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The effect of using core stability exercises on dynamic balance, some physical and skill variables for table tennis players

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Abstract

The The aim of this research is to designing a training program thru core stability exercises and observes the effect of this suggested program on dynamic balance, some physical and skills variables for Table Tennis players, the researcher used the experimental method for the one experimental group.

The research sample was been selected from players of the Alnasr sporting club in Oman. The sample of the research was (5) players, the researcher applied physical and skills abilities tests after that he applied the training program using core stability exercises for (10) weeks, then he performed measurements on Dynamic balance, some physical and skills variables test.

The results revealed that there were statistical differences between the Pre-measurement, Tracer- measurement, and the post-measurement regards variables Dynamic balance, some physical and skills variables the researcher recommended using the core stability exercises over the preparation period.

Keywords: Core stability exercises, Dynamic balance, physical variables, skills, table tennis, players.

Introduction

Karate Table tennis is distinguished from other sports by a great demand for its practice, as it is an interesting game that brings together many public and private advantages and benefits, which are not available in many other sports, which makes it at the top of friendly sports that are easy to practice to achieve various sporting and educational goals and purposes and this is evident. (12:9)

Basic Skills consider the backbone of table tennis, as they are the core of performance for this

activity. They also help the player in attack and defense to score points and win the match, Although the basic skills in table tennis seem easy to perform, they require great effort in learning and mastering them due to the difficulty of implementing them due to the small size of the table, the racket, and the ball, as its practice requires the player to have a high concentration of concentration as well as a high skill, physical, tactical and psychological ability to suit the nature of this sport. (23:33) (7:12)

It is known and scientifically proven that the mastery of basic skills is that the player training on them from a young age and continues to train on them in every training unit throughout his sporting life in the sports field, and it is clear that the player does not rise to the national level or the global level in his country unless these sports skills are fully mastered. (9:36) (22)

Also, preparing the player physically to meet the requirements of the sporting activity is considered one of the main duties of the sports training process, which leads to the progression of the training state of the player to reach the higher levels in the practiced activity especially in table tennis. (23:50)

And It is known in advance that skill performance is closely related to special physical and motor abilities, as the mastery of skill performance depends on the extent to which the requirements for this performance are developed in terms of special physical and movement capabilities such as (reaction speed - muscle power- flexibility - agility - etc.) and often evaluates the level of performance Skills utilizing the extent of the individual's acquisition of these special physical and movement variables. (8:165)

The muscles of the core are the main physical and muscular center for the distribution of movement in the body, and for example, if the player moves the arms or legs, then he feels the movement of the core muscles and feels his physical and muscular center and leads to ease of movement control. Therefore, centering is the basis of movement performance and it is scientifically proven that the stability of the trunk is the group of muscles that work the stability of the abdomen, back, and thigh to perform the skill efficiently. (17:23) (2:61) (1)

Numerous researches have proven the importance and extent of the stability and rigidity of the lower

part of the core in mastering human movements in general, as well as the increase in the efficiency of force production and the generation of more associated power and the movement of the limbs and control of their movements and the economy in the effort as a result of the stability and stability of the lower core area And surrounding muscles as a study by Sammson MK (2005)(20), Kibler (2006)(11), Willardson (2007)(24), Sata (2009)(19), Cissik, J.M. (2011)(6), Ali Hasoona (2012)(3), Sameh Tantawi, Sami Aker (2014)(18), Adel Muhammad (2017)(1).

Mohamed Sobhi (2004) believes that balance is an important physical ability that highlights its importance in daily life in general and in the field of physical education in particular, as it is an important component in the performance of motor skills, whether basic or complex skills. (16: 431)

And the researcher believes that all the general and special physical characteristics required for the player to be possessed must be developed, in addition to the stability training of the trunk, which plays an important role in maintaining the balance of the body during movement, as the positioning is the basis of good motor performance, which is reflected in the skillful performance of the player, which helps to prepare the players physically. To be able to fulfill the requirements of the game's performance (physically, skillfully, and strategically) and to achieve the best possible level of achievement.

