The effect of a sports program for developing sensorimotor control on the efficiency of the vestibular apparatus and some motor abilities of blind girls

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Abstract:

The research aims to identify the effect of a mathematical program for developing sensorimotor control on the efficiency of the vestibular apparatus and some of the motor abilities of blind girls.

The two researchers used the experimental method by using the method of pre- and post-measurement for one group on a sample of blind (partial blind) female primary school students (9-13 years).

The pre-measurements were carried out and included the measurement of (sensorimotor control - the efficiency of the vestibular apparatus - motor abilities), then the sports program was applied to develop sensorimotor control for a period of three months with two units per week. **The following conclusions were reached:**

1- The proposed sports program has a positive effect in improving the sensorimotor control of the blind girls, the research sample.

2-The proposed sports program for the development of sensorimotor control affects the efficiency of the vestibular apparatus for the blind girls, the research sample.

3-The proposed sports program for the development of sensorimotor control affects the improvement of the kinetic abilities of the blind girls, the research sample.

The most important recommendations recommended by the researcher:

1- Applying the proposed sports program for developing sensorimotor control within schools and institutions for the blind because of its effective role in improving their sensorimotor control.

2- Using the proposed sports program to develop sensorimotor control in order to improve the efficiency of the vestibular apparatus for the blind.

3- Using the proposed sports program to develop sensorimotor control in order to improve the motor abilities of the blind.

4- Applying the proposed sports program for developing sensorimotor control in schools and institutions for people with special needs (of all categories) because of its effective impact on improving sensorimotor control and improving the efficiency of the vestibular apparatus and improving their kinetic abilities.

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Introduction and research problem:

The sense of sight is one of God's blessings on man, that has a great role in his life, blindness is one of the most sensory disabilities that affect daily human life, asit affects negatively on one's performance and growth.**(22:29) (15:137)**

Alaa El-Din Saleh (2018) and Abdel-Muttalib El-Qaryouti (2005) have agreed that an individual who suffers from visual impairment is unable to practice many activities m, and this leads to disturbance of his movement, limited mobility, control of his environment. This increase his feeling of fear, insecurity, anxiety, hesitation and caution in general, and avoiding exposing himself to new external experiences in his environment in particular, and limiting the opportunities for playing and exploring the components and features of his external environment, and then decreasing his learning opportunities to benefit from them, due to the shortcomings that lead to him in his motor skills, mobility difficulties, and his perception of spatial relationships, such as distances and directions. (13:360) (14:141)

Children with visual disabilities have less opportunities to acquire motor skills. These problems are represented in standing or sitting, walking, running, receiving and eating, and their motor abilities such as balance, strength, flexibility and agility. (5:18) (25:45) (38:213)

The blind person can overcome his disability by relying more on the vestibular system and the motor sense organs, by increasing the dependence on the sensory receptors in the muscles, tendons and joints, which send sensory nerve signals about the positions of the different parts of the body, the accuracy of movement in the space and the extent of muscle shortening or lengthening. This information is sent to the nervous system, which sends signals to the muscles for contraction and motor control. The blind person also depends on the sensory receptors of the vestibular system in the middle ear, which is responsible for the responses related to stability, balance, and the harmony of muscular work that maintains the integrity and balance of the body.(1:3) (16:319,320) (3:122) (15:238)

The development of kinesthetic control of the blind depends on a set of integrated kinesthetic and sensory exercises, aimed at reaching the blind to the stage of moving with complete independence and developing his personality, and its program focuses on the extensive use of all abilities and senses of the blind individual such as hearing, touch and the ability to remember, and using his sense of placing his body in the void, awareness of directions. (21:49)

Aladdin Ibrahim (2018) confirmed the need to pay attention to the development of the blind's motor abilities of strength, agility, flexibility, compatibility, static balance and motor balance, and the development of the body's balance system for the blind by increasing the reliance on sensory receptors in muscles, joints and tendons, as well as improving the

efficiency of the vestibular system through balance exercises .(14:14)

This study is one of the scientific attempts that sheds light on the blind category, which is considered the most social group in need to use and develop kinesthetic awareness to improve their life skills and treat their movement disorder. Thisencouraged the two researchers to do a study using a sports program to develop sensory-motor control that contains exercises to develop awareness of space and awareness of distances and directions, exercises to develop body awareness and morphological control, and exercises to develop static and kinetic balance, harmony, strength, flexibility and agility, in order to identify the impact of a sports program to develop kinesthetic control on the efficiency of the vestibular apparatus and some motor abilities of the blind.

