The European Proceedings of
Social & Behavioural Sciences
EpSBS

Future Academy

ISSN: 2357-1330

http://dx.doi.org/10.15405/epsbs.2018.06.83

ERD 2017
Education, Reflection, Development, Fifth Edition

PROCEDURES FOR RECOVER CIPHOSIS -COMPARISON BETWEEN NEUROMUSCULAR ELECTROSTIMULATION AND AUDITIVE FEEDBACK-

Mircea-Nicolae Ordean (a)*, Vlad Teodor Grosu (b), Adela Popescu Neamțu (c), Paul Stănescu (d), Mihai Trăistaru (e)
*Corresponding author

(a) Doctoral School of Physical Education and Sport, Babeş Bolyai University, Cluj Napoca, Romania, ordean.mirecea@yahoo.com
(b, d, e) Department of Mechatronics and Dynamics of the Machine, Faculty of Mechanics, Technical University, Romania
(c) Doctoral School of Engineering Studies, Politehnica University Timisoara, Romania.

Abstract

The present study had as a general objective the investigation of the efficacy of two different procedures in order to correct the problems of static vertebral, ciphotic and ciphotic attitude. The two procedures used independently of this study made statistically significant changes in the column angle and the acromion-wall distance, and a hierarchy was established as a result of the results. Thus, for correction of these deficiencies, neuromuscular electrotherapy is the better procedure, and the auditory feedback hammer remains only an alternative with close results in the modification of the dorsal column angle and the scapular-humeral belt deviation, as observed in our research. After an analysis of these results, as a source of documentation for other studies, we have tried to understand why auditory feedback ranks last in terms of efficiency, being a state-of-the-art method that should improve the results. Our conclusion was that monitoring the wearing of the device is difficult, so we asked questions like: what is the percentage of time that was wearing properly? Worthiness of wearing has been improved from one session to another? What is the average recovery time? All of these questions were left unanswered, which is why we thought of expanding the study by using this method - audible feedback. Based on previous data, we want to see if through a software system we can achieve the performance of other recovery methods. The method to be applied for validation will be a comparative method of data.

Keywords: Ciphosis, ciphotic attitudes, neuromuscular electrostimulation, auditive feedback, column.

http://dx.doi.org/10.15405/epsbs.2018.06.83
Corresponding Author: Mircea-Nicolae Ordean
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

1. Introduction

Ciphosis represents an anterior-posterior curvature of the spine. This medical term refers to curvature of the vein with an angle greater than or equal to 50 °, a certain degree of curvature is normal. The column of people who suffer from ciphosis or ciphotic attitudes may appear normal or may have a lump in the dorsal area (Shamsi, Veisi, Karimi, Sarrafzadeh & Najafi, 2014). It is often accompanied by lumbar hyperlordosis (to keep the trunk in balance), scapular belt deviations (fallen shoulders and dropped shoulders), clogged chest, head and neck inclined forward, muscles being affected as well, And elongation of the back muscles. Ciphosis occurs as a result of developmental problems, degenerative diseases such as spine arthritis, osteoporosis with vertebral compression fracture or spinal trauma. Office work, long study or sitting in a poor back (and, implicitly, spine) position may cause the appearance of the genotype. A correct posture in the sitting position means having shoulders pointing to the back, chest exposed in the anterior direction, straight neck, vertical, chin straight (Ghandhari., Hesarikia, Ameri & Noori 2013). This position creates an imaginary line parallel to the knees and neck (see figure 01).

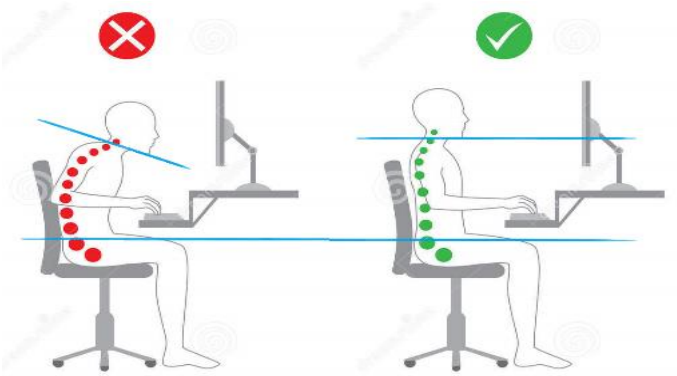

Figure 01. Correct posture and incorrect posture

It is important to treat this pathology because in severe cases, platelets, nerves and other tissues or organs can be affected, causing painful symptoms or other medical problems. The treatment of ciphosis depends on the patient's age, the causes that caused it and the complications it can cause (Jianu & Săpărescu, 1998). Therefore, considering the high incidence of genotype among children, this study is important because it helps to correct the genotype until it becomes structural, with specialized studies specifying that bone and muscle maturation is completed at the age of 18-19 (Girls) and 19-20 (boys). It is also important to prevent kyphosis because it refers not only to the aesthetic problems of the human body but also to the cardiovascular problems due to the pressure of the thoracic box on the lungs and the heart (Antonescu, Obrașcu & Ovezea, 1993). This study aimed to evaluate 10 children (two experimental samples of 5 subjects per sample) aged 15-18 who had problems with vertebral static, ciphosis and ciphotic attitudes. After the evaluation, this study sought to treat the deficiencies by two different procedures: neuromuscular electrostimulation and auditory feedback equipment. In the end, the results of the two procedures were compared, thus determining which of them is most effective to correct these deficiencies more quickly.