In light of the above and through the researcher's work as a table tennis trainer in addition to teaching table tennis at the Faculty of Physical Education at Sadat University, he sees the need to pay attention to the development of some important elements of physical fitness, which is reflected in the level of skill performance, and this is what prompted the researcher to design a program for trunk stability exercises and know its effect On the motor balance and the level of performance of some motor skills in table tennis.

Aims of the research:

To design a proposed program for core stability exercises for table tennis players, in an attempt to find out:

1. The effect of the proposed program on the Dynamic balance for the sample under study.

2. The effect of the proposed program on the level of some physical variables for the sample under study.

3. The effect of the proposed program on the level of some skill variables for the sample under study.

Terminology of research:

Core Stability: The ability of the muscles of the abdomen**,** back**,** and thigh to control the movement performed. (21:31)

Dynamic Balance: The ability to maintain body balance while moving**.** (15:334)

Methodology:

The researcher used the empirical approach because it is suitable for the nature of this study where it relied on the experimental design of the measurements (pre-, tracer, and Post) of one experimental group.

Sample

The research sample was been selected from players (Men) of the Alnasr sporting club in Oman. The sample of the research was (15) players, (10) players were selected to conduct exploratory studies, and (5) players for basic study, the researcher applied physical and skills abilities tests after that he applied for the training program thru core stability exercises throughout (10) weeks, then he performed measurements on physical and skills abilities test.

Statistical characterization of the sample in the variables (Length, Weight, Age, and Training age) (N=10) (5 for exploratory studies & 10 for basic study)

Variables	Measuring Unit	Mean	Median	St. Deviation	Skewness
Age	Year	22.4	22	0.843	0.389
Height	CM	175.7	174.5	2.497	1.122
Weight	KG	74.1	74.5	2.998	0.096
Training Age	year	9.1	9.0	1.197	-0.233

Table (1) Shows the modality of the distribution of the sample in the variables (Length, Weight, Age, and Training Age) where the torsion coefficients

are limited to (±3) which makes it moderate in the distribution of the research sample in those variables.

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Table (2)
Statistical characterization of the sample in the physical and skill variables (N=10) (5 for exploratory studies & 5 for basic study)

Variables	Unit	Mean	Median	St. Deviation	Skewness
Muscular power	Meter	19.7	20	0.949	-0.234
Performance Endurance	Second	50.9	51	1.370	-0.104
Flexibly	cm	36.1	36	1.663	-0.145
Agility	Rept.	16.1	15.5	1.792	0.394
Coordination	Sec.	21.9	22	1.370	-0.104
Motor Speed	Rept.	15.4	15	1.776	1.320
Reaction Speed	Rept.	23.8	23.5	1.398	0.134
Precision	Rept.	22.3	22	1.567	1.546
Static Balance	Second	28.1	28	0.876	-0.223
Dynamic Balance	Degree	34.7	35	1.160	-0.342
Forehand counter drive	Rept.	7.4	8	1.578	-0.620
Backhand counter drive	Rept.	7.3	7.5	1.494	-0.140
Forehand Loop	Rept.	5.1	5	0.738	-0.160
Backhand Loop	Rept.	4.5	4	1.179	0.255

Table (2) Shows the modality of the distribution of the sample in the physical and skill variables where the torsion coefficients are limited to (±3) which makes it moderate in the distribution of the research sample in those variables.

The proposed program for the Core Stability program:

According to the set goals of the program with its 3 stages and the degrees of training loads, the schedule was set for 10 weeks, at the rate of 3 units of core stability program every week. Thus, the proposed program included 30 units. The duration of each ranged from 90 – 120 minutes. Then, the researcher applied for the proposed Core stability program on the sample during the sports season 2018 / 2019 starting from Sunday 14 / 01 / 2018 to Thursday 22 / 03 / 2018. The program was applied under the supervision of the researcher and his assistants in special preparation period.

Methods of data collection:

Reference survey:

The researcher surveyed studies and scientific references in table tennis and sports training science that was available to the researcher to identify the global and professional variables in the operation of the research, as well as identify options in measuring these variables, as well as surveyed scientific references specialized in the sport of table tennis, defines basic skills in the sport of table tennis.