Second: Research Objectives:

The research aims to identify the effect of a sports program for developing sensorimotor control on the efficiency of the vestibular apparatus and some of the motor abilities of blind girls, through:

1- Recognizing the percentage of improvement in the sensorimotor control of the blind.

2- Identifying the percentage of improvement in the efficiency of the vestibular apparatus for blind girls.

3- Identifying the percentage of improvement in the motor abilities of the blind.

Third: Research hypotheses:

1- There are statistically significant differences between the pre and post measurements of sensorimotor control for the post measurements of the blind.

2- There are statistically significant differences between the pre and post measurements of the efficiency of the vestibular apparatus for the post measurements of the blind.

3-There are statistically significant differences between the pre and post measurements of motor abilities for the post measurements of the blind.

Fourth: Research procedures:

Research Methodology:-

The two researchers used the experimental method for its suitability to the subject and nature of the research, using the method of pre-post measurement for one group.

Research ranges:

Spatial range: Al-Nour School for the Blind in Alexandria .

Time range: the second semester of the academic year 2020-2021.

The human range: the blind (partially handicapped) female primary school students (9-13 years old) at Al-Noor School for the Blind.

Research sample:-

The research sample was chosen in an intentional way, as the original sample was (33) female students, they were divided into (12) female students as a basic sample and (12) female students as a pilot sample, and (9) female students were excluded for the following reasons:

- Students who have other movement disabilities:-
- Students who are frequently absent .

- Exclusion of older or younger female students from the age of (9-13) years.

The statistical description of the research sample is shown in Table (1):

Table (1)

The mean and standard deviation in the basic variables of the research sample (N=12)

Test	measruing unit	Mean	Median	standard deviation	skewness coefficient
Height	Cm	146.29	145.00	7.47	0.52
Weight	Kg	45.58	44.00	16.14	0.30
Chronological age	Year	11.9	11.00	0.94	0.32

It is clear from Table (1) the arithmetic mean and standard deviation in the basic variables of the research sample and that all the skewness coefficients are close to zero, which indicates the moderation of the values and the homogeneity of the blind sample members.

Search metrics:

Anthropometric measures:

Height measure: A restameter was used to measure the total length of the body to the nearest centimeter.

Weight measure: The medical scale was used to measure body weight to the nearest kilogram**.**

Chronological age (age): The chronological age was calculated to the nearest month at the beginning of the pre-measure of the research.

Sensorimotor control measure: The S3-Check system was used to measure:

- Right/left side balance.
- Front/back balance.

Measures of the efficiency of the vestibular apparatus(Berg scale for assessing balance): Attachment (2)

In measuring the efficiency of the vestibular system, the two researchers relied on the Berg scale for assessing balance, which was prepared by **Berg K, Wood-Dauphinee S, Williams JI 1995),** which uses an objective determination of the ability (or inability) to balance safely through a series of predetermined tasks, and the scale result is as follows (below 35 is poor, 35 to 40 is average, 40 to 45 is good, 45 to 50 is very good, greater than 50 is excellent) and its tests are:

-Sitting to standing.	-Standing with feet together	-Placing alternate foot on stool.
-Standing unsupported.	-Reaching forward withoutstretched arm.	-Standing with one foot in front.
-Sitting unsupported.	-Retrieving object from floor.	-Standing on one foot .
-Standing to sitting.	-Turning to look behind.	
-Transfers.	-Turning 360 degrees.	
-Standing with eyes closed.		

Measures of kinetic abilities: Attachment (3)

- Static Balance: One-footed standing test (second).

-Kinematic Balance: walking test on Swedish bench (second).

- **Agility**: - Zigzag running test (second)

- **Flexibility**: stump flexion test from standing (cm) -

-Compatibility: - the test of the reversal of the reciprocal exchange of the legs and arms (second)

- **Strength**: Right-hand fist strength test (kg)&Left- hand fist strength test (kg) .

Search procedures:

1- The two researchers made a comprehensive survey of scientific references and scientific studies related to the topic of research to determine and design expert opinion poll forms for:

- Exercises for the development of sensorimotor control for blind people.

- The important kineticabilities of the blind.

