The Relationship between Attention and Some Coordination Abilities among Students in (6-9) Age Group

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Abstract

Purpose - The study aimed to identify the level of attention concentration and coordination abilities among the students in the age group (6-9) years, as well as the differences in these abilities levels according to the gender and the age group variables. In addition, the correlation between the level of mental and some coordination abilities. Methodology - The researchers used the descriptive approach on a sample consisting of (150) students within the age group (9-12) years, with (25) female students and (25) male students in each age group, as they were purposively chosen. The researchers used a drop test (PKT) to detect the ability to attention concentration as mental ability and some vocabulary of the (DKT) test and the Munich Fitness test (MFT) to detect some coordination abilities that included: dynamic balance test, side-to-side jumping for a period (15) seconds, ball bounces from standing position on a Swedish seat and the accuracy of aiming at a target. Consequently, to process the process, the researchers used means, standard deviations, one-way ANOVA, Scheffe, and Pearson correlation coefficient by using SPSS version 24 with a confidence level of 95% (p value= 0.05). Findings - The results of the study showed that there are statistically significant differences in the attention concentration ability and some coordination abilities such as dynamic balance and ball bounces from standing position on a Swedish seat for (30) seconds among students in (6-9) age group according to the gender variable and in favour male. And there are statistically significant differences at the level of ($\alpha \leq 0.05$) in the attention concentration ability and all coordination abilities among students of the 6-9 age group according to the age group variable and in favour of the older age group (8.99-8) years. The results of the study also showed a positive correlation with a statistically significant level ($\alpha \leq 0.05$) between the attention concentration and all coordination abilities.

Keywords: Attention concentration, Coordination abilities, Dynamic balance, Students, Age group (6-

9) years.

There is no doubt that the level of movement activities of our children has changed in the world we live in, which negatively affected not only their motor abilities and their motor system but exceeded this to negatively effect on their mental and psychological development (Zimmer, 2004). Where most the school students in all their age groups are distinguished by their lack of movement, this is due to the lack of optimal utilization of their free time for the movement and work (Weineck, 2003). The lifestyles of different age groups including children have become generally restricted to negative mental activities with narrow spaces, such as the use of visual aids represented in computer games and watching television. As a result, their motor deficits resulted in neglecting physical activities, which negatively affected their development in various fields (Dordel et al., 2000; Graf, 2016). The problem with these methods is that their use is limited to entertainment only and long hours (Witting, 2007).

One of the main factors that may affect children's participation in physical activity is their level of motor skills, as this participation decreases with disturbances in their coordination abilities (Cairneg et al., 2005; Hands & Larkin, 2006; Baerg et al., 2011). Consequently, this can adversely affect their physical fitness level, so that they become at a low-efficiency level of the cardiac respiratory system and muscle strength (Cantell et al., 2008). The low level of motor skills is also associated with a lack of attention and focus (Chen et al., 2009). Dewey et al. (2002) indicate that 50% of children with motor difficulties were diagnosed concurrently with attention deficit hyperactivity disorder. Children with better motor ability have better cognitive performance, on the other side; children with a lower physical fitness level may have less cognitive abilities (Pontifex et al., 2012).

Coordination capabilities contribute to improving the executive functional capabilities among the children (Stein et al., 2017). It also contributes significantly to the development of the attention level (Gollott et al., 2015). Noting that the academic achievement among the child and the ability to perform motor skills depends on the attention level through its influence on the quality of sensory stimulation treatment, which is important in planning and controlling multiple movements (Sundermier et al., 2001). Similarly, coordination abilities and physical fitness are associated with a positive relationship with academic achievement (Ruiz et al., 2010; Rasbrry et al., 2011; Dumith et al., 2011). Where attention deficit hyperactivity disorder is the most common neuropsychiatric disorder in childhood and affects 3-6% of children in school and often affects multiple areas such as adaptation to people, school and family (Oliveira et al., 2009). They may also encounter difficulties in motor coordination tasks such as picking things and difficulties in running side-to-side (Vidarte et al., 2009).