http://dx.doi.org/10.15405/epsbs.2018.06.83
Corresponding Author: Mircea-Nicolae Ordean
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

2. Problem Statement

To highlight the importance of treating this condition, the results of several national studies have been followed, among which the most representative are:

• Study conducted by the University of Medicine and Pharmacy "Gr. T. Popa "University of Iasi examined 1867 children from schools and high schools, grades V-XII, of which 391 were found with deviations of the spine. Thus, the incidence of genotype in the study group was 97 cases, representing 42% of all cases;

• A campaign run by the Rotary Club Alba Iulia in collaboration with the Alba County School Inspectorate examined 413 pupils from six schools, of which 236 received a medical letter. In this case, the incidence of ciphosis was 54 cases, representing 13.08% of the total cases.

As a conclusion of other specialty studies, it was found that the disease occurs in a proportion of 60% in children aged 14 years. Other studies have shown that approximately 80% of the population (not just children and adolescents) suffers from affections and lombar pain due to a poor back position.

3. Research Questions

Technology is a form of evolution used in almost all areas. This modern tool is meant to help the man to take action and to significantly reduce, if possible, the type of analysis and decision. Based on a considerable set of data through artificial intelligence, which is no longer a utopia, predictions can be made. Predictions are calculated based on complex algorithms with a very low error rate and in a very short time. Without the help of technology people would take a considerable time to reach the same results / conclusions. However, the data by which the system creates its decision tree are actual human data validated and are intended to serve as a set of initial data training data. In order to interconnect actions, it is important to understand the causes that trigger a condition. Dr. Hammer alerted the importance of understanding the cause before applying a treatment. Everyone is different in his or her way, so the diseases can not have exactly the same behavior but it is important to follow the evolution and to understand the common parts of a disorder regardless of the type of person or try to classify the symptoms of a disease by type of person. All of these processing is nothing more than trying to find a reproduction model, a more easy-to-understand and intuitive model. An intimate understanding of the causes or an analysis that could prevent the occurrence of diseases is very much sought after nowadays. For this, data is aggregated, different classifiers are used to try to prevent or stop the afflictions from incipient phases. Methods used in patient recovery are based on the type of deformation of the column, but also by age (Fon, Pitt &Thies, 1980). A method of recovery used in kinesiotherapy is represented by an auditory feedback harness. An extension of this tool to provide more information about the patient's health status as well as the evolution of recovery can be one of the options. A prototype with functions similar to those proposed above is presented in the work. This prototype uses a series of sensors to identify the body's position. Sensors have a linear resistance and can be easily integrated into fabrics. Position identification is based on the strength of the muscle calculated by the formula:

$$\frac{l - l_0}{l_0} \cdot 100[\%]$$

Where l represents the current position and 10 is the initial position.

http://dx.doi.org/10.15405/epsbs.2018.06.83
Corresponding Author: Mircea-Nicolae Ordean
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

Sensor placement was performed in heavily muscular areas and was divided into several areas as follows: shoulder muscles, arm muscles, muscles used to bend forward and back, and muscles for torso rotation. In order to be able to measure with significant accuracy, 21 sensors were used. Transmitting data from sensors to the processing device was done using a bluethoot module.

After identifying posture, a classification was attempted. These classes have been preloaded in a Bayes network in order to launch predictions about the class within which a particular topic falls. This classification was made using the following formula:

$$nAcc_{Total} = \frac{1}{C}\sum_{i=1}^{C}\frac{Recognized_i}{Relevant_i}$$

Where C represents the total number of classes, Recognized and Relevant, representing the number of correct identifications in relation to the total number of subjects observed. The maximum accuracy achieved by the algorithm was 0.97. This means that of a total of 100 subjects, not less than 97, were correctly framed.

