The Effect of Physiotherapy of Spine Deviations According to Anatomical and Kinematic Analysis

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Abstract

This research includes several axes through the use of physiotherapy by utilizing therapeutic exercises to correct the Students’ curvatures of the spine as those exercises are working on the treatment of curvatures and improving the body texture for students. This study aims at recognition of training program impact that is suggested for correction of spine curvature, the study was conducted on two groups of school boys and girls by the age of (8-11) years numbered (20) students. The experimental method has been used of two equivalent partial groups that is applied therapeutic units that included therapeutic exercises for (16) weeks by a fact of (32) therapeutic units and a time of (40) minutes a unit, kinematic analysis has been used to determine the angles of curvature of the spine for students (boys and girls). The Study results signified improvement of straightness of spine for both groups; the study also recommended using of the suggested therapeutic program for individuals suffering curvatures of the spine.

Introduction

The sports medicine has contributed in therapy of physiological and pathological changes occurred in human body because of practicing of sport activities in different conditions, sports medicine has many divisions and physiotherapy is one of them which is considered a vital division as the other divisions as health education and physiology, injury science that uses other physiotherapy means .(1)

Therapeutic exercises are selected collection of exercises meant to correct or injury treatment or deviation from normal state that lead to loss or disability to perform the functions fully. Therapeutic exercises are based upon physiological, anatomical and mechanical principles depending on situation diagnosis and physical test for each individual; they include preliminary, strength, durability, swiftness, flexibility, balance, endurance and muscular sense tests(2). The proper straightness is considered one of the most important and fundamental brace in human life by which man can build glory and revive heritage, practice various physical activities that help to build a body free of deviation and deformation and illness, contribute in building civilization as no civilization has risen, prospered and grown without sport as a trait of it, and civilization dwindle and perish by ignoring the physical aspect (3), the body texture can be defined as consistency of body movement as a result of balance between basic body parts which are the skeleton and musculature (4).

Spine deformation includes Kyphosis (Scheuermann's disease) and also anterior curvature of the spine which usually accompanies pain in the lower back, and the dorsal curvature of the spine(scoliosis) which is defined as the increasing in curvature of dorsal region of spine(5). As for lateral curvature or deviations in spinal curvature referred as, The lateral deformity is coupled with rotational deformity of the involved vertebrae, with the condition ranging from mild to severe. Scoliosis may appear as either a C- or an S-curve involving the thoracic spine, the lumbar spine, or both (6). The spinal column is a very complex and important part physiologically in human body, with this mechanical connection
between upper and lower segments, it helps movement with all three levels and also protects spinal cord (7).

Biomechanics is the science that researches movement of any living organism of all aspects (anatomical, physiological, psychological, bodily, mechanical and physical) that deals with effective force on living bodies whether they are moving or still(8).

**Practical Part**

**Field Research Procedures**

The researchers used experimental method of equivalent groups, and experimental research includes an attempt to control fundamental effective factors in changing the dependent variables of the experiment except one factor controlled by researcher and changed in a certain way about determining and measuring its effect on the variable or the dependent variables (9) and the specimen is the sample on which the researcher conducts overall and center work and is part of research society (10), based on that research society has been determined from the following schools: Al-Shareef Al-Rathi elementary for boys and girls numbered 150 students and nominating 20 students aged 8-11 years by Purposive method, therapeutic program has been applied that includes therapeutic exercises for 16 weeks by 32 unit timed 40 minutes, Kinematic analysis has been used to determine degrees of deviation angles for boys and girls students, then preparing special tools for experiment procedures such as physiological balls, rubber ropes, wooden stick, some sponge pieces and Chinese HP laptop.

**Kinematic Measurements**

**Horizontal Deviation**

The deviation of shoulders' axis from the horizontal axis, this variable is measured by x-ray radiation of the specimen then inserting the picture into kinetic analysis (dart fish) to the computer to determine edges of the composed angle of horizontal axis (first line) and second line is drawn between two points or two marks fixed upon the Acromion process for each side of the body so that intersecting point of two lines represents the angle vertex.

**Vertical Deviation**

The deviation of the spine from the vertical axis, his variable is measured by x-ray radiation of the specimen then introducing the picture into kinetic analysis (dart fish) to the computer to determine edges of the composed angle of vertical axis (first line) and second line draws a line along the linear axis of the spine, the intersecting point of two lines represents the angle vertex.

