ADHD. Various mechanisms suggested for this improving in reaction time and skill forecasts. One of the plausible mechanisms for this improving is to increase the heart rate due to exercise, increases blood flow in the cerebral cortex. And increasing cognitive function due to increased arousal [24] Also this reduction could result in improved concentration, alertness, muscle function and the speed and accuracy [32].

In order to justify these results can be refer to theories, Luria, a neuroscientist at the Russian [1966] who believes that vital motor learning relationship and cognitive growth can be detected. Also, Heb [1949] knows the motor learning as the integral part of the builder, sets of the brain cells and emphasizes its importance. Piaget [1936, 1952] also stresses that sensory-motor learning founded in the further complicated early stage of cognitive development and cognitive. Selective attention to certain stimuli or failing to timely respond to some of them often comes back to inadequate capacity of the path or our inability to address the same time to all sensory tips which in the effect of training of motor skills, increase nerve branches and the formation of new synapses following frequent use of neural pathways increases the ability of selective reaction. In fact, prolonged sensory stimulation increases the brain synapses and ultimately lead to sensory perception at a high level, which reduces the reaction and anticipated time [33]. The results of this study may be explained due to the action of Gibson's perception-action theory. According to this theory there is close internal relationship between perceptual system and motor system. The implied refers of these comments in motor development is that these capabilities do not change with a change in the person and lead to new movement patterns. Development size or increase motor abilities may provide the ability to do things which previously were not possible.

Gibson also rejected this thought which the central nervous system is the cause of unlimited computing performance to determine the speed and the orientation of person and moving things .According to Gibson, with continuous movement of the eyes, head and body can directly perceive their environment. This activity creates a space for visual flow which determines the spatial and temporal information. In fact it can be argued that perceptual-motor by strengthening the infrastructure of the system of perceptual-motor training, is strengthened motor skills and process information [34] on the other hand the reaction time is composed of two section of the time to move forward and departure time. During the pre-move time, perceptual or cognitive information processing stimuli takes place and on the movement time, the output of motor response begins. Christina and Rose reported that changes in reaction time, increase the complexity of the response and the resulting increase in the time ahead. Sheridan showed that the time of pre-moving is the respondent of in reaction time resulting from the increased speed of movement [35].

Thus, likely reducing the reaction time of the reaction because of doing perception-motor exercises, because of reducing time pre-moving or increasing speed of processing perception of cognition. Strengthening the motor system, strengthens the perceptual system and therefore cognitive processes such as reaction time and anticipation would be improved. Therefore, according to the results of this study and other studies, the researchers can be offered physical education teachers and coaches can be awarded of this method and by participating children in the regular motor activities lead to decline in the children disorders. However, the future should focus about the impact of targeted activities such as mentioned activities and other cognitive features, mental and physical-motor of hyperactive children to theoretical knowledge about these persons would be increased and become the way to design more effective training sessions and finally increasing educational and social efficiency of these kinds of people.

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