- Tests the important kineticabilities of the blind.

The program for developing Sensorimotor control for blind girls included:

* Exercises to develop awareness of space: awareness of distances and directions.

* Exercises to develop body awareness and postural control.

* Exercises to develop kineticperception with auditory discrimination.

* Exercises to develop stable balance.

* Exercises to develop kinetic balance.

* Exercises to develop coordination and neuromuscular control.

* Exercises to develop (strength - flexibility - agility). Attachment (1)

2- (The program, kinetic abilities and tests) was presented to the experts through expert opinion poll forms.

* Finally, according to the opinion of the experts, the appropriate exercises for the blind were identified.

Table (2)

shows the percentage of expert opinions to determine the important motor abilities of blind girls N=9

N	kinetic ability	Total agreed opinions	Percentage
1	Speed	4	44,44
2	Compatibility	8	88,88
3	static balance	9	100
4	Respiratory circulatory endurance	4	44,44
5	Muscular strength	7	77,77
6	Muscular endurance	5	55,55
7	Kinetic balance	9	100
8	Agility	7	77,77
9	Flexibility	8	88,88

It is clear from Table (2) that the most important kinetic abilities of the blind, according to the experts' opinions, are compatibility, static and kinetic balance, muscular strength, agility and flexibility, where the experts' opinions increased by more than 65%.

Table (3)
shows the percentage of the opinions of the experts to know the kinetic abilities of blind girls N = 9

N	kinetic ability	The test	Agreeing opinions	Percentage
1	Speed	Running for (4) seconds with high start	4	44,44
		Running in place for (15) seconds	3	33,33
		Running for (10) seconds	2	22, 22
2	Compatibility	Reversing the opening and joining of the arms and legs.	8	88,88
		Rope skipping test per second	5	55,55
		crawl in (&) form	4	44,44
3	Balance	Standing on the two insteps	9	100
		Walking on a Swedish bench	9	100
		Walking forward on a drawn line on the ground	5	55,55
4	Arms muscular endure	Adjusted leaning /s	5	55,55
		Pull up	3	33,33
		Hold the arms folded / s	4	44,44
5	Power	Sitting from lying in 20s for both sexes	4	44,44
		Stretching to the highest rate	3	33,33
		fist strength test	7	77,77
6	Legs muscular endure	Vertical jump from standing with knees bent	5	55,55
		squat test	4	44,44
7	Agility	Zigzag running between the balls	7	77,77
		High speed running 40m	5	55,55
		Running around a circle	4	44,44
8	Flexibility	Bend the trunk from standing on a Swedish bench	8	88,88
		Bend the trunk forward from sitting	5	55,55

It is clear from Table (3) that the appropriate tests for measuring the kinetic abilities of blind girls, which exceeded 65%, according to the opinions of experts, are:

- Static balance: standing on one foot test with the stability of the middle / s.
- Kinetic balance: a walking test on a Swedish bench .
- Flexibility: the standing test bends the trunk over a Swedish bench .
- Strength: the right and left hand fist strength test .(dynamometer).
- Compatibility: The test of reversing the opening and joining of the arms and legs.
- Agility: a zigzag running test between the benches.

3- Then the two researchers did a pilot study on February 21st, 2021 to February 24th, 2021 to find out the scientific transactions to verify the validity and reliability of the tests, as well as verifying the appropriateness of the program exercises and tests and the ease of their application to the sample members.

Scientific coefficient:

Reliability coefficient:

To find the reliability of the kinetic abilities tests, the two researchers applied them to the pilot study sample, (12) female students, and repeat them at a period of two days.

Table (4)
shows the reliability coefficient for tests of kinetic abilities of the blind N=12

N	The tests	measrui ng unit	First apply		Second apply		reliability coefficient
			X1	Y1	X2	Y2	
1	Stand on one foot	Second	6,5	0,39	6,49	0,41	0,91
2	Walking on a Swedish bench	Second	13,72	1,32	13,75	1,35	0,92
3	Bend the trunk from standing	Cm	8,47	0,91	8,56	0,74	0,84
4	Right hand fist strength	Kg	17,13	2,29	17,25	1,96	0,93
5	left hand fist strength	Kg	17,00	1,58	17,56	1,37	0,92
6	Reverse the opening and joining of arms and legs	Number	1,64	0,08	1,66	0,07	0,77
7	zigzag running	Second	11,13	1,54	11,5	1,12	0,84

It is clear from Table (4) that the reliability coefficient is close to (1) , as its value ranged between (0.77) and (0.93), which indicates a high reliability coefficient.