4. Purpose of the Study

Verification of procedures and means of assessment in the correction of cifotic cysts and attitudes that will be used to improve these problems of static vertebral. At the end of the study after obtaining the data, they will be compared to determine the most effective way. Thus, in order to achieve the purpose of the study, the following assumptions were made in which we assume that the ESNM experimental group will have more effective results than the auditory feedback experimental group and also assume that the final measurements applied for each experimental group will have a lower value than the measurements Intermediate, respectively initial ones. The value of the column angle will be lower for the intermediate measurement than for the initial one for the two experimental groups, and the column angle value will be lower for the final measurement as compared to the median for the two experimental groups. Also, the value of the acromion - wall distance will be smaller at the intermediate measurement compared to the initial one for the two experimental groups, and the value of the acromion - wall distance will be lower at the final measurement compared to the intermediate measurement for the two experimental groups.

5. Research Methods

This study was conducted over a period of approximately five months (June 3 - October 29, 2016), so that after signing consent by parents (for minor subjects) and by the major subjects, they were assigned to the two samples (a sample for kinetotherapy and second for neuromuscular electrostimulation). This study included 10 subjects (N = 10), both male and female, aged 15-18 years old, residents of Alba Iulia. They were randomly assigned, with 5 subjects in the two groups, the study being conducted over a period of 20 days, Monday through Friday. The auditive feedback model has benefited from the loan of the equipment at home. They were asked to use this equipment for five hours for 20 days. The electrostimulation model was summoned to the recovery room for the neuromuscular electrostimulation procedure, four electrodes (two left and two right). On the dorsal area, more precisely on the rhomboid

http://dx.doi.org/10.15405/epsbs.2018.06.83
Corresponding Author: Mircea-Nicolae Ordean
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

muscles (large and small rhomboid). Program 1 of the electrostimulation device (5 second stimulation / 5 seconds rest) was used for 10 minutes (Babault, Cometti, Maffiuletti & Deley, 2011). The intensity used is 3 - 6 mA / 4x4 electrode in the form of individual. The subjects of the two groups were evaluated at three different times, as follows: initially - at the beginning of the study; Intermediate - after 10 days; Final - after 20 days. These measurements were made using the column angle measuring device and the scale to measure the distance between the acromion wall (Barrett, McCreesh & Lewis, 2013). Objective and accurate values were obtained following the measurements, which were then statistically processed with the help of the SPSS program, in order to compare the two groups. To measure the angle of the dorsal column we used the inclinometer (see Figures 02 and 03), instrument used in all three moments (initial, intermediate and final). We used this tool to collect accurate and accurate data (Perriman, Scarvell, Hughes, Lueck & Smith, 2010). To measure the distance between the acromion and the wall we used the echer (see figure 04), which is used in the three measuring moments. Like the inclinometer, this instrument gave us concrete and accurate data on the distance between the acromion and the wall (Nijs., Roussel, Vermeulen & Souvereyns, 2005). Other measuring instruments used for this pilot study were: taliometer - used for subject height measurement and scales - used to measure the kilograms of subjects. Subsequently, based on these two measurements, the BMI was calculated for each subject**.**

6. Findings

This research was based on both a descriptive statistical analysis for the collection and classification of data and an analytical one to interpret the data obtained. For this purpose, we used the ANOVA method together with the Post-hoc Scheffe method and the T-test method. Therefore tables were made for each dependent and independent variables. A first step in the interpretation of the results refers to the descriptive analysis of the data We can see a decrease in the mean values from baseline to the end of both groups with a plus for the neuromuscular electrostimulation sample compared to the auditory feedback equipment sample.

Table 01. Descriptive statistical analysis COLUMN ANGLE (degrees)

Method	Moment	Mean	Std. Deviation	N
Feedback	initial	47.8000	2.38747	5
	intermediate	46.2000	2.16795	5
	Final	43.6000	2.07364	5
	Total	45.8667	2.72204	5
Electrostimulation	Initial	50.4000	1.14018	5
	intermediate	47.6000	1.81659	5
	final	43.4000	2.30217	5
	Total	47.1333	3.41983	5

(Mean = mean values; std.deviation = standard deviation; n = number of subjects)

Regarding the column angle, based on the table, it can be observed that the first experimental group (auditory feedback) obtained an average of 47.8 ± 2.38 in the initial testing, 46.2 ± 2.16 in the intermediate test and 43 , 6 ± 2.07 in the final test, indicating a significant decrease between the three measurements performed. The second experimental group (electrostimulation) obtained an average of 50.4 ± 1.14 in the initial test, 47.6 ± 1.81 in the intermediate test and 43.4 ± 2.30 in the final test, which we Again shows a

http://dx.doi.org/10.15405/epsbs.2018.06.83
Corresponding Author: Mircea-Nicolae Ordean
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

significant decrease between the three measurements. In other words, for the angle of the column, in the case of the electrostimulation sample, there was a decreasing evolution from the initial to the final 7 degrees, and for the sample with the auditory feedback equipment only 4.2 degrees.

