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The effect of bridge exercises on the postural deviations and spinal cervical vertebrae deformities among wrestlers

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ABSTRACT

This study aims to identify the effect of these exercises on the bridge skill on the cervical vertebrae of the players, using modern technology by the Posture Pro 8 device, which is a high-tech devein determining the prediction of future deformations, which may occur as a result of practices and exercises that lead to the occurrence of complications, and the study sample was selected from the players of the Shooting Sports Club in Mahalla city in Egypt, and the bridge exercises were applied to that sample, and the results of the study showed no change the significant effect of bridge exercises on the occurrence of anterior or lateral deviations in the cervical vertebrae, as shown by the results of the studies. It founds that all values of the effect size in the frontal and lateral deviations are less than 80.0, which is of unremarkable effect and the total deviations between the pre and post-measurements of the group under study have an unremarkable effect as well, as the value of the rate of change ratios ranged between 0.441%.

1. Introduction

Exercises and rehabilitation programs are the main focus in treating a group of physiological deviations and accompanying sports injuries, because of their great role in restoring the affected human organ to its normal state (Lee et al., 2017). Any defect in the relationship between the bones, muscles, and ligaments causes what is called poor posture (Özdenk and Karabulut, 2018). The muscles working around the spine and related to it have a great effect in maintaining moderate stature in maintaining its natural curves without increasing or decreasing or preserving the spine without any side bends (Özer, 2019), and deviations in strength can be divided It is divided into two types: the simple type that can be treated with compensatory exercises, where these deviations are within the limits of the muscles and ligaments only, as well as the advanced chronic type, where the effect is on the bones directly, and they are called deformities of the body, and treatment in this particular type requires surgical intervention (Zhanibek et al., 2021).

Body deviations are defined as a state of inconsistency and balance between the components of the locomotor system and the various vital devices of the human body, which leads to the expenditure of excess energy during different kinetic conditions, whether it is stability or movement (Kara et al., 2021). Tissue, muscles, or different parts of the body, and this change may affect the efficiency of the organ and change its shape (Lewald, 2002). and proper posture allows the muscles of the body to work with maximum efficiency during various motor positions such as standing erect, bending, or squatting (Vaughn and Brown, 2007).

Wrestling is one of the sports in which the wrestler falls under a sports load and the intensity of performance is high. This activity is accompanied by a great effort in all the organs and systems of the body (Arslanoglu, 2015). The continuation of this great effort during the actual match time leads to the player being subjected to fatigue and physical stress, and wrestling achieves the balanced growth of body parts, as well. Its players gain the ability to use muscles with high efficiency. Rarely do we find a wrestler who is weak (Özdenk and Karabulut, 2018). weak, or with a turbulent movement (Ruivo et al., 2015). The movements that the wrestler makes are performed in different directions and have difficult paths and varying heights. However, there are many

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external factors and influences such as weight, friction force, equilibrium state for each of the wrestlers, and the center of gravity.

The researchers also confirm that the wrestling match is characterized by a permanent fusion with the competitor, and each of them tries to beat his opponent in one of the many ways to win. During the conflict or training multiple injuries to the players sometimes occur (Broennle et al., 2017), or deformities in the state of posture or the cervical vertebrae of the players from repeating the fall on the neck. Players may be subjected to various injuries in that area, and among the deformations of that area is the deformation of the head falling forward (Kumate and Falcous, 2015), where it happens that the joints of the neck contract and the head thrust forward and down, and the protrusion of the neck or concavity of the neck is similar to the fall of the head forward, except that the head remains up, and therapeutic exercises help a little in the correction of late cases of this deformity (Demirhan, 2020) and this deformity may be accompanied by tilting of the head and rotation of the head, and at other times this deformation is related to the convexity of the upper back region. The muscles and ligaments in the front of the neck become stronger and shorter.