Validity coefficient:

Table (5)
shows the statistical significance of the validity of the tests of kinetic abilities of the blind N=12

N	The tests	measruing unit	Upper quartile		lower quartile		Av.	(T) value	significance
			X1	Y1	X2	Y2			
1	Stand on one foot	Second	8,85	0,53	7,12	0,43	1,73	9,61	significant
2	Walking on a Swedish bench	Second	9,9	0,71	13,83	0,5	3,93	17,86	significant
3	Bend the trunk from standing	Cm	10,75	0,63	4,75	1,19	6,00	17,14	significant
4	Right hand fist strength	Kg	21,35	0,63	15,95	0,84	5,4	20,00	significant
5	left hand fist strength	Kg	20,98	0,68	15,7	0,12	5,28	29,33	significant
6	Reverse the opening and joining of arms and legs	Number	2,83	0,23	1,50	0,62	1,33	7,82	significant
7	zigzag running	Second	7,03	0,63	9,05	0,77	2,02	6,97	significant

Tabular value (T) at the level of 0.05 = 2.14

Table (5) shows that there are statistically significant differences at the level (0.05) between the upper and lower quartiles of the blind level in the kinetic abilitiestests, which ranged between (6.97) and (29.33), which shows that these tests distinguish and clarify the level of the blind.

4- pre-tests:

Pre-tests applied made between (2/27/2021 - 2/28/2021), and the moderation of the values and the homogeneity of the research sample were confirmed in the following tests:

Table (6)
shows the mean, standard deviation, median, and skew coefficient for the sensorimotor control test for the blind. N=12

sensorimotor control test	arithmetic average	Median	standard deviation	skew coefficient
Left/right sensorimotor control	6.180°	5.902	0.585	1.16
Forward/reverse sensorimotor control	6.193°	5.893	0.636	1.17

It is clear from Table (6) that the degrees of the skew coefficient in the sensorimotor control test are close to zero and are limited to (±3), which indicates the moderation of the values and the homogeneity of the sample members in those tests.

Table (7)
shows the mean, standard deviation, median, and skew coefficient for tests of the efficiency of the vestibular apparatus for the blind N=12

Berg scale tests	mean	Median	standard deviation	skew coefficient
Sum of Berg Scale tests	38.00	39.05	5.237	0.255

It is clear from Table (7) that the degrees of the skewness coefficient in the total of the Berg scale tests are close to zero and are limited to (±3), which indicates the moderation of the values and the homogeneity of the sample members in those tests.

Table (8)
shows the mean, standard deviation, median and skew coefficient for tests of kinetic abilities of blind people. N=12

N	The tests	kinetic abilities	mean	Median	standard deviation	skew coefficient
1	Stand on one foot	Static balance (s)	7,5	7,00	1,31	1,15
2	Walking on a Swedish bench	Kinetic Balance (s)	12,13	12	1,54	0,25
3	Bend the trunk from standing	Flexibility (cm)	8,7	8,5	0,31	1,94
4	Right hand fist strength	Strength (kg)	16,95	17,00	0,84	0,18-
5	left hand fist strength	Strength (kg)	16,7	16,5	0,67	0,90
6	Reverse the opening and joining of arms and legs	Compatibility (number)	1,87	1,9	0,33	0,27-
7	zigzag running	Agility (w)	11,75	11,5	0,43	1,74

It is clear from Table (8) that the degrees of the skew coefficient in the kinetic abilities tests are close to zero and are limited to (±3), which indicates the moderation of the values and the

homogeneity of the sample members in those tests.

5-The program was applied to develop the sensorimotor control for blind girls for a period of (12) weeks at two units per week, the time of each unit (45) minutes in the period (1/3: 31/5/2021). Attachement (1)

6- post-tests:

The post-tests were applies in the period (1/6/2021 - 2/6/2021).

7-Statistical coefficient:

- Mean.
- Standard deviation.
- Median.
- skew coefficient.
- Significance of Differences Test (T).
- Percentage.
- Effect Size.