The importance of the promotion and development of children in the early age groups is associated with many future benefits associated with motor efficiency (Lubans et al., 2010). Also, childhood is a crucial period for the development of basic motor skills, which in the future contribute to the development of more complex motor skills (Clark & Metcalfe, 2002). Note that when children engage in physical activity, they will have a better concentration level (Gallotta et al., 2015). Where it can be noted that attention is a comprehensive term for all forms of knowledge that includes both intelligence, language, thinking, problem-solving, attention and focus through its close association with cognitive processes such as inference (deduction), judgment on something, in addition to all of the strategies for learning, retaining, Abstract and Logical (Gerrig & Zimbardo, 2008). Hollmann & Strueder (2003) stated that the movement of motor activities has a positive effect on the brain, as the dynamic

motor activities and the motor abilities work to supply the brain with oxygen through the increase in blood perfusion, as well as increase the production of nerve cells, especially in (Hippocampus, (Cortex) and (Cerebellum) also the coordination abilities lead to an increase in the intensity of synapses, which leads to an increase in the capacity and efficiency of long Term Memory, which positively affects both learning and remembering.

The problem of this study arises from the fact that the nature of the lack of movement in our societies has become evident in our daily lives, including in educational institutions, especially schools, and we find a lack of student movement due to the prevailing educational pattern in which the student moves from one class to another and from one lesson to another while he is performing his lessons and duties sitting without any movement, which negatively effects on the coordination abilities among students. On the other side, motor abilities play an essential role in the practice of various motor activities and are considered the cornerstone from which the individual begins to move towards practice and then excel and achieve. Therefore, this study aimed to identify the level of attention concentration and coordination abilities among the students in the age group (6-9) years, as well as the differences in these abilities levels according to the gender and the age group variables. In addition, the correlation between the level of mental and some coordination abilities.

Methodology

Participants

To achieve the objectives of the study, we have been using the descriptive approach and attention concentration test, some vocabulary of the (DKT), and the Munich Fitness test (MFT) on 150 (75 boys; 75 girls) healthy student's in Mafraq Governorate. The chronological age with two decimals was calculated for each child as the difference between test date and birth date, where 6 -6.99 years refers to age group (6) years, for example. The age range of the 150 students at baseline spanned from sex years (25 boys; 25 girls), seven years (25 boys; 25 girls), and eight years (25 boys; 25 girls), Table 1 shows a description of the study sample.

Table 1 Characterization of the study sample according to the gender variable (n=150)

Variables	Gender	Lowest value	Height value	Means	Standard deviation
Height/ m	Male	1.11	1.30	1.23	0.07
	Female	1.11	1.30	1.22	0.07
Mass/ kg	Male	18.00	27.00	22.68	2.97
	Female	18.00	28.00	22.45	2.44
Body mass index (BMI)/ kg/m²	Male	13.22	16.74	14.94	0.81
	Female	13.43	17.92	15.01	0.81

Tools

The researchers use the following tools: stopwatch (4), Swedish seat (4), ball (4), numbered ruler (4), tape measure for length (4), balance scale to measure (4), adhesive tape Length (1) meters and width (30) cm, (4), wooden beams, length (3) meters and height (5) cm, different width (3, 4.5 ,6) cm (1), plastic cones (6), chalk , 500g sandbag, whistle, coach registration form.

The tests used

The researchers use the following tests:

1- Mental ability test: The researchers used a drop Punktier test (PKT) to detect the ability to attention concentration as a mental ability and this test template were created by Prof. Dr. Fried helm Schilling developed and are designed for children from 5 to 12 years. They should serve to check the development of the fine motor performance of both hands and to determine the respective form of handedness of the test person. The puncture test is based on the child being

punctured along an outline with 150 small circles - with both the right and the left hand within (90) seconds and at the same time, it is looked at how exactly the individual circles are hit. The templates are printed in green and it is recommended that the test be carried out with a red marker so that the accuracy of the puncturing can be clearly seen).Schilling, 2009(.