The tools used in the research:

The tape measure to measure the length "in centimeters" - the device for the thrower of the table tennis balls - a medical scale to measure the body weight "in kilograms" - table tennis - table tennis balls - cones - medical balls 1.5 kg weight - chalk - stopwatch - meter tape to measure distance - long ropes – Swedish ball – Bands - training mattresses.

Physical and skills tests used in the study:

- Passing test in (10) seconds ... to measure Motor speed.
- Passing accuracy test of movement ... to measure accuracy.
- The triangular jump test ... to measure agility.
- Numbered circuit test ... to measure coordination.
- Throwing a medical ball 1.5 kg test ... to measure Muscular Power.
- Fleishman Test … to measure flexibility.
- Ball ejected machine test ... to measure the speed of the striking hand's response.
- Transition test between markers …to measure dynamic balance.
-Table test ... to measure performance endurance. (Edited by the researcher)
- Forehand counter drive test ... to measure Forehand counter drive.
- Backhand counter drive test ... to measure Backhand counter drive.
- Forehand Loop test ... to measure Forehand Loop drive.
- Backhand Loop test ... to measure Backhand Loop drive.

Scientific Transactions for Tests:

Validated Tests:

The validity of the tests was calculated by calculating the validity of differentiation by applying them to two groups of (5) players each. The first group represents AlNasr Sports Club players from the same

research community and outside the research sample, and the participants in the League Table Tennis (Distinguished Group), while the second group represents the non-performance category from AlNasr Club players (Undistinguished group) on Sunday 7/1/2018, and the following table shows the significance of the differences between the two groups in all tests.

Table (3)

The significance of the differences between the two distinct and non-distinguishing groups in physical and skill tests (N1=N2=5)

Variables	unit	Distinct G.		non-distinguishing		Average Difference	T.Test
		Mean	S.DEV	Mean	S.DEV		
Muscular power	Meter	19.8	0.837	14	0.707	5.8	9.333*
Performance Endurance	Second	43.6	0.548	51.8	0.837	8.2	41.000*
Flexibly	Cm	35.6	1.817	29.4	1.517	6.2	6.395*
Agility	Rept.	14.8	0.837	9.8	0.836	5.0	9.129*
Coordination	Sec.	14.6	1.157	21.2	1.304	6.6	5.880*
Motor Speed	Rept.	15.4	1.673	10.4	0.894	5.0	4.767*
Reaction Speed	Rept.	24.2	1.643	17.6	0.548	6.6	7.117*
Precision	Rept.	21.6	0.894	17.2	0.837	4.4	17.963*
Static Balance	Second	28.0	1.000	20.4	1.517	7.6	9.355*
Dynamic Balance	Degree	34.6	1.140	16.6	0.894	16	25.298*
Forehand counter drive	Rept.	7.8	1.643	3.8	0.837	4.0	5.657*
Backhand counter drive	Rept.	6.2	1.095	2.0	0.707	4.2	7.208*
Forehand Loop	Rept.	5.2	0.837	1.6	0.548	3.6	9.000*
Backhand Loop	Rept.	4.0	1.225	1.6	0.548	2.4	4.707*

"T" tabulated value at (0.05) = 2.306

Table (3) showing there are statistically significant differences between the (**Distinct group**/ **non-distinguishing group**) groups in the variables under study, which shows the difference between the two groups in these variables since the calculated "T" value is more than the tabulated "T" value. So that the tests can be used.

Stability for Tests:

To find the stability of tests, the researcher applied the test and repeat it with a time interval of six days, and the researcher used Pearson's simple correlation coefficient to find the correlation coefficient between the results of the first and second apply.