Show presentation :

First: Presenting the results of the first hypothesis:

Table (10)

The significance of the differences between the pre- and post-measurement of sensorimotor control for blind girls N=12

N	sensorimotor control tests	Pre-measure		Post-measure		The difference		(T) Value	Effect amount
		X+	Y ±	X-	Y ±	X-	Y ±		
1	Right/left side balance	6.180	0.585	4.173	0.765	2.007	0.833	**9.332	2.410
2	front/back balance	6.193	0.636	4.447	1.032	1.747	1.162	5.823	1.503

T-value at significance level (0.01) = 2.977

It is clear from Table (10) that there are statistically significant differences between the pre-measurement and the post-measurement of sensorimotor control of right/left side balance and front/back balance for the post-measurement. This indicate the effect of the program in developing the sensorimotor control of the blind.

Second: Presenting the results for the second hypothesis:

Table (11)

The significance of the differences between the pre- and post-measurement of the efficiency of the vestibular apparatus for the blind girls. N=12

N	Vestibular apparatus efficacy tests	Pre-test		Post-test		The difference		Calculated (T) value	Improvement Percentage%
		X-	Y ±	X-	Y ±	X-	Y ±		
1	Reaching forward with outstretched arm	2.46	0.52	2.53	0.52	0.07	0.26	1.00	2.70

Follow Table (11)
The significance of the differences between the pre- and post-measurement of the efficiency of the vestibular apparatus for the blind girls. N=12

N	Vestibular apparatus efficacy tests	Pre-test		Post-test		The difference		Calculated (T) value	Improvement Percentage%
		X-	Y ±	X-	Y ±	X-	Y ±		
2	Retrieving object from floor	2.54	0.52	2.67	0.49	0.13	0.35	1.47	5.26
3	Turning to look behind	2.46	0.52	2.53	0.52	0.07	0.26	1.00	2.70
4	Turning 360 degrees	2.20	0.94	2.67	0.72	0.47	0.52	**3.50	21.21
5	Placing alternate foot on stool	2.07	0.46	2.20	0.41	0.13	0.35	1.47	6.45
6	Standing with one foot in front	2.07	0.46	2.27	0.46	0.20	0.41	1.87	9.68
7	Standing on one foot	2.07	0.70	2.20	0.41	0.13	0.52	1.00	6.45
8	Sitting to standing	3.40	0.51	4.00	0.00	0.60	0.51	**4.58	17.65
9	Standing unsupported	3.33	0.49	4.00	0.00	0.67	0.49	**5.29	20.00
10	Sitting unsupported	3.93	0.26	4.00	0.00	0.07	0.26	1.00	1.69
11	Standing to sitting	2.40	0.51	3.33	0.62	0.93	0.59	**6.09	38.89
12	Transfers	2.53	0.52	3.00	0.65	0.47	0.52	**3.50	18.42
13	Standing with eyes closed	3.93	0.00	4.00	0.26	0.07	0.26	1.00	1.67
14	Standing with feet together	2.59	0.52	2.66	0.59	0.07	0.46	1.00	1.68
Sum of the Berg balance scale (score)		38.00	5.24	42.13	3.80	4.13	1.77	**9.06	10.88

Tabular value "T" at the level of 0.05 = 2.145, at the level of 0.01 = 2.977

It is clear from table (11) that there are statistically significant differences between the pre- and post-tests of the efficiency of the vestibular apparatus for the post-test, as the percentage of improvement in the degree of the Berg scale was (10.88%), and the improvement rates in the tests of the scale ranged between (1.67%: 38.89%) for the post- tests. That indicates the effectiveness of the sports program in developing sensorimotor control in improving the efficiency of the vestibular apparatus for blind girls.

Third: Presenting the results of the third hypothesis:

Table (12)

The significance of the differences between the pre and post measurements of the kinetic abilities of the blind girls N=12

No	kinetic abilities tests	Pre-tests		Post-tests		The difference		Calculated (T) value	Improvement Percentage%
		X-	Y ±	X-	Y ±	X-	Y ±		
1	Static balance	5,2	2,23	11,5	3,41	6,3	154,1	*4,81	%90,15
2	kinetic balance	12,4	3,14	9,7	2,00	2,7	21,57	*5,51	%21,77
3	Flexibility	9,6	2,15	14,5	2,25	4,9	18,9	*10,65	%51,04
4	Right hand fist strength	17,2	4,02	21,7	3,04	4,5	48,5	*6,16	%26,16
5	Left hand fist strength	18,8	3,74	21,5	4,18	2,7	28,23	*4,82	%14,36
6	Compatibility	1,8	0,98	3,00	0,89	1,2	1,60	*9,23	%66,67
7	Agility	11,1	2,12	8,6	0,92	2,5	22,4	*5,00	%22,52

T-table value at the level of 0.05 = 1.83

It is clear from Table (12) that there are statistically significant differences between the pre and post measurements of kinetic abilities for the post measurement, and the improvement rate ranged between (14.36%: 90.15%), which indicates the effectiveness of the sports program for developing sensorimotor control in improving the kinetic abilities of blind girls.