2- Coordination abilities test: The researchers used the Dordel-Koch test (DKT) and this test is a heterogeneous test battery for children and adolescents between the ages of six and 16, which has been put together from seven established, valid basic tests: the side-to-side jumping, the sit and Reach, the sit-ups, the long jump, the one-leg stand, the push-ups, and the 6-minute run. It is characterized by economical and practical handling and enables the test to be optimally adapted to the respective resources (low material and time expenditure) compared to most other test batteries. Also the Munich Fitness Test (MFT) was used to evaluate the physical fitness levels. The MFT is a valid and reliable test for assessing essential parameters of physical fitness such as power, strength, strength, flexibility, speed, balance, and coordination in children. The test consists of six different parameters, including balancing and bouncing (speed and coordination), accurate throw (speed and coordination), trunk flexibility, vertical jumping (power), hanging (endurance and muscular strength), and step test (cardiorespiratory endurance, speed, and coordination). After all the parameters are completed, the score of each parameter is calculated from the standardization chart according to age and sex. This total score is divided by the number of parameters and recorded as MFT total score (Arikan et al., 2015(. Based on the previous presentation, the researchers used the following tests (dynamic back balance, side-to-side jumping for a period (15) seconds, ball bounces from standing position on a Swedish seat for a period of (30) seconds, and the accuracy of aiming at a target tests.

Study variables:

1-The independent variables: the age group (6-9) years, gender.

2- Dependent variables: attention concentration level, dynamic back balance, side-to-side jumping for a period (15) seconds, ball bounces from standing position on a Swedish seat for a period of (30) seconds, and the accuracy of aiming at a target tests.

Scientific coefficients of the study tool

To verify the stability coefficient for the study tests, the researchers used the (Test- R test) on (30) students. The test was re-applied after a week from the first application on the same sample that was excluded from the original sample of the study. In order to verify the test's validity, the researcher used Internal-Consistency. Table 2 shows the stability coefficient of the study tests.

Table 2. The results of the stability coefficient for study tests (n=30)

Tests	Stability coefficient	Validity coefficient
Drop test (Punktiertest (PKT)	0.87	0.89
Dynamic back balance	0.84	0.85
Side-to-side jumping for a period (15) seconds	0.82	0.91
Ball bounces from standing position on a Swedish seat for a period of (30) seconds	0.78	0.89
The accuracy of aiming at a target	0.77	0.92

(*Significant for $\alpha \leq 0.05$)

Table 2. Shows the stability coefficient values of the study tests, which ranged from

(0.77 -0.87), and all of which are accepted stability coefficients and meet the study objectives.

Ethical considerations

They were provided with a comprehensive explanation that their involvement in the study was voluntary and that they could withdraw at any time and written approval was obtained from all study participants by the student's parent.

Statistical analysis

To achieve the objectives of the study, the researchers used means, standard deviations, one way ANOVA, independent samples T. test, Scheffe and Pearson correlation coefficient by using SPSS version 24 with a confidence level of 95% (p value= 0.05).

Results

This study aimed to identify the level of attention concentration and coordination abilities among the students at age group (6-9) years, Table 3 indicates the results among the study sample in examining the attention test and the differences in these results according to the gender variable.

Table 3. Results of (Independent Samples T-Test) among the study sample in the attention according to the gender variable (n = 150)

Number of attempts	Gender	Mean	Standard deviation	T	Sig.
Correct attempts	Male	60.65	22.17	3.00	0.00*
	Female	50.27	20.24		
Erroneous attempts	Male	106.23	23.01	2.68	0.01*
	Female	115.73	20.24		

(*Significant for $\alpha \leq 0.05$)

While Table 4 indicates the mean and standard deviations of the study sample results in the attention concentration test according to the age group variable.

Table 4. Mean and standard deviations of the study sample results in the attention concentration test according to the age group variable (n = 150)

Number of attempts	Age/ year	Mean	Standard deviation
Correct attempts	6-6.99	44.24	19.91
	7-7.99	55.46	16.06
	8-8.99	66.68	23.07
Erroneous attempts	6-6.99	121.76	19.91
	7-7.99	111.98	17.18
	8-8.99	99.32	23.07

To identify the fundamental differences in the means of the study sample results in the concentration test according to the age group variable, the researchers used one-way Anova, and Table 5 illustrates this.