The bridge skill is one of the basic skills in wrestling, in which the player tries to keep his shoulders away from the sports rug (Genç, 2020), calculate the touch of the shoulders, and try not to lose the match. Therefore, the players perform many and multiple exercises for this skill, in which the player rotates and descends on the cervical vertebrae from a standing or ground position. Reliance on the head, hands, and feet, and the repetition of these exercises may expose this dangerous area of the body to injury or deformities of the cervical vertebrae, and accordingly, the current study seeks to identify the effect of these exercises on the bridge skill on deviations in the body and deformations of the cervical vertebrae of the spine among wrestlers (Ylinen et al., 2003). There have been numerous studies and research to identify the factors that lead to injury during training or competition (Demirel et al., 2018), and within the limits of the researchers' knowledge, none of the studies addressed the identification of changes in the deviations of the physique and deformations of the cervical vertebrae from the impact of these exercises (Ferreira et al., 2010), and for this, the idea of the study was established so that the deviations of the stature are measured and determined or deformations that may occur to the cervical vertebrae of wrestlers from the impact of bridge exercises, and that is using the Posture Pro 8 technology (Yonca et al., 2017), it is one of the high-tech devices in determining the prediction of future abnormalities that may occur as a result of practices and training that lead to complications.

This study aims to identify the effect of bridge exercises on the postural deviations and spinal cervical vertebrae deformities spine among wrestling athletes. The main question of this study is: Do bridge exercises affect postural deviations and cervical vertebrae deformities of the spine in the study sample group?

2. Methodology

The researchers used the experimental method on one group, due to its suitability to the nature of the research.

2.1. The research sample

The research sample was chosen randomly for the players registered with the Egyptian Wrestling Federation at the Mahalla Shooting Club in Egypt under 16 years of age. It consisted of 10 wrestlers, and 2 players were excluded for not attending the exercises, so the total basic sample was 8 wrestlers.

2.2. Standard error of skew modulus = 0.752 (The limit of the skew coefficient at the level of significance is 0.05 = 1.474)

Table 1 shows the arithmetic mean, median, standard deviation, and skew coefficient among the research sample members in the variables of the growth indices rates under study. It is clear that the skew coefficient values ranged between ±3 and it is less than the skew coefficient limit, which indicates the moderation of the data and its devoid of any Disadvantages of unequal distributions.

Table 1: Statistical indications for the characterization of the research sample members in the variables of rates; Indications of growth to show the moderation of data; n=8

#	Variables	SMA	Mediator	tandard deviation	Flatness	Skewness
1	Age	14.917	14.900	0.160	-1.311	0.041
2	Height	163.167	163.500	2.483	0.735	-0.871
3	Weight	60.167	60.500	1.472	-0.859	-0.418

2.3. Standard error of skew modulus = 0.752 (The limit of the skew coefficient at the level of significance is 0.05 = 1.474)

Table 2 shows the skew coefficient of the research sample in the variables of the forward deviations understand, and it is clear that the skew coefficient values have ranged between ±3 and are less than the skew coefficient limit, which indicates the moderation of the data and its freedom from defects in non-equilibrium distributions.

Table 2: Statistical indications for the characterization of the research sample in the forward deviation variables; n=8

#	Variables	SMA	Mediator	standard deviation	Flatness	Skewness
1	Head tilt to the side	2.125	2.000	0.641	0.741	-0.068
2	Shoulder fall	3.750	3.500	1.282	-0.021	0.611
3	Pelvic tilt to the side	3.125	3.000	1.246	0.146	-0.304
4	force on the neck	0.463	0.450	0.151	0.658	-0.152

2.4. Standard error of skew modulus = 0.752 (The limit of the skew coefficient at the level of significance is 0.05 = 1.474)

Table 3 shows the skew coefficient of the research sample in the lateral deviation variables under study. It is clear that the skew coefficient values ranged between ±3 and it is less than the skew coefficient limit, which indicates the moderation of the data and its freedom from defects in non-moderate distributions.