**Convexity**

It represents the big curvature in dorsal vertebrae to outside, and measured by aforementioned procedures in deviation variables, but angle of convexity is determined by determination of three marks, the first is located above the first dorsal vertebra under the neck, the second is on the top of convexity and usually is sixth or seventh vertebra, the third is above the twelfth vertebra at the its point of connection with the first lumbar vertebra, then two lines are drawn starting from the middle mark to the first, and to the third thus an angle is composed at the intersection point of the two lines represent the angle vertices and its magnitude gives degree of convexity.

To adjust angle measurements, black and white x-ray is used on the spine for specimen individuals; the picture is inserted to the computer and the specific marks of angle edges is determined by high tech kinetic analysis program (dart fish).

**Homogeneity and Valency**

Homogeneity and Valency were conducted at 23/11/2016 that included determination of deviation angles of spinal column.

**Educational Units**

Educational units have been applied that include therapeutic exercises for 16 weeks by 32 therapeutic units timed 40 minutes, kinematic analysis has been used to determine deviation angle degrees for students (boys and girls).

**Helpful Tools**

Researchers have prepared set of tools that help the therapy of spine curvatures for the specimen students such as: physiological balls, rubber ropes, wooden sticks, some pieces of sponges, one of them is rectangular.
shaped 60 cm length and 60 cm diameter, the other one is curved shaped 70 cm length and 34 cm high from the middle.

**Dimensional Tests**

Dimensional tests were conducted at 29/1/2017 including deviation degrees of spine curvature.

**Statistical Tools**

Statistical program (SPSS) has been used.

**Results and Discussion**

After emptying the data gained by the researcher and processed statistically to check validity of presumptions; Results of the two student groups (boys and girls) has developed in spinal column curvatures according to some anatomical and kinematic variables pursuant to experimental design of research, then data has been analyzed statistically by statistic bag (SPSS) to compare between test scores average before and after for the two student groups, a (t. test) has been used for unlinked independent specimens to recognize morality differences of arithmetic averages between two student groups (boys and girls), and to check the effect of therapeutic exercises in correction of spine curvatures of research specimen.

<table>
<thead>
<tr>
<th>Table 1: Statistic results of dimensional tests for two experimental groups with calculated research variables</th>
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<tbody>
<tr>
<td><strong>Variables</strong></td>
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<tr>
<td>Deviation angle of shoulder axis from horizontal axis</td>
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<tr>
<td>Deviation angle of spine from vertical axis</td>
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<td>Convexity of dorsal region</td>
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X= Arithmetic Mean
Y= Standard Deviation

Spinal column consists of 26 bones that are articulated with each other and normal condition includes two anterior convexities in cervical and lumbar regions and two posterior convexities in dorsal, sacral and coccygeal regions (11), those convexities are determined with angles within normal rates as convexity degree reaches 20 degrees in dorsal regions (12), after field survey of al-shareef al-rathi boys and girls students, researchers have found that a group of students have an apparent convexity in that region besides a spine curvature from vertical and horizontal axes, that step has occurred with help of medical staff specialized in bone surgery, as a therapeutic units for those deviations using a set of help tools that assisted in stimulation of some muscles working on both sides of spine and Musculus erector spinae, those muscles could get shortness, stiffness and weakness because of wrong physical nurturing of children or getting used to behavioral habits as in sitting or walking ... etc of daily movements.

Exercises in physiotherapy have focused on stimulation of muscular balance between body sides especially in spine region.

As rubber rope exercises work on extending the injured muscles with sclerosis and dryness as well as back exercises on physiological ball that helped the specimen to extend back muscles, chest and belly, also the use of geometrical shapes of sponge pieces to accomplish a collection of special exercises to strengthen and extend side muscles of back region.

So we found an improvement in reduction of deviation degrees for both genders of students and their approach to normal levels with appearance of statistic difference convexity variable in favor of girl students, for girl’s structural nature and general social status are considered a factor that activate that situation mixed with girls taking wrong mechanical positions in terms of convexity in dorsal region so as to reducing pushing thoracic region forward and that position continuation leads to convexity.
Conclusion
Body deviations can be cured by exercises if it were first class as appeared in therapy of Lateral deviation. Using therapeutic exercises have helped to improve deviation angles, strength and flexibility of back muscles for both groups in favor of second experimental group (boys students). The use of anatomical and kinematic analysis has helped to determine degree of spine deviation of specimen as well as selection of exercises of suitable tools.

Recommendations
It is important to provide space inside schools for the student to move around in his free time. To organize awareness seminar about body deviations for parents, teachers and principals. Importance of provision of suitable school seats for different ages. Inviting to practice physical activity generally in every community establishment and activating role of sport instructor in schools because he has a big and effective role to

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