Table 5. Results of the One-Way ANOVA for the study sample in the concentration of attention test according to the age group variable (n = 150)

Number of attempts		Sun of squares	df	Mean square	F	Sig.
Correct attempts	Between Groups	12588.84	2	6294.42	15.91	0.00*
	Within Groups	58140.42	147	395.51		
	Total	70729.26	149			
Erroneous attempts	Between Groups	12656.99	2	6328.50	15.49	0.00*
	Within Groups	59662.98	146	408.65		
	Total	72319.97	148			

Number of attempts		Sun of squares	df	Mean square	F	Sig.

(*Significant for $\alpha \leq 0.05$)

Where Table 5 shows the presence of statistically significant differences at the level of significance ($\alpha \leq 0.05$) in the students 'degrees of attention concentration test according to the age group variable. To find out the sources of these differences, a Scheffe test was applied for the Post Hoc and Table 6 shows that.

Table 6. Scheffe test results for the students 'scores in the attention concentration level according to the age group variable (n = 150)

Number of attempts	Age/ year	Mean	6-6.99	7-7.99	8-8.99
Correct attempts	6-6.99	44.24		-11.22*	-22.44*
	7-7.99	55.46			11.22-*
	8-8.99	66.68			
Erroneous attempts	6-6.99	121.76		9.78*	22.44*
	7-7.99	111.98			12.66*
	8-8.99	99.32			

(*Significant for $\alpha \leq 0.05$)

Table 7 indicates the results of the study sample in some coordination abilities and the differences in these results according to the gender variable.

Table 7. Results of (Independent Samples T-Test) among the study sample in the coordination test's according to the gender variable (n = 150)

Coordination test's	Gender	Mean	Standard deviation	T	Sig.
Dynamic back balance	Male	19.81	3.59	3.28	0.00*
	Female	17.97	3.27		
Side-to-side jumping for a period (15) seconds	Male	34.76	10.33	1.64	0.10
	Female	31.71	12.34		
Ball bounces from standing position on a Swedish seat for a period of (30) seconds	Male	24.37	4.73	3.69	0.00*
	Female	21.15	5.93		
The accuracy of aiming at a target	Male	9.48	1.57	1.31	0.19
	Female	9.15	1.51		

(*Significant for $\alpha \leq 0.05$)

While Table 8 indicates the mean and standard deviations of the study sample results in the coordination tests according to the age group variable.

Table 8. Mean and standard deviations of the study sample results in the coordination tests according to the age group variable (n = 150)

Coordination test's	Age/ year	Mean	Standard deviation
Dynamic back balance	6-6.99	16.28	3.04
	7-7.99	19.06	3.07
	8-8.99	21.34	2.54
Side-to-side jumping for a period (15) seconds	6-6.99	25.60	5.68
	7-7.99	32.80	10.11
	8-8.99	41.30	11.75
Ball bounces from standing position on a Swedish seat for a period of (30) seconds	6-6.99	19.64	4.00
	7-7.99	22.46	5.99

Coordination test's	Age/ year	Mean	Standard deviation
	8-8.99	26.18	4.58
The accuracy of aiming at a target	6-6.99	8.64	1.34
	7-7.99	9.02	1.50
	8-8.99	10.22	1.40

To identify the fundamental differences in the means of the study sample results in the coordination abilities according to the age group variable, the researchers used one-way Anova, and Table 9 illustrates this.