Table 3: Statistical indications for the characterization of the research sample in the lateral deviations variables; n=8

#	Variables	SMA	Mediator	standard deviation	Flatness	Skewness
1	head falling forward	5.375	5.500	1.685	0.913-	0.168
2	lumbar concavity	4.875	5.000	1.808	0.930-	-0.336

2.5. Standard error of skew modulus = 0.752 (The limit of the skew coefficient at the level of significance is 0.05 = 1.474)

Table 4 shows the skew coefficient of the research sample in the variable total deviations understudy, and it is clear that the skew coefficient values ranged between ±3 and it is less than the skew coefficient limit, which indicates the moderation of the data and its freedom from defects in non-moderate distributions.

Data collection tools and devices:

1- Posture Pro 8 device and the following variables were measured: (head tilt to the side, shoulder fall, pelvic tilt to the side, force on the neck, head falling forward, lumbar concavity)
2- A rheostat to measure the length.
3- A medical scale to measure weight.
4- Stopwatch.
5- Digital camera.

Table 4: Statistical indications for the characterization of the research sample members in the variable total deviations; n=8

#	Variables	SMA	Mediator	standard deviation	Flatness	Skewness
1	Total deviations	19.713	19.500	5.427	1.411	-0.159

2.6. Posture Pro 8 posture analysis software

Body deviations were detected by the Posture Pro 8 posture Analysis Software, a modern device that keeps pace with modern technology in the field of detecting and identifying deviations and distortions of textures. The most important feature of the device is that it is used for all age groups of both genders and helps in detecting physiological deviations at the beginning of its formation and then assisting in preparing rehabilitation, treatment, training, and kinetic programs to improve posture and identify the causes of these deviations and physiological deviations, and then help in setting up rehabilitation programs for them in proportion With these deviations and distortions of textures, Fig. 1 illustrates the most important components of the device.

This device is characterized by speed and effectiveness in the detection of deviations and distortions of texture, which saves effort, time, and expenses when compared with other devices in the field of texture. What is the state of his body easily unlike other devices in this field, as well as what will be the development of the body in the future based on the information and data taken after examining the patient's condition, as well as assistance in the development of rehabilitation programs based on what will be the shape of the body in the future, and it appears This is done through Fig. 2.

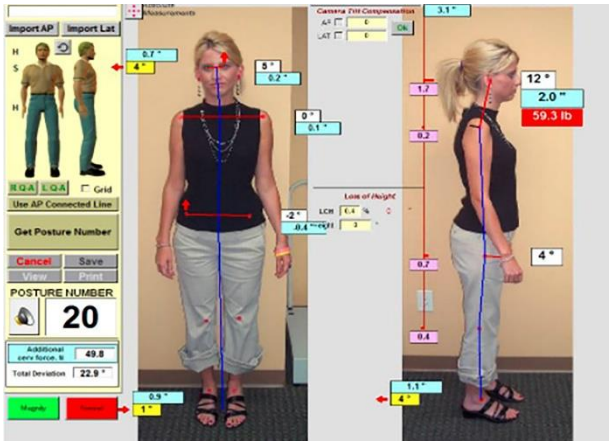

Fig. 1: Posture pro 8 posture analysis software

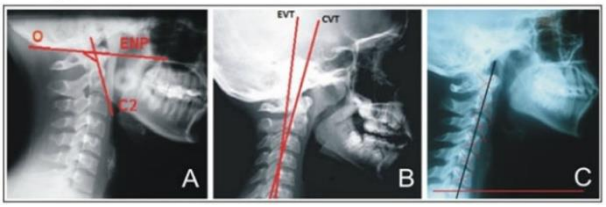

Fig. 2: Predictions of future physiques according to the degree of deviation and its dental stages through a posture pro 8 posture analysis software

The contents of the device shall include the following:

- The laptop has all the latest versions of Microsoft.
- A modern digital camera for taking measurement pictures.
- A modern color printer.
- Some A4 paper to print the necessary reports.
- Some points "stickers" to identify the anatomical points.