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Table (4)
The Correlation coefficient between the results of the first and second apply of the tests under research N= (5)

Variables	unit	First Apply		Second Apply		R
		Mean	S.DEV	Mean	S.DEV	Value
Muscular power	Meter	19.8	0.837	20.4	0.894	0.830*
Performance Endurance	Second	43.6	0.548	44.0	0.548	0.764*
Flexibly	Cm	35.6	1.817	35.4	1.949	0.974*
Agility	Rept.	14.8	0.837	15.0	0.707	0.845*
Coordination	Sec.	14.6	1.157	14.8	1.342	0.943*
Motor Speed	Rept.	15.4	1.673	15.6	1.342	0.869*
Reaction Speed	Rept.	24.2	1.643	24.0	1.000	0.913*
Precision	Rept.	21.6	0.894	21.8	0.837	0.869*
Static Balance	Second	28.0	1.000	28.2	1.095	0.913*
Dynamic Balance	Degree	34.6	1.140	34.8	1.095	0.921*
Forehand counter drive	Rept.	7.8	1.643	8.0	1.581	0.866*
Backhand counter drive	Rept.	6.2	1.095	6.4	1.095	0.721*
Forehand Loop	Rept.	5.2	0.837	5.2	1.095	0.764*
Backhand Loop	Rept.	4.0	1.225	4.2	1.304	0.939*

It is evident from Table (4) that the value of correlation coefficients between the first and second apply for all variables ranged between (0.721 - 0.974), and these values are statistically significant at a significance level (0.05), which indicates that they have high stability coefficients and the stability of the tests.

Statistical processing:

The researcher used the statistical program with the following statistical data: (Mean - Median - standard deviation - simple correlation coefficient Person – one way analysis of variance (Anova) - LSD test.

The researcher took (0.05) to be statistically significant.

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Results:

Table (5)
Statistical characterization of the pre-, tracer, and post for measurements of the research sample in the study variables N=5

Variables	Measurement	Mean	Median	St. Deviation	Skewness
Muscular power	Pre- Test	17.6	18	0.548	0.609
	Tracer- Test	20.6	21	1.517	1.749
	Post Test	25.4	26	0.894	1.258
Performance Endurance	Pre- Test	52.4	53	1.517	1.118
	Tracer- Test	50.4	50	0.894	2.236
	Post Test	46.2	46	1.304	0.541
Flexibly	Pre- Test	32.2	32	0.837	0.512
	Tracer- Test	34.8	35	0.837	0.512
	Post Test	37.0	37	1.225	1.361
Agility	Pre- Test	12.2	12	0.837	0.512
	Tracer- Test	14.8	15	1.304	0.541
	Post Test	15.8	16	0.837	0.5122
Coordination	Pre- Test	17.4	17	1.140	0.405
	Tracer- Test	16.2	16	1.095	1.293
	Post Test	13.6	14	1.140	0.405
Motor Speed	Pre- Test	11.8	12	0.837	0.512
	Tracer- Test	14.4	15	0.894	1.258
	Post Test	17.4	18	0.894	1.258
Reaction Speed	Pre- Test	20.2	20	0.837	0.512
	Tracer- Test	22.8	23	0.836	0.512
	Post Test	25.6	25	0.894	1.258
Precision	Pre- Test	20.6	20	1.342	0.166
	Tracer- Test	22.8	23	1.095	1.293
	Post Test	25.8	26	0.837	0.5122
Static Balance	Pre- Test	27.2	27	0.447	2.236
	Tracer- Test	30.4	30	1.140	0.405
	Post Test	34.8	35	0.837	0.512
Dynamic Balance	Pre- Test	33.8	34	0.837	0.512
	Tracer- Test	37.0	37	0.707	0.000
	Post Test	39.4	39	0.548	0.609
Forehand counter drive	Pre- Test	7.4	7	0.458	0.607
	Tracer- Test	9.8	10	0.837	0.512
	Post Test	12	12	0.707	0.000

Backhand counter drive	**Pre- Test**	5.6	6	0.548	0.609
	Tracer- Test	7.2	7	0.837	0.512
	Post Test	8.8	8	1.095	0.609
Forehand Loop	**Pre- Test**	5.6	5	0.894	1.258
	Tracer- Test	7.6	8	0.548	0.609
	Post Test	11.6	12	0.547	0.609
Backhand Loop	**Pre- Test**	4.6	5	0.548	0.609
	Tracer- Test	6.4	6	1.140	0.405
	Post Test	10.2	10	0.837	0.512

It is evident from Table (5), which indicates the homogeneity of the research sample and the possibility of processing it statistically.