Discussing the results:

It is clear from the table (10) that there are statistically significant differences between the pre and post measurements of the sensorimotor control of the right/left side balance and the front/back balance for the post measurements, the calculated “t” valu of the right/left side balance was (9.332) which is greater than the tabular value at the level of significance (0.01) which is (2.977),

and the effect size was (2.410) indicates a large effect size. and the calculated "T" value of the front/back balanc was (5.823), which is greater than the tabular value at the level of significance (0.01), which is (2.977), and the effect size was (1.503).This indicates the effectiveness of the sports program in developing the sensorimotor control of the blind girls.

The two researchers attributed these results to the use of the sensorimotor control development program, which consists of exercises to develop awareness of space and awareness of distances and directions, exercises to develop body awareness and postural control, and exercises to develop static and kinetic balance, harmony, strength, flexibility and agility.

The study of **Alexandra Halverson, & Mari Dohrn (2015)** also showed that the training program for sensorimotor control had a positive effect on improving self-efficacy in controlling balance, which led avoid falls, reduce the fear of falling, increase walking speed and improve physical functions. (27:417)

The results of this study agree with the study of **Kruis, BL. et al., (2006),**that showed a significant improvement in sensorimotor control capabilities with respect to left/right lateral balance and front/back balance as a result of practicing balance exercises. (33)

From the above, it is clear that the first hypothesis is achieved, which states that there are statistically significant differences between the pre and post measurements of sensorimotor control for the post measurements of the blind girls.

It is clear from Table (11) on the efficiency of the vestibular apparatus for blind girls that there are statistically significant differences between the pre and post measurements for the post measurements, where the percentage of improvement in the Berg scale reached (10.88%), and the improvement rates in the scale tests ranged between (1.67%: 38.89%)) for the post measurement, which indicates the effectiveness of the sports program for developing sensorimotor control in improving the efficiency of the vestibular apparatus for blind girls.

The two researchers attributed this to the effect of the sports program for developing kinesthetic control. The sense of balance of the body gives the blind a sense of safety, and there is a balance device in the semicircular canals of the ear, and any disturbance in it leads to feelings of nausea, anxiety and insecurity, as some individuals feel when staying in a boat that shakes in the sea, and the normal causes of blindness do not affect the balance**.** (22:43)

Ali Galal al-Din (2008) mentioned that the signals sent form the vestibular receptors distinguish the characteristics of movement: rotation, tilt, standing, sitting, lying down, as well as determining directions and positioning the center of the body weight. (33:17)

The results of the this study agree with what were confirmed by previous scientific studies and research, whereby balance and kinesthetic training programs can be

effective in improving transitional movements and balance and increasing the resistance of the vestibular apparatus, which increases its efficiency. (29: 655-660)

Thus , it is clear that the second hypothesis is achieved, which states that there are statistically significant differences between the pre and post measurements of the efficiency of the vestibular apparatus for the post measurements of the blind girls.

It is clear from Table (12) that there are statistically significant differences between the pre and post measurements for the post measurements, and the improvement rate ranged between (14.36%: 90.15%), which indicates the effectiveness of the sports program for developing sensorimotor control in improving Kinetic abilities for blind girls.

The two researchers attributed this to the positive effect of the sensorimotor control development program, which included exercises to develop some kinetic abilities in addition to sensorimotor control exercises, which led to the improvement of some motor abilities of the blind, which are balance, compatibility, strength, flexibility and agility.

Many scientific references agreed with what was shown by the study of The results of the this study agree with the study of Mustafa Sabah Saleh (2020) that programs for developing sensorimotor control affect positively on kinetic abilities such as static and motor balance, strength, flexibility, compatibility and agility. Kinetic abilities can be developed with training and practice.

