The effect of (strength – balance – stability) exercises in developing endurance of strength and muscular balance of the muscles in the middle of the body

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First Gate

Summary of the Research:

The effect of (strength – balance – stability) exercises in developing endurance of strength and muscular balance of the muscles in the middle of the body

## 1. Introduction and importance of research:

(Strength – balance – stability) exercises play a major role in improving strength levels to the athlete, and at the same time contributes to create muscular balance (Cabanas–Valdés, at all 2016). The disparity
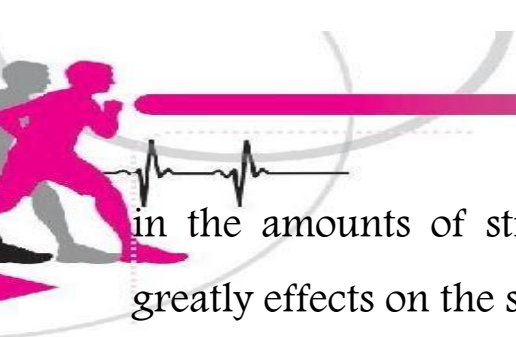
in the amounts of strength to the muscles in the middle of the body greatly effects on the safety of the player and the level of his performance. The trunk owns a great important in various sports. Therefore, the training of the muscles supporting the backbone must be coordinated. Not focusing on muscles without others during training, as this action poses a great danger to the safety of the boxer firstly, and secondly effects on the form and level of performance (Hamed, A., Bohm, S., Mersmann, F., & Arampatzis, A. (2018).

Hence, the importance of research comes from using (strength – balance – stability) exercises to develop endurance of strength and muscular balance of the muscles in the middle of the body. This helps to create muscular balance, which in turn contributes greatly to the safety of the player and increases the strength of the midsection of the body. As for the research problem, it was summarized in answering the following questions: first What is the difference in muscle strength ratios for a group of muscles in the middle of the body (spinal erectus, rectus abdominis, external or internal abdominal obliques). Second Do (strength – balance – stability) exercises have a positive effect on improving the muscular balance of the muscles in the middle of the body.

While the research objectives were coming as follows: Recognize the proportions of muscular balance for some muscles in the middle of the body, prepare (strength – balance – stability) exercises in order to develop endurance of strength and muscular balance of the muscles in the middle of the body, prepare special exercises to develop endurance of strength
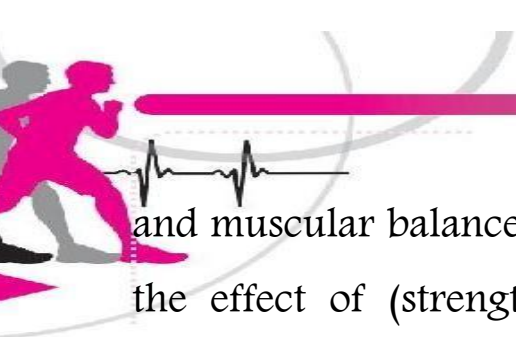
and muscular balance for the muscles in the middle of the body. identify the effect of (strength – balance – stability) exercises in developing endurance of strength and muscular balance of the muscles in the middle of the body. The researcher assumes that (strength – balance – stability) exercises have a positive effect on developing endurance of strength and muscular balance for the muscles in the middle of the body.

Third Gate:

3. Research Methodology and Field Procedures:

3.1 Research Methodology:

The researcher used the experimental method by designing two equal groups to suit the nature of the research problem, Table (1) shows the experimental design.

Table (1) shows the experimental design of the research.

Group	Measurements and Tests Before Exercise	Experimental Procedure	Measurements and Tests After Exercise
first experimental group	Strength endurance test for muscles (abdomen, back, right and left sides of the torso)	Exercises (strength – balance – stability) for the muscles in the middle of the body	Strength endurance test for muscles (abdomen, back, right and left sides of the torso)
second experimental group	Strength endurance test for muscles (abdomen, back, right and left sides of the torso)	Strength exercises (traditional) for the muscles in the middle of the body	Strength endurance test for muscles (abdomen, back, right and left sides of the torso)

3.2 Research Community and Sample :

The research sample was from Air Defense Club basketball players. The total number of the sample was 8 players, who were divided equally into two experimental groups. The first group used (strength – balance – stability) exercises, while the second group used moving strength exercises for the middle muscles.