Table 9. Results of the One-Way ANOVA for the study sample in the coordination test are according to the age group variable (n = 150)

coordination test's		Sun of squares	df	Mean square	F	Sig.
Dynamic back balance	Between Groups	642.173	2	321.087	38.370	0.000*
	Within Groups	1230.120	147	8.368		
	Total	1872.293	149			
Side-to-side jumping for a period (15) seconds	Between Groups	6176.333	2	3088.167	34.003	0.000*
	Within Groups	13350.500	147	90.820		
	Total	19526.833	149			
Ball bounces from standing position on a Swedish seat for a period of (30) seconds	Between Groups	1076.040	2	538.020	22.158	0.000*
	Within Groups	3569.320	147	24.281		
	Total	4645.360	149			
The accuracy of aiming at a target	Between Groups	68.013	2	34.007	16.941	0.000*
	Within Groups	295.080	147	2.007		
	Total	363.093	149			

(*Significant for $\alpha \leq 0.05$)

Where Table 9 shows the presence of statistically significant differences at the level of significance ($\alpha \leq 0.05$) in the students 'degrees of coordination tests according to the age group variable. To find out the sources of these differences, a Scheffe test was applied for the Post Hoc and Table 10 shows that.

Table 10. Scheffe test results for the students 'scores on the coordination test's according to the age group variable (n = 150)

coordination test's	Age/ year	Mean	6-6.99	7-7.99	8-8.99
Dynamic back balance	6-6.99	16.28		-2.78*	-5.06*
	7-7.99	19.06			2.28-*
	8-8.99	21.34			
Side-to-side jumping for a period (15) seconds	6-6.99	25.60		-7.20*	-15.70*
	7-7.99	32.80			8.50-*
	8-8.99	41.30			
Ball bounces from standing position on a Swedish seat for a period of (30) seconds	6-6.99	19.64		-2.82*	-6.54*
	7-7.99	22.46			3.72-*
	8-8.99	26.18			
The accuracy of aiming at a target	6-6.99	8.64		-0.38*	-1.58*
	7-7.99	9.02			1.20-*
	8-8.99	10.22			

(*Significant for $\alpha \leq 0.05$)

Finally, Table 11 indicates the correlations between coordination abilities and attention among the study sample.

Table 11. Results of the Pearson Correlation between the coordination abilities and attention concentration (n = 150).

Coordination test's		Correct attempts	Erroneous attempts
Dynamic back balance	Correlation coefficient	0.18	−0.15
	Sig.	0.03*	0.07*
Side-to-side jumping for a period (15) seconds	Correlation coefficient	0.23	−0.22
	Sig.	0.01*	0.01*
Ball bounces from standing position on a Swedish seat for a period of (30) seconds	Correlation coefficient	0.24	−0.23
	Sig.	0.00*	0.01*
The accuracy of aiming at a target	Correlation coefficient	0.18	−0.15
	Sig.	0.03*	0.06*

(*Significant for $\alpha \leq 0.05$)

Discussion

Based on the previous presentation, the results of the study showed that the males excelled in attention concentration ability. Perhaps the reason for this is that most the male children depend on their free time to play various electronic games that require a large amount of attention and for long periods of time compared to their female peers. Similarly, the male superiority in the coordination abilities under study, where contributes significantly to the development of their attention concentration level. Where the male children are involved in physical activities more than females, accordingly, when children engage in physical activity, they will have a better concentration level. The researchers believe that the practice of motor activities has a positive impact on their brains. Dynamic activities and kinetic abilities work to feed the brain with oxygen through the increase in blood perfusion, as well as increase the production of nerve cells, especially in (Hippocampus, Cortex) and (Cerebellum). The coordination abilities lead to an increase in the intensity of synapses, which leads to an increase in the capacity and efficiency of long Term Memory, which positively affects both learning and remembering. Noting that the level of attention is affected by many factors, including interests and tendencies. Thus, this result is consistent with the study results (Khashouqa, 2019), which showed that there are statistically significant differences at the level of ($\alpha \leq 0.05$) in the field of interest in practicing school sports and the field of physical and athletic activity in the school according to the gender variable and in favor of males.