Table 02. Descriptive statistical analysis ACROMION-WALL DISTANCE (cm)

Method	Moment	Mean	Std. Deviation	N
feedback	initial	13.2000	1.48324	5
	intermediate	11.8000	1.48324	5
	Final	10.0000	.70711	5
	Total	11.6667	1.79947	5
electrostimulation	Initial	13.8000	1.09545	5
	intermediate	12.0000	1.00000	5
	final	9.8000	.83666	5
	Total	11.8667	1.92230	5

(mean=media valorilor; std.deviation=abaterea standard; n=numărul de subiecți)

As far as the acromion-wall distance is concerned, it can be seen from the table that the first experimental group (auditory feedback) obtained an average of 13.2 ± 1.48 in the initial test, 11.8 ± 1.48 in the intermediate test And 10.0 ± 0.70 in the final test, indicating a significant decrease between the three measurements. The second experimental group (electrostimulation) obtained an average of 13.8 ± 1.09 in the initial test, 12.0 ± 1.00 in the intermediate test, and 9.8 ± 0.83 in the final test, which we Again shows a significant decrease between the three measurements. In other words, for the acromion-wall distance, in the case of the electrostimulation sample, a decreasing evolution from the initial to the final 4 cm was observed, and for the auditory sample sample only 3.2 cm.

7. Conclusion

The present study had as a general objective the investigation of the efficacy of two different procedures in order to correct the problems of static vertebral, cytotic cysts and attitudes. More specifically, the two procedures used independently in this study have made statistically significant changes in the column angle and acromion-wall distal, resulting in a hierarchy of results. Thus, for correction of these deficiencies, neuromuscular electrotherapy is the better procedure, and the auditory feedback hammer remains only an alternative with close results in the modification of the dorsal column angle and the scapular-humeral belt deviation, as observed in our research. After an ample analysis of these results, as a source of documentation for other studies, we have tried to understand why auditory feedback ranks last in terms of efficiency, being a state-of-the-art method that should Improve the results. Our conclusion was that monitoring the wearing of the device is difficult, so we asked questions like: what is the percentage of time she was wearing properly? Worthiness of wearing has been improved from one session to another? What is the average recovery time? All of these questions were left unanswered, which is why we thought of expanding the study by using this method - audible feedback. Based on previous data, we want to see if through a software system we can achieve the performance of other recovery methods.

In addition, the system wants to be able to offer suggestions and set certain measured values. The method to be applied for validation will be a comparative method of data. Following this study, two further researchesare to be carried out to compare the neuromuscular electrostimulation - kinetotherapy and

http://dx.doi.org/10.15405/epsbs.2018.06.83
Corresponding Author: Mircea-Nicolae Ordean
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

kinetotherapy - the eudative feedback hammer equipment. Later, the results will compare to the above study, so we will try to find out which is the best and obviously the most compatible recovery method for each subject. At the same time, the contribution of the final study aims at optimizing the quality of life, the social and personal functioning of the subjects.

References

Antonescu D., Obraşcu C., Ovezea A., (1993). *Corectarea coloanei vertebrale*, Bucureşti: Editura Medicală, 44-162;

Babault, N., Cometti, C., Maffiuletti, N. A., & Deley, G. (2011). Does electrical stimulation enhance post-exercise performance recovery? *European Journal of Applied Physiology*, 111(10):2501–7

Barrett, E., McCreesh, K., & Lewis, J. (2013). Intrarater and Interrater Reliability of the Flexicurve Index, Flexicurve Angle, and Manual Inclinometer for the Measurement of Thoracic Kyphosis. Hindawi Publishing Corporation Rehabilitation Research and Practice, 7 pag.;

Fon, G.T., Pitt, M.J., & Thies, A.C. (1980). Thoracic kyphosis: range in normal subjects. American Journal of Roentgenology, 134(5):979-983;

Ghandhari, H., Hesarikia, H., Ameri, E., and Noori, A. (2013). Assessment of Normal Sagittal Alignment of the Spine and Pelvis in Children and Adolescents. Hindawi Publishing Corporation BioMed Research International, 7 pag.;

Jianu, M., Săpărescu, I. (1998). *Modificările de axa ale coloanei vertebrale la copil şi adolescent*, Bucureşti; 160-300;

Nijs, J., Roussel N., Vermeulen, K. and Souvereyns G. (2005). Scapular positioning in patients with shoulder pain: a study examining the reliability and clinical importance of 3 clinical tests. Arch Phys Med Rehabil. 86 7:1349–1355;

Perriman, D. M., Scarvell, J.M., Hughes, A.R., Ashman, B. Lueck, C.J., & Smith, P.N. (2010). Validation of the flexible electrogoniometer for measuring thoracic kyphosis, Spine (Phila Pa 1976), 35(14):633-640;

Shamsi, M.B., Veisi, K., Karimi, L., Sarrafzadeh, J., & Najafi, f. (2014). *Normal Range of Thoracic Kyphosis in Male School Children*, Hindawi Publishing Corporation, 5 pag.;