2.7. The procedure for determining and measuring body deviations in the device

The measurement of the sample under study was carried out by Posture Pro 8 posture Analysis Software with following the following steps:

1. When the measurement and analysis begin, the device will recall the images that were saved before, where the specialist determines the anatomical landmarks through the "stickers" points that were identified previously in the images (Fig. 3).
2. The program calculates the deviation from the normal position and shows the results in angles and distances with high accuracy in a few seconds.

Table 5 shows Anatomical points in the anterior-lateral positions; Posture Pro 8 (Posture Analysis Software).

3. Pilot study

The researchers conducted an exploratory study on Saturday 31/7/2021 to ensure:

- Validity of the place, devices, and tools used.
- Discovering the difficulties that researchers may face in applying the measurements and the program.

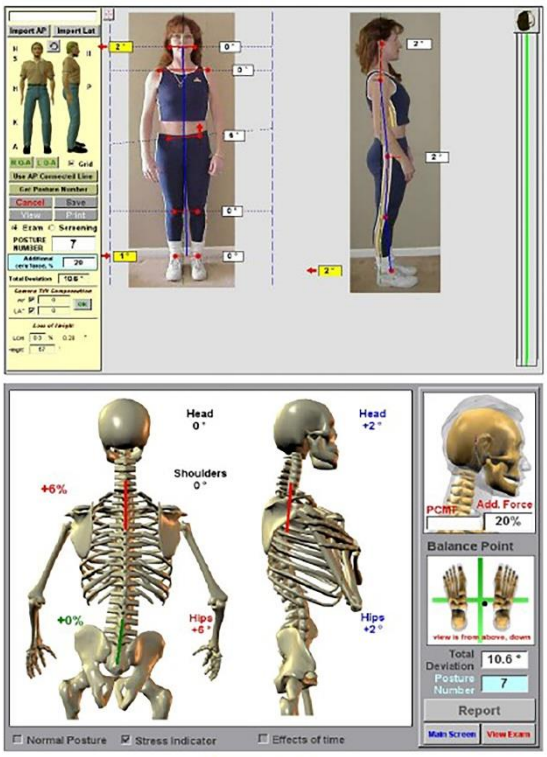

Fig. 3: Determination of anatomical landmarks while measuring morphological deviations using posture pro 8 posture analysis software

Table 5: Anatomical points in the anterior-lateral positions; posture pro 8 ("posture analysis software")

First: the front position	Secondly, the side position
Two dots on the nipples of the ears.	The point on the nipple.
Two points at the ends of the acromial process.	A point above the middle of the acromial spur.
Two points above the iliac bone.	A point at the top of the iliac bone (or a point on the top of the thighbone).
Two points in the middle of the end of the femur.	A point in the middle of the knee from the outside.
Two points in the middle of the head of the shin bone.	A point on the outside of the heel bone.

3.1. Basic experience

Tribal measurements were made on Saturday 08/14/2021, and the implementation of the bridge exercises program for the wrestlers in the group under consideration was started to find out their effect on the deviations of the physique and deformities of the cervical vertebrae. The program continued for 12 weeks until Sunday 14/11/2021.

a. Tribal measurement: At that stage, before performing the training unit, the degree of

deviations in the cervical vertebrae area for each player was measured separately.

b. The program followed in the training, where several exercises were developed for the bridge skill, in which the researchers took into account the nature of the age stage, as well as the level and experience of the players and the type of period in which the program is applied. The important foundations for the development of the program are the following:

1. Taking into account the individual differences between the players.
2. Observe the gradation of pregnancy from the easiest to the most difficult.
3. Paying attention to the correct and correct formation of pregnancy, the number of repetitions, as well as groups within the unit, as well as rest periods between each group and another and between each repetition and another.

c. Telemetry: The telemetry was carried out in the same way as the pre-measurement, and then the imaging analysis was done using the Posture Pro 8 device.

It is clear from Table 6 the significance of the statistical differences at the level of significance of 0.05 between the two measurements before and after the research group in the variables of the forward deviations. It is also clear that all the values of the effect size are less than 80.0 and they have an unobservable effect.