Table (6)
One-way Anova of the pre-, tracer, and post for sample measurements in the variables under study N=5

Variables	Source of the contrast	Freedom Degree	Sum of squares	Mean squares	Anova Value
Muscular power	**Between Groups**	2	112.067	56.033	*11.936
	Within Groups	12	56.333	4.694	
	Total	14	168.400		
Performance Endurance	**Between Groups**	2	89.167	44.583	*17.735
	Within Groups	12	30.167	2.514	
	Total	14	119.333		
Flexibly	**Between Groups**	2	57.833	28.917	*30.174
	Within Groups	12	11.500	0.958	
	Total	14	69.333		
Agility	**Between Groups**	2	32.600	16.300	*13.647
	Within Groups	12	14.333	1.194	
	Total	14	46.933		
Coordination	**Between Groups**	2	42.100	21.050	*23.317
	Within Groups	12	10.833	0.903	
	Total	14	52.933		
Motor Speed	**Between Groups**	2	60.000	30.000	*10.800
	Within Groups	12	33.333	2.788	
	Total	14	93.333		
Reaction Speed	**Between Groups**	2	60.900	30.450	*17.539
	Within Groups	12	20.833	1.736	
	Total	14	81.733		

Precision	**Between Groups**	2	46.267	23.133	*7.571
	Within Groups	12	36.667	3.056	
	Total	14	82.933		
Static Balance	**Between Groups**	2	126.900	63.450	*27.687
	Within Groups	12	27.500	2.292	
	Total	14	154.400		
Dynamic Balance	**Between Groups**	2	65.600	32.800	*20.359
	Within Groups	12	19.333	1.611	
	Total	14	84.9333		
Forehand counter drive	**Between Groups**	2	38.100	19.050	*10.973
	Within Groups	12	20.833	1.736	
	Total	14	58.933		
Backhand counter drive	**Between Groups**	2	24.400	12.200	*14.640
	Within Groups	12	10.000	0.833	
	Total	14	34.400		
Forehand Loop	**Between Groups**	2	67.433	33.717	*12.844
	Within Groups	12	31.500	2.625	
	Total	14	98.933		
Backhand Loop	**Between Groups**	2	48.600	24.300	*6.888
	Within Groups	12	42.333	3.528	
	Total	14	90.933		

"F" tabulated value at (0.05) = 3.880

Table (6) shows that there are statistically significant differences at a level of significance (0.05) between the measurements of the pre, tracer, and post research sample in all the variables under study, and to clarify the significance of the differences between these measurements ... The researcher will calculate the lowest significant difference using the **LSD** test.

Table (7)
The significance of the differences between the averages of the measurements of the pre, Tracer, and post for in all variables of the sample under study

Variables	Measures	Mean	Deference between Means			LSD Value
			M1	M2	M3	
Muscular power	Measure 1	17.6		4.0*	7.2*	2.986
	Measure 2	20.6			3.2*	
	Measure 3	25.4				
Performance Endurance	Measure 1	52.4		2.5*	6.7*	2.185
	Measure 2	50.4			4.2*	
	Measure 3	46.2				
Flexibly	Measure 1	32.2		2.8*	5.2*	1.349
	Measure 2	34.8			2.3*	
	Measure 3	37.0				
Agility	Measure 1	12.2		2.7*	3.5*	1.506
	Measure 2	14.8			0.8	
	Measure 3	15.8				
Coordination	Measure 1	17.4		2.2*	4.5*	1.310
	Measure 2	16.2			2.3*	
	Measure 3	13.6				
Motor Speed	Measure 1	11.8		3.3*	5.0*	2.301
	Measure 2	14.4			1.7	
	Measure 3	17.4				
Reaction Speed	Measure 1	20.2		2.8*	5.3*	1.816
	Measure 2	22.8			2.5*	
	Measure 3	25.6				
Precision	Measure 1	20.6		3.0*	4.3*	2.409
	Measure 2	22.8			1.3	
	Measure 3	25.8				
Static Balance	Measure 1	27.2		4.5*	7.5*	2.086
	Measure 2	30.4			3.0*	
	Measure 3	34.8				
Dynamic Balance	Measure 1	33.8		3.3*	5.3*	1.749
	Measure 2	37.0			2.0*	
	Measure 3	39.4				
Forehand counter drive	Measure 1	7.4		2.8*	3.8*	1.816
	Measure 2	9.8			1.0	
	Measure 3	12				