3.2.1The homogeneity of the sample and the equivalence of the two groups:

To complete the requirements of the experimental design followed, the researcher verified the homogeneity of the research sample in the studied variables using the (Levine) test. The test showed the significance level value (.Sig) greater than (0.05) for all search variables. This indicates the homogeneity among the members of the research sample, as shown in Table (2).

In order for the researcher to attribute the differences to the experimental factor, the researcher conducted parity between the two research groups before starting to implement the exercises. The appropriate statistical method was used which represented by t-test. This test was used for independent samples of equal number in which the value of the significance level (sig.) greater than (0.05) and for all tests, which confirms the equivalence of the two research groups as shown in Table (2).
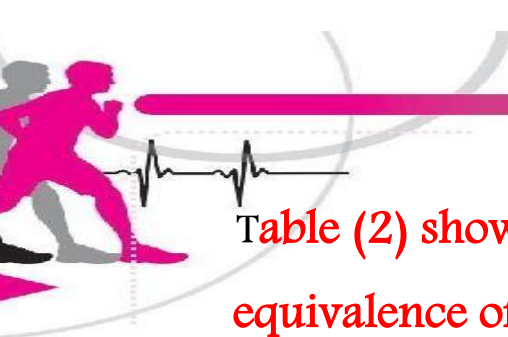
Table (2) shows the homogeneity of the sample and the equivalence of the two research groups in the variables investigated.

Ability	The Tests	The Measurement Unit	f. Value (Homogeneity)	Significance Level	Computed (t) Value (Equivalence)	Calculated Value of Significance Level	Statistical Significance
Endurance of the Strength	Rectus Abdominis Muscle	Once	2.33	0.165	0.16	0.55	Random
	Lower Back Muscles		0.003	0.95	0.092	0.92	Random
	External Abdominal Oblique Muscle		1.16	0.31	0.34	0.74	Random
	Internal Abdominal Oblique Muscle		1.52	0.25	0.57	0.58	Random

The researcher relied on the following equation to extract the equilibrium ratios between the working and opposite muscles (1):

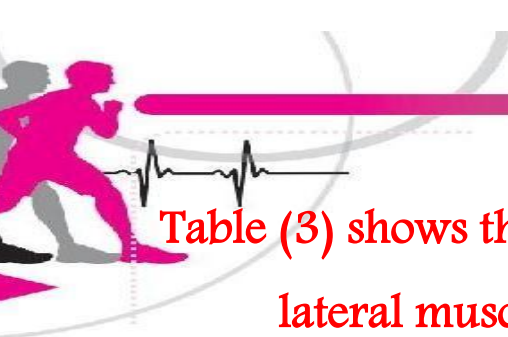$$\frac{front\ muscle\ ratio}{posterior\ muscle\ ratio} * 100$$

As below:

Table (3) shows the balance ratios between the lower back and lateral muscles of the trunk before the experiment.

Variables	The Measurement Unit	The Ratio %
Back muscles • abdominal muscles for the first experimental group		35.87
Back muscles • abdominal muscles for the second experimental group	Newton	37.82
Abdominal muscles, right side • left side, for the first experimental group		95
Abdominal muscles, right side • left side, for the second experimental group		94

Note that the ratio of the strength of the abdominal muscles to the strength of the back muscles in athletes is (65-80%) of the strength of the back muscles. While the ratios of strength for the external and internal abdominal oblique muscles are approximately equal.
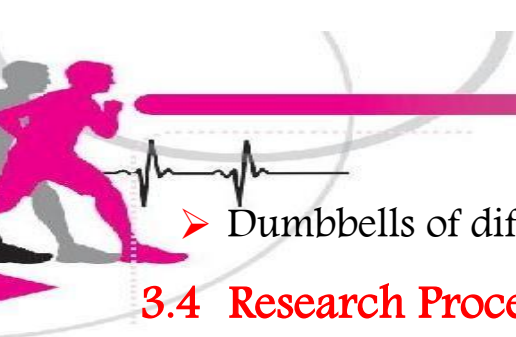
3.3 The means, devices and tools used in the research:

3.3.1 Data collection methods:

➢ Observation

➢ personal interview

➢ Tests and Measurement

➢ Experimentation

3.3.2 Equipment and tools used in research:

➢ tape measure

➢ one laptop Lenovo version made in China.