Table 6: The significance of the differences between the tribal and remote measurements for the group searching for forwarding deviation variables; n=8

		Tribal measurement		Telemetry measurement							
#	Variables	S	± A	S	± A	Average differences	Standard error of the mean	t value	Improvement rate %	Effect size	Indication of effect size
1	Head tilt to the side	2.125	0.641	2.115	0.744	0.010	0.189	0.053	0.471	0.014	Not available
2	Shoulder fall	3.750	1.282	3.725	0.916	0.025	0.375	0.067	0.667	0.022	Not available
3	Pelvic tilt to the side	3.125	1.246	3.120	0.835	0.005	0.250	0.020	0.160	0.004	Not available
4	force on the neck	0.463	0.151	0.461	0.076	0.002	0.055	0.027	0.324	0.012	Not available

T-table value at a significant level of 0.05 = 1.895; Effect Size Levels: 0.20: Low 0.50: Medium 0.80: High

It is clear from Table 7 the significance of the statistical differences at the level of significance of 0.05 between the two measurements before and after the research group in the lateral deviations variables, that the calculated t value ranged between 0.034 to 0.106 and the value of the improvement rate ratios ranged between 0.410% to 0.465%, as it is clear that all the values of the effect size are less than 80.0, which has an unnoticeable effect.

It is clear from Table 8 that the significance of the statistical differences at the level of significance of 0.05 between the two measurements before and after the research group in the variable total deviations, and the calculated t-value was achieved at 0.107 and the value of the improvement rate ratios ranged 0.441%, and it is clear that the value of the effect size is less than 80.0, which has a subtle effect.

Table 7: The significance of the differences between the two measurements, before and after, for a searching group for lateral deviations variables; n=8

		Tribal measurement		Telemetry measurement							
#	Variables	S	± A	S	± A	Average differences	Standard error of the mean	t value	Improvement rate %	Effect size	Indication of effect size
1	Head falling forward	5.375	1.685	5.350	1.982	0.025	0.730	0.034	0.465	0.014	Not available
2	Lumbar concavity	4.875	1.808	4.855	1.506	0.020	0.189	0.106	0.410	0.010	Not available

T-value at a significant level of 0.05 = 1.895; Effect Size Levels: - 0.20: Low 0.50: Medium 0.80: High

4. Discussion

It is clear from Tables 6 and 7 that the differences between the two measurements before and after the research group in the variables of the frontal and lateral deviations, that the significance of the statistical differences at the level of significance 0.05 between the two measurements before and after the research group in the variables of the frontal deviations, and the value of t The calculated values ranged between 020 to 0.67, and the value of the improvement rate ranged between 0.160% to

0.667%, while the lateral deviations ranged between 0.034 to 0.106 and the value of the improvement rate ranged between 0.410% to 0.465%, as it is clear that all values of the effect size are less than 80.0, which has an unremarkable effect, which confirms that the bridge exercises used in the study have a positive effect on the frontal deviations and did not cause distortions or fundamental changes in the shape of the cervical vertebrae for the variables under study that Including variables (inclination of the head to the side-shoulder fall-pelvic tilt to the side-force on the neck), as well as the lateral deviations, as confirmed by the results of the study, which are (head fall forward-lumbar concavity). The calculated T value ranged from 0.034 to 0.106 and ranged. The value of the percentage improvement rate is between 0.410% to 0.465% and it is clear that all the values of the effect size are less than 80.0, which has an unremarkable effect, which confirms that the bridge exercises used in the study have a positive effect on the lateral deviations as well, and there were no deformations or deviations in the cervical vertebrae of the study sample.