From this, it is clear that the third hypothesis is achieved, which states that there are statistically significant differences between the pre and post measurements of kinetic abilities for the post measurements of the blind girls.

Conclusions:

According to the results of the study and in the light of the aims and hypotheses of the research and within the limits of the research sample and its characteristics, the following conclusions were reached:

1- The proposed sports program has a positive effect in improving the sensorimotor control of the blind girls, the research sample.

2-The proposed sports program for the development of sensorimotor control affects the efficiency of the vestibular apparatus for the blind girls, the research sample.

3-The proposed sports program for the development of sensorimotor control affects the improvement of the kinetic abilities of the blind girls, the research sample.

Recommendations:

Depending on the results that have been reached, and within the research sample, the two researchers recommend the following:

1- Applying the proposed sports program for developing sensorimotor control within schools and institutions for the blind because of its effective role in improving their sensorimotor control.

2- Using the proposed sports program to develop sensorimotor control in

order to improve the efficiency of the vestibular apparatus for the blind.

3- Using the proposed sports program to develop sensorimotor control in order to improve the motor abilities of the blind.

4- Applying the proposed sports program for developing sensorimotor control in schools and institutions for people with special needs (of all categories) because of its effective impact on improving sensorimotor control and improving the efficiency of the vestibular apparatus and improving their kinetic abilities.

First: Arabic references:

1- Amal ShafikAzab: The effectiveness of the central nervous system in response to sensory inputs to achieve balance and its relation to the skill performance level of rhythmic gymnasts. 13th International Scientific Conference, Physical Education and Sports, Faculty of Physical Education for Boys, Helwan University, 2010.

2- Abu El-Ala Abdel-Fattah, Muhammad SobhiHassanein: Sports Physiology and Morphology and Methods for Evaluation, first edition, Dar Al-Fikr Al-Arabi, Cairo, 1997.

3- Abu Al-Ela Abdel-Fattah: Physiology of Training and Sports, Dar Al-Fikr Al-Arabi, 2003.

4- Osama Riyad: Sports of the Disabled, Medical and Sports Foundations, Dar Al-Fikr Al-Arabi, 2005.

5- Eglal Yousry: Therapeutic Psychology, Alam Al-Kutub, Cairo, 1990.

6- Al-Bahnasy Amer Al-Halmoush: A water exercise program and its effect on improving the level of skill performance for abdominal crawling swimming, MA, Faculty of Physical Education for Boys, Helwan, 2005.

7- **Elaine Wadee Farag**: Experiences in games for young and old. Mansha'at al-Maaref in Alexandria, 1996.

8- Elaine Wadee Farag: The New in Tennis, The Road to the Championship, Mansha'at al-Maaref in Alexandria, 2007.

9- Elaine Wadee Farag: Tennis (education - training - evaluation - arbitration), Mansha'at al-Maaref, 2007.

10- Bahaa El-Din Ibrahim Salama: Physiology of sports and physical performance (blood lactate), first edition, Dar Al-Fikr Al-Arabi, Cairo, 2000 .

11- Abdul Hakim Ben Jawad Al-Matar, Adel Ali Hosni: Physical Education for People with Special Needs, King Saud University, 2015.

12- Abdul Muttalib Amin Al-Qaryouti: The Psychology of People with Special Needs and their Order, Dar Al-Fikr Al-Arabi, Cairo, 2001.

13- Abdel Muttaleb Amin El-Qaryouti: The Psychology and Education of People with Special Needs and their education , 4th Edition, Dar Al-Fikr Al-Arabi, Cairo, 2005.

14- Alaa El-Din Ibrahim Saleh: Physical Education for the challenger with Disabilities, Al-Kitab Center for Publishing 2018.

15- Alaa El-Din Muhammad Aliwa: sports exercises (strength - agility - speed - compatibility – balance- Flexibility), first edition, Mahi Publishing, 2009.

16- Ali Galal al-Din: Principles of Organ Physiology, first edition, Dar Al-Pharaohs, 2007.

17- Ali Galal al-Din: The Physiological Basis of Movement Activities, Dar Al-pharana, 2008.

18- Laila Zahran: The curricula in Physical Education, Dar Al-Fikr Al-Arabi, Cairo, 1991.

19- Mohammad Hassan Allawi, Abu Ela Abed Al-Fattah: Physiology of Sports Training, Dar Al-Fikr Al-Arabi, 2000.