➢ Stopwatch

➢ flat belly

➤ Dumbbells of different weights

3.4 Research Procedures domain:

3.4.6 Pre-tests:

The researcher conducted the pre-physical tests for the control and experimental sample on Thursday and Friday, corresponding to 23-24/11/2021.

3.4.7 the main experiment:

3.4.8 Post-tests:

The researcher conducted post-tests for the members of the research sample after the end of the main experiment period on Friday and Saturday corresponding to 9-10/2/2022.
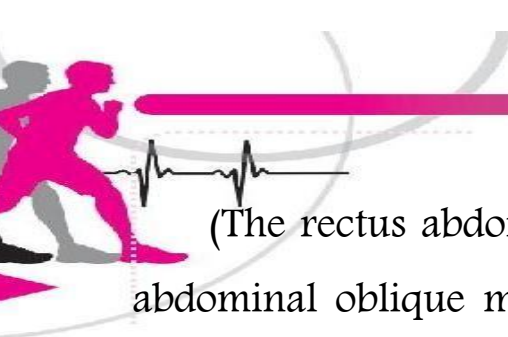
3.5 Statistical means:

The researcher used the statistical package (SPSS).

Fourth Gate:

4. (present, analyze, discuss) the results:

Presenting the results of the research variables (the rectus abdominis muscle, the lower back muscles, the external abdominal oblique muscle, the internal abdominal oblique muscle) for the pre and post tests of the first experimental group, then analysis and discussion the results.

Table (5) shows the values of the arithmetic mean, standard deviation, the calculated t value, and the level of significance of the test results.

(The rectus abdominis muscle, the lower back muscles, the external abdominal oblique muscle, the internal abdominal oblique muscle) for the pre and post tests for the first experimental group.

Ability	Statistical parameters The variables investigated	The Measurement Unit	Pre-test		Post-test		the computed (t) value	sig. value	Statistical significance
			mean	standard deviation	mean	standard deviation			
Endurance of the Strength	Rectus Abdominis Muscle	Once	17	0.54	26.6	2.70	6.24	0.03	significant
	Lower Back Muscles		24.80	3.27	30.4	0.89	3.72	0.02	significant
	External Abdominal Oblique Muscle		18.2	1.09	21.4	1.14	4.35	0.01	significant
	Internal Abdominal Oblique Muscle		17.8	1.09	21.4	0.89	4.12	0.01	Significant
at the level of significance (0.05)									

Table (5) shows that there are differences between the results of the pre and post measurements for the first experimental group in the investigated variables. the variable endurance of strength for the rectus abdominis muscle, there were differences between the results got in pre and post tests for the experimental group. Where the arithmetic mean value in the pre-test was (17) degree and the standard deviation value (0.54). While the mean value in the post-test was (26.6) degree and the
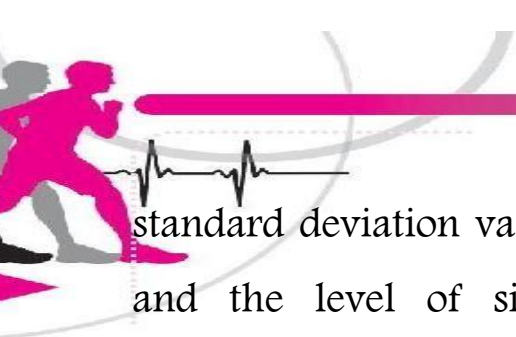
standard deviation value was (2.70). The calculated (t) value was (6.24) and the level of significance (0.003) which is smaller than the significance level (0.05), so the difference was significant and in favor of the post-test.