Table 8: The significance of the differences between the tribal and remote measurements for the research group of the variable total deviations; n=8

		Tribal measurement		Telemetry measurement							
#	Variables	S	± A	S	± A	Average differences	Standard error of the mean	t value	Improvement rate %	Effect size	Indication of effect size
1	Head falling forward	19.713	5.427	19.626	3.235	0.087	0.811	0.107	0.441	0.113	Not available

T-table value at a significant level of 0.05 = 1.895; Effect Size Levels: - 0.20: Low 0.50: Medium 0.80: High

The researchers also confirm that the bridge exercises used for the sample under study have contributed to the strength of the cervical vertebrae (Hrysomallis, 2016; Lee et al., 2017), that the strength of the cervical vertebrae contributes to and helps reduce the risk of injury for wrestlers, and that strengthening these muscles of the cervical vertebrae contributes to the prevention of injuries to wrestlers, and this is what the results of the current study showed that the strength of the muscles of the wrestlers The neck helped during the bridge exercises not to occur tangible deformations, The results of this study are also in agreement with what was mentioned by Broennle et al. (2017), and the wrestlers have more muscle strength in the cervical vertebrae than others in some games, and this may be due to the nature of the specialized exercises for that area among the wrestlers.

The researchers stress that the training planning using the bridge exercises took into account the imbalance, which affects the strength of the neck muscles, which helps the success of the research experiment in the availability of measurements, this was confirmed by Ylinen et al. (2003) and that the strength of the neck helps to give useful information in planning the correct training programs and for the absence of an imbalance in the potential muscular deficiency.

As it is clear from Table 8, the total deviations between the tribal and remote measurements of the group under study have an unobservable effect, as the calculated t-value achieved a value of 0.107 and the value of the improvement rate ratios ranged from 0.441%, and it is also clear that the value of the effect size is less than 80.0. This also confirms that the bridge exercises that were implemented on the sample under study had a positive impact in the absence of any deviations with a noticeable effect, as the bridge exercises depend on the curvature and moderation of the body during arching based on the head and legs and the importance of the safety of the spine during the performance of the arch, and that Moderation of stature and coordination of all parts of the body depends on the health and safety of the spine and the health of the muscle balance work related to it, and what confirms the results of the research that the wrestlers under the study enjoy a good condition for the strength of the spine and the surrounding ligaments, and that the bridge exercises contributed to the absence of deformities affecting negatively on the strength of the cervical vertebrae, as well as the moderate strength depends on the condition of the bones, muscles, and ligaments. Some of the muscles connected to the spine have a significant impact on increasing or decreasing the curvature of the spine. If these muscles weaken, balance is disturbed and the shape of the natural curves changes accordingly. Researchers confirm that the use of The measurement with Posture Pro 8 technology in the current study, and its high ability to predict deformities, has revealed with high accuracy the orthopedic status of the cervical vertebrae. For the wrestlers under the study before starting the bridge exercises as well as after those exercises, which did not appear to have any significant negative effect that can be observed on the variables under study, and accordingly, the researchers verified the answer to the question of the study, which is the lack of bridge exercises on the postural deviations and spinal cervical vertebrae deformities among wrestlers in the group under consideration.

5. Conclusions

There is no tangible change in the impact of bridge exercises on the frontal deviations, as the value of the rate of change ratios ranged between

0.160% to 0.667%. There was no significant change in the impact of bridge exercises on lateral deviations, as the value of the rate of change ratio ranged between 0.410% to 0.465%. It is clear from the results of the study that all values of the effect size in the frontal and lateral deviations are less than 80.0, which has an unremarkable effect. The total deviations between the tribal and remote measurements of the group under study have an unnoticeable effect, as the value of the rate of change ratios ranged between 0.441%, and it is clear that the value of the effect size is less than 80.0, which has an unnoticeable effect.

6. Recommendations

Tracking the measurement of the skeleton state of the cervical vertebrae over the next several years for the sample under study. Tracking the measurement of the structural state of the cervical vertebrae during the periods of the sports season (preparatory period, before competitions, and during competitions). Using the bridge exercises under study by the appropriate age group. Paying attention to the legalization of training and the correct direction of loads during the use of bridge exercises.

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Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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