20- Mohamed Hussein Abdel Moneim: The effect of a proposed kinetic education program on the static and kinetic balance of completely blind students from 7-9 years, MA, Faculty of Physical Education for Boys, Alexandria University, 2000.

21- **Mohamed Refaat Hassan Mahmoud**: Sports for the Disabled, Almaktabat almisria,2002.

22- **Mohamed Refaat Hassan Mahmoud**: Sports Training for the Blind, Almaktabatalmisria, 2006.

23- Mohamad NashaatTammom: Development of the characteristics of determining direction and distance and their impact on the most important manifestations of motor behavior among blind students from 6-10 years, Ph.D., Faculty of Physical Education for Boys, Alexandria University, 1997.

24- Mostafa Sabah Saleh: A rehabilitation program to improve Sensorimotor control and some kinetic abilities to prevent injuries in the elderly, Ph.D., Faculty of Physical Education for Girls, Alexandria, 2020.

25- Mona Sobhi Al-Hadidi: An Introduction to Sight Impairment, Dar Al-Fikr Al-Arabi, Cairo, 1998.

26- Youssef Shalabi Al-Zumet: Professional Rehabilitation for the Disabled, Dar Al-Fikr Al-Arabi, Amman, 2000.

Second: Foreign references:

27-Alexandra Halvarsson, Mari Dohrn (2015): Taking balance training forolder adults one step further:the rationale for and a descriptionof a proven balance training programme.Clinical Rehabilitation 2015, Vol. 29(5) 417– 425

28-Berg K, Wood-Dauphinee S, Williams JI : The Balance Scale: reliability assessment for elderly residents and patients with an acute stroke Scandinavian Journal of Rehabilitation Medicine 27, 27-36.1995.

29-Bulat T, Hart-Hughes S, Ahmed S, Quigley P, Palacios P, Werner DC and Foulis P: Effect of a group-based exercise program on balance in elderly. PubMed.p. 2(4):655-60.2007.

30-Gérome C. Gaucharda, Claude Jeandelb, AndréeTessierc and Philippe P. Perrin*:*Beneficial effect of proprioceptive physical activities on balance control in elderly human subjects**.** Neuroscience273 (2): 81-4**.** Oct 1999

31. James oat Judge : Balance training to maintain mobility and prevent disability).American Journal of preventive Medicine .p.150-156.200***3***

32- Jazi,S.D., purrajabi, f., movahedi, a., &jalali, s: effect of selected balance exercises on the dynamic balance of children with visual impairments . Journal of visual impairment& blindness, 106(8),466.2012..

33-Kruis, BL, Pol RJ van de, Oosten EC van, Stoltz NM and Vermolen SM: Feasibility of using Instumented Balance Analysis with the MFT S3® Stability Check. PubMed.2006.

34- Liu-Ambrose T, Khan KM, Eng JJ, Lord SR and McKay HA : Balance confidence improves with resistance or agility training. Increase is not correlated with objective changes in fall risk and physical abilities.p. 50(6):373-82.2004.

35-Ming-hsia Hu and Marjorie Hines Woollacott*:* Multisensory training of standing balance in older adults: I. Postural stability and one-leg stance balance . PubMed. P. 49(2):M52-61 ,1994**.**

36-Nagy E, Feher-Kiss A, Barnai M, Domján-Preszner A, Angyan L and Horvath G: Postural control in elderly subjects participating in balance training. PubMed. P.100(1):97-104,2007.

37-Prasansuk S, Siriyananda C, Nakorn AN, Atipas S and Chongvisal S : Balance disorders in the elderly and the benefit of balance exercise. PubMed. P.87(10):1225-33.2004.

38- Skaggs , Hopper: Individuals with visuol impair mentareview of psycnomotorbehavior , adapted physical activity auarterly (cchmaignm,1111) OB (1) Jan 10-26-refs:23.1996.

39-Vladimir Ganda: The effectiveness of the physical sensory training program for elderly individuals with the history of the fall. Sports injuries and rehabilitation, University of California, USA 2: 139.2018.

Third: References from the Internet:

40- 64.http://srv2.eulc.edu.eg/eulc/Libraries/Thesis/BrowseThesisPages.aspx?fn=ThesisPicBody&BibID=10183571&TotalNoOfRecord=14&PageNo