There were also differences between the results of the pre and post tests for the second experimental group in the variable endurance of strength to the lower back muscles. Where the value of the arithmetic mean in the pre-test was (24.80) degree and the value of the standard deviation was (3.27). While the arithmetic mean value in the post-test was (30.4) degree and the standard deviation value was (0.89). The calculated (t) value was (3.72) and the level of significance (0.02) which is smaller than the level of significance (0.05), so the difference was significant and in favor of the post-test.

The value of the arithmetic mean in the pre-test to the endurance of the strength for the external and internal abdominal oblique muscle reached (18.2) (17.8) degrees respectively, and the value of the standard deviation was (1.09) (1.09). While the mean value in the post-test was (21.4) (21.4) degree respectively, and the standard deviation value was (1.14) (0.89). The calculated (t) value reached (4.35) (4.12) and the level of significance (0.01) (0.01) which is smaller than the significance level (0.05), and this indicates that there is an existence significant difference between the pre and posttests in favor of the post-test.

From the above, the results of the tests that were reached for the first experimental group in the research variables show an evolution between
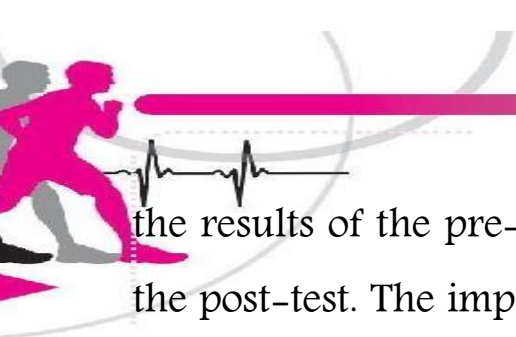
the results of the pre-test and the results of the post-test and in favor of the post-test. The improvement was shown in the arithmetic mean of the tests. In addition to what was shown by the results of the (t) test, which gave significant differences for the arithmetic mean values and in favor of the post-test. This indicates that the experimental group has increased its performance level by using the exercises associated with stimulation prepared by the researcher.

The researcher attributes the reason behind reaching to these results in developing the performance level for the first experimental group in the post-tests to the effect of (strength – balance – stability) exercises in developing the endurance of strength and muscular balance of the muscles in the middle of the body that the researcher developed to train the investigated variables in (endurance of strength). The effect of these training loads that suitable for these abilities has been codified, which has positively affected in muscular balance of the lower back. "As the exercises must have a goal that work to develop, whether physical, skill or tactical. Also, should be commensurate with the level of the component and the time period allotted to the exercises"(Hafström, A., Malmström, And all (2016).

(Szafraniec, R., Bartkowski, J., & Kawczyński, A. (2020).(Hammami, R., Granacher, U. R. S., Makhlouf, I., Behm, D. G., & Chaouachi, A. (2016).(Lengkana, A. S., Tangkudung, J., & Asmawi, A. (2019).
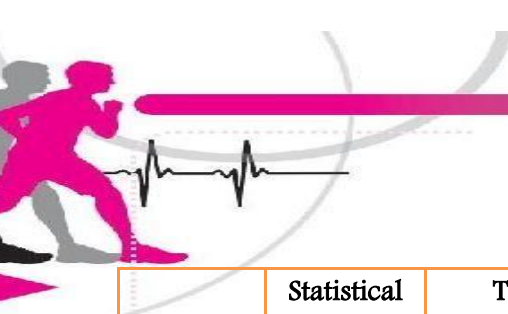
"One of the main and essential benefits of these exercises focus on the basic muscles, which include (pelvis, abdomen, back, chest) and the
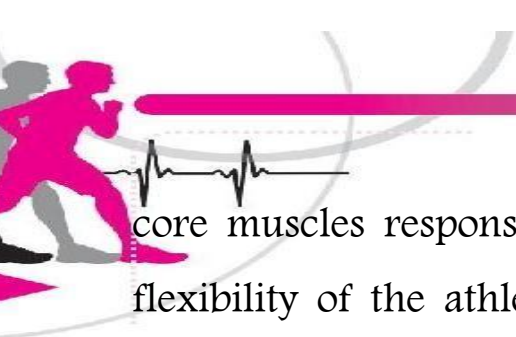
core muscles responsible for stabilizing the body. Besides balance and flexibility of the athlete when train with TRX tool, the three elements (Stability, Balance, and Flexibility – face challenging with each movement). This means that the core muscles are constantly working, and these muscles have to keep the body steady every second during the exercise even when doing exercises that are completely unrelated to the core body muscles(Dolati, M., Ghazalian, F., & Abednatanzi, H. (2017).(Heltne, T., Welles, C., Riedl, J., Anderson, H., & Howard, A. (2013).