From the above, the results indicated that the age group (8-8.99) years achieved the best concentration of attention results, followed by the age group (7-7.99) years, while the lowest results were achieved in the age group (6-6.99) years. As he gets older, his higher mental processes, such as focus, attention, the information processing process that takes place through specific areas of the cerebral cortex, and the coordination abilities that are controlled and processed by the central nervous system and specific fields in the cerebral cortex also expand. It agrees with the study (Bataina and Al-Aqili, 2018) that showed statistically significant differences at the level of ($\alpha \leq 0.05$) in the mental abilities level as well as in the motor abilities level and in favor of the age group (8-8.99) years.

The male also outperformed one of the coordination abilities of the motor test and

represented in the dynamic back balance, the ball bounces from standing position on a Swedish seat for a period of (30) seconds and the motive behavior practiced by male students of the age group (6-9) years can be a reason for this. Where this kinetic behavior of males depends on basic motor skills such as running, jumping, and rope which leads to the development and development of the muscular strength of the lower limbs. In addition, their practice of motor activities, whether individual or group, depends on motor balance and basic motor skills such as throwing, licking, weighting, and attachment, and practicing some group movement activities such as basketball and football. Which are intransigent on stable balance as well as eye compatibility with hands like bouncing and the ball bounces. Also, males excel in muscle mass compared to females. On the contrary, we find that the females to the games that are characterized by motor compatibility and accuracy and away from games that are rough. On the other side, the results of the study showed that there were no statistically significant differences at the level of ($\alpha \leq 0.05$) between students 'degrees with regard to the harmonic capabilities represented in the motor test jumping free for a period of (15) and the accuracy of aiming at the target despite the superiority of the males. These motor skills Characterized by accuracy do not depend on the muscle strength of the upper limb but rather on the motor precision.

From the above, the results indicated that the age group (8-8.99) years achieved the best coordination results, followed by the age group (7-7.99) years, while the lowest results were achieved in the age group (6-6.99) years. Perhaps the development contributes to the efficiency and functional ability of the central nervous system with age as a reason for that, as the stages of information processing systems are represented by sensory inputs, sensation, choice of response, response programming, and kinematic outputs that they go with all individuals with the same principle and arrangement, but this does not mean that they are going for each individual with the same speed and accuracy, that is, the level and quality of the treatment process determines the quality of these outputs. (Weineck, 2003) indicates that the development of kinetic speed as well as the reaction speed in middle childhood is increasing with increasing age, as well as the kinetic speed and especially the speed of repetitive movements in this age group is increasing with increasing age, and this is reflected in the development of Rhythmic ability, given that the kinetic duty is easy and not complicated, as is the case with single movements.

Finally, the results showed that there is a statistically significant correlation between the correct attempts and the coordination abilities under study as there is a correlation between the concentration of attention that is addressed through specific areas of the cerebral cortex and the coordination abilities that are controlled and treated by the central nervous system and specific fields of the cortex Cerebral also so that these regions are common to both mental and coordination abilities. Where, Chomitz et al (2009) indicate that there is a positive correlation relationship statistically between some motor abilities and academic achievement in mathematics and English. Also, Memmert & Weickgenannt (2006) indicates a strong statistically significant correlation between the concentration of attention ability and exercise. While the study showed an inverse relationship with statistically significant between the attention with regard to the number of erroneous attempts and coordination abilities represented in the motor test side-to-side jumping for a period (15) seconds and ball bounces from standing position on a Swedish seat for a period of (30) seconds where all transactions Correlation is negative and statistically significant.

Conclusions

One of the main factors that may affect the participation of children in physical activity is

their motor skill level, as this participation decreases with the presence of disturbances in the coordination abilities, and therefore this can negatively affect the level of their physical fitness so that they become at a low level in the efficiency of the cardiac respiratory system and muscle strength, as well as it is related to the low level of motor skills due to lack of attention concentration, as this study showed that the superiority of males in the level of concentrated attention, the coordination abilities under study, and in favor of the older age group. With statistically significant correlations between coordination abilities and attention concentration. In light of these results, the researchers recommend the necessity of activating the sports education classes in this age group, especially among females, while emphasizing that the practice of physical activities does not negatively affect the academic student's achievement.

Conflict of Interest Statement: We declare no competing interests.

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