Backhand counter drive	**Measure 1**	5.6		2.3*	3.0*	1.258
	Measure 2	7.2			0.7	
	Measure 3	8.8				
Forehand Loop	**Measure 1**	5.6		2.8*	5.7*	2.233
	Measure 2	7.6			2.8*	
	Measure 3	11.6				
Backhand Loop	**Measure 1**	4.6		2.3	4.8*	2.589
	Measure 2	6.4			2.6*	
	Measure 3	10.2				

Table (7) indicates that there are statistically significant differences at the level of significance (0.05) between the averages of the measurements of the pre, tracer and post research sample. In all variables in favor of the mean of the post measurement.

Discussion:

It is evident from the results of Table (6) that there are statistically significant differences at the level of significance between the measurements of the pre, tracer, and post research sample in the physical and skills variables, which are: (Muscular power, Performance Endurance , Flexibility , Agility , coordination , Motor Speed , Reaction Speed , Precision , Static Balance , Dynamic Balance , Forehand counter drive , Backhand counter drive , Forehand Loop, Backhand Loop) of the sample under study.

To clarify the significance of the differences between these measurements, the researcher calculated the lowest meaning difference using the **LSD** test to determine the significance of the differences between these measurements, as Table (7) indicates that there are statistically significant differences at the level of significance (0.05) between the averages of the measurements of the pre, tracer and post research sample In the physical and skills variables in favor of the mean of the Post measurement.

The researcher attributes these incident differences to the construction of the training program using core stability exercises that were applied during the special preparation period and the preparation for competitions on table tennis players for the sample

under study, which gives a positive indication of improvement in the level of physical and skills variables of the sample under study.

It is evident from Table (**7**) that showing there is statistically significant differences between the (pre, tracer, and post) measurements for the post measurement.

This is supported by **Chabut** (2009) that good and regular training of the core area leads to the cooperation between all the muscles in it and to perform the movements effectively and with more attractive force. (4)

This result is consistent with the results of the study of **Cissik, JM**.(2002)(5)**, Samson** (2005)(20), **Willardson** (2007)(24), **Kibler** (2006)(11), **Sata** (2009)(19), **Mohamed hamed** (2013)(14), **Ihab (2013)(10) Sameh** & **Sami**(2014)(18), **Mohamed Jamal** (2016)(13), **Adel Mohamed** (2017)(1) indicate that Core stability exercises programs lead to an increase and improvement in Dynamic Balance, Physical and skill level.

Through the above ... the researcher believes that the significance of the differences occurring between the averages of the research sample measurements is the subject of the research sample for the proposed core stability exercises program under consideration.

And which relied in its design on the scientific rules and foundations to develop and improve the level of physical and skill variables under study.

This result verifies the validity of what was stated in the hypothesis, which states that "there are statistically significant differences between the averages of the pre-, tracer- and post-measurements in the level of some physical and skill variables under study in favor of the post-measurement."

Conclusions:

According to the goals and nature of this study, and within the sample of the research and the methodology applied therein, as per the data collected by the researcher and the results of statistical analysis, the researcher reached the following conclusions:

1- The Core Stability exercises program is effective in the

improvement of Dynamic Balance for table tennis players.

2- The Core Stability exercises program is effective in the improvement of Physical Variables for table tennis players.

3- The Core Stability exercises program is effective in the improvement of some skills variables for table tennis players.

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