## 4.2 Present, analyze and discuss the results of the physical variables to the pre and post tests for the first experimental group:

Table (6) shows the arithmetic mean, standard deviation, calculated T value and significance level for the results of (rectus abdominis muscle, lower back muscles, external abdominal oblique muscle, internal abdominal oblique muscle) to the pre and post tests for the first experimental group.

| Ability	Statistical parameters The variables investigated	The Measurement Unit	Pre-test		Post-test		the computed (t) value	sig. value	Statistical significance
			mean	standard deviation	mean	standard deviation			
Endurance of the Strength	Rectus Abdominis Muscle	Once	17.6	1.81	22.6	2.19	7.90	0.01	significant
	Lower Back Muscles		24.6	3.57	28	1.87	3.30	0.03	significant
	External Abdominal Oblique Muscle		17.8	2.38	21	1.58	3.30	0.03	significant
	Internal Abdominal Oblique Muscle		17	2.91	19.8	1.48	3.25	0.03	Significant
at the level of significance (0.05)									

Table (6) shows that there are differences between the results of the pre and post tests for the second experimental group in most of the variables studied. in the variable that related to the endurance of strength of the rectus abdominis muscle, there were differences between the results of the pre and post tests for the first experimental group. Where the arithmetic mean value in the pre-test was (17.6) degree and the standard deviation value was (1.81). While the mean value in the post-test was (22.6) degree and the standard deviation value was (2.19). The calculated (t) value was (7.90) and the level of significance (0.01) which
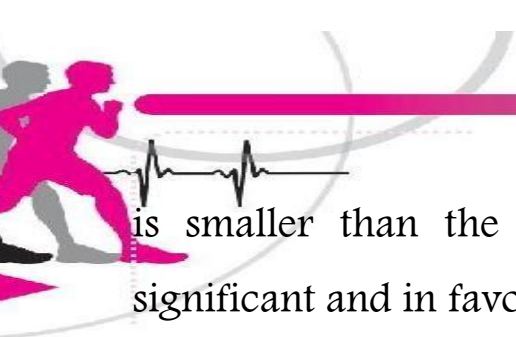
is smaller than the significance level (0.05), so the difference was significant and in favor of the post-test.

also There were differences between the results of the pre and post tests for the first experimental group (the control group) in the endurance of strength variable of the lower back muscles. Where the arithmetic mean value in the pre-test was (24.6) degree and the standard deviation value was (3.57). While the arithmetic mean value in the post-test was (28) degree and the standard deviation value was (1.87). The calculated (t) value was (3.30) and the level of significance (0.03) which is smaller than the significance level (0.05), so the difference was significant and in favor of the post-test.

The value of the arithmetic mean in the pre-test to the endurance of the strength for the external and internal abdominal oblique muscle reached (17.8) (17) degrees respectively, and the value of the standard deviation was (2.38) (2.91). While the mean value in the post-test, respectively, was (21) (19.8) degrees. The standard deviation value was (1.58) (1.48). The calculated (t) value reached (3.30) (3.25) and the level of significance (0.03) (0.03), which is smaller than the significance level (0.05), and this pointed that there is an existence significant difference between the pre and post tests and in favor of the post-test.
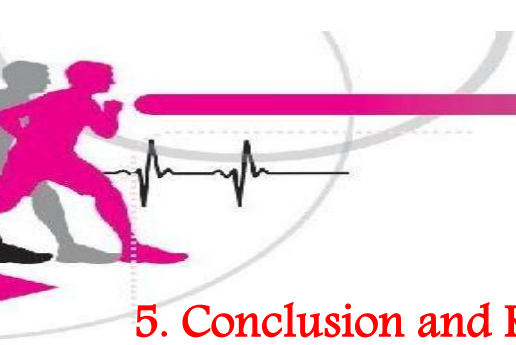
5. Conclusion and Recommendations:

5.1 Conclusion:

In light of the results reached by the researcher, the following was concluded:

➤ (Strength – balance – stability) exercises have a positive effect in relating to the endurance of the strength of the rectus abdominis muscle and the muscles of the lower back. At the same times, there were no significant differences in the endurance of the strength of the external and internal abdominal oblique muscle.

5.2 Recommendations:

Considering the conclusion, the researcher recommends the following:

➤ use (strength – balance – stability) exercises in other games and sports.

➤ The necessity of using (strength – balance – stability) exercises in the period of general and private preparation.
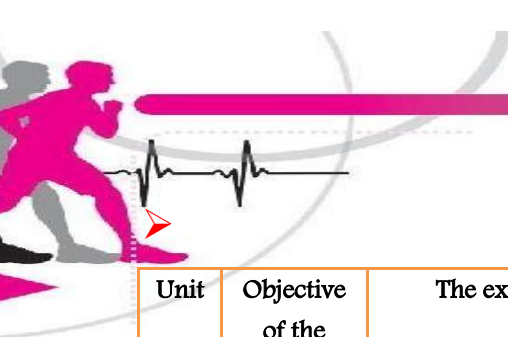
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Unit	Objective of the training unit	The exercises used	Intensity %	training volume	rest exercise	rest groups	exercise time	total time
first	Develop endurance strength	From a lying position on the back –Raise the right leg up, then lower –Raise the left leg up and then lower	80%	30s•4	1m	2m	5m	7m
		From a lying position on the back (legs bent) –Lifting the torso forward and back		30s•4	1m	2m	10m	14m
		From a lying position on the back, arms aside –Raising and lowering the legs together		30s•4	1m	2m	5m	7m
		Flat plank position (side – right) –Lateral support on the right leg and right elbow –Lateral support on the left leg and left elbow		30s•2	1m	2m	2m	4m
Total								34m

traditional training units

Unit	Objective of the training unit	The exercises used	Intensity %	training volume	rest exercise	rest groups	exercise time	total time
first	Develop endurance strength	From a lateral lying position –Raise the right leg up, then lower –Raise the left leg up and then lower	80%	30s•4	1m	2m	5m	7m
		From a lying position on the back (legs bent) –Lifting the torso forward and back		30s•4	1m	2m	10m	14m
		From a lying position on the		30s•4	1m	2m	5m	7m
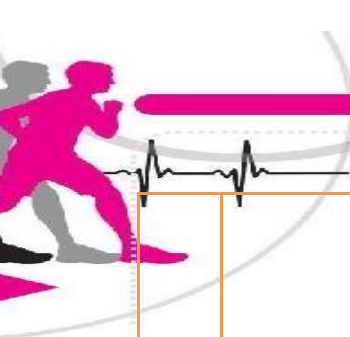
		back, arms aside –twist torso far right and far left						
		Flat plank position (side – right) –Lateral support on the right leg and right elbow –Lateral support on the left leg and left elbow		30s•2	1m	2m	2m	4m
Total								34m

Training modules (Strength - Stability - Balance)

Unit	Objective of the training unit	The exercises used	Intensity %	training volume	rest		exercise time	total time
					exercise	groups		
first	Develop endurance strength	From a lying position on the stomach, arms in front –Raise the right arm with the left leg –Raise the left arm with the right leg	80%	30s•4	1m	2m	5m	7m
		From kneeling position on the knees and hands –Extend the right leg back and the left arm forward –Extend the left leg back and the right arm forward		30s•4	1m	2m	10m	14m
		Flat plank position –Fulcrum on the insteps and elbows		30s•4	1m	2m	5m	7m
		From a lying position on the back, arms back –Raising and lowering the legs and arms together		30s•2	1m	2m	2m	4m
Total								34m