

# **CORRECTION OF KYPHOTIC ATTITUDES BY MICROCONTROLLER AND ANDROID APPLICATION IN CHILDREN AGED 15-18**

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## **SUMMARY**

### **ENGLISH LANGUAGE**

The human was created to be in constant motion, so kinetology or kinesiology is represented by the study of motion. In the beginning, human life depended on movement, but now the individual no longer treats movement as something essential. At the moment, the individual is dominated by technology and is looking for different ways to move away from his nature. So the lack of activity predisposes the spine to adopt vicious positions, transformed along the way from physiological positions to non-physiological positions, this problem is found worldwide. In the present, medicine is not only satisfied with the medical treatment of the disease, but also wants to give the patient the ability to participate in a more active life from a physical and mental point of view. Physiotherapy plays an important role in this process. Movement therapy combines perfectly with other restorative means such as massage, yoga, manipulation methods, postural reeducation and others, adding an additional value to the personalized therapeutic plan after each need.

The spine has an important role to play in supporting and maintaining the correct position of both the human body and its segments. The correct posture of the human body is a complex combination of the correct set of all body joints, only when the movement is influenced by muscle balance and joint mobility. After the age of 5, the process of myelination of the nerve canals ends, so that in the child's mind is indicated to begin a process of implementing the

correct body attitude. At the age of 6 to 7 years, the child is in a dangerous stage of posture, requiring a prevention of postural problems and body deformities. Until the age of 14 there are many morphological and functional changes that change the natural orthostatic posture being necessary correction exercises through programs specially built to remove the defective posture.

Viewed from the front, the spine is rectilinear with small variations of  $2^{\circ}$  to  $3^{\circ}$  to the right or left, depending on the subject who is right-handed or left-handed. If we look from the sagittal point of view, the spine presents an alternation of curves that increase the resistance of the spine to axial compressions: cervical lordosis, dorsal kyphosis, lumbar lordosis and sacro-coccygeal kyphosis. The variations being in low limits, the dorsal kyphosis is around  $35^{\circ}$ , and the lumbar lordosis has a value of  $50^{\circ}$ .

Visual examination can be done by global and segmental alignment of the body (somatoscopy), front, back and profile or another examination using measuring and control instruments (somatometry) a method that objectifies our diagnosis.

The specialist will diagnose kyphosis by performing a physical examination and evaluating the individual's medical history. The patient will have to follow a kinetic program or if the kyphosis is severe to follow a surgery followed by a recovery under the guidance of a physiotherapist. The clinical examination includes palpation of the spine to see if various abnormalities are evident, checking the sensitivity of the muscles by pressing, examining the patient's height and positioning him in a flex position of the body to check the lateral spine. Kyphosis can be treated non-surgically effectively through specific exercises to strengthen the back and abdomen. This reduces discomfort and improves posture. Not treating kyphosis can cause serious damage to the spine and head area. The best way to prevent kyphosis is to maintain the correct position.

Dr. Ryke Hammer, sounding the alarm on the importance of understanding the case before applying treatment. Each person is different in its own way as any disease can not behave exactly but it is important to follow the evolution and understand common parity regardless of the type of disease the person or try symptoms of a disease classification by type of person. An understanding of the causes or an analysis that could prevent the emergence of diseases is very popular nowadays. For this aggregated data, use different classifiers trying to prevent or stop the affection the early stages. The methods used are based on patient recovery column type strain, and age. Technology is evolving as used in almost all areas. This tool is designed to help modern

man to undertakings actions and to significantly reduce, if possible to 0, the type of analysis and decision. Based on a data set considerably through artificial intelligence is no longer a utopia, can give predictions. 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 considerably longer to achieve the same results / conclusions. However, given that the system creates its decision tree data validated by real human beings are meant to serve as a set of baseline data, training data. In order to support actions, it is important to understand the causes that trigger an affection.

In the preliminary research, three methods will be used to improve kyphotic attitudes in children aged between 15 and 18 years. The three methods used are postural equipment for auditory feedback, neuromuscular electrostimulation and physical therapy. These methods will be used in comparative studies to determine which method is more effective in correcting spinal problems.

Our research aims to address those deficient problems of the spine that can affect children's quality of life. So all three recovery methods used in this research brought statistically significant changes to change the alpha angle (backbone angle) but also to change the acromion-wall distance, establishing a hierarchy following the results.

This research began after a campaign of information and awareness of vicious back positions in two high schools in Alba Iulia. After campaign persons who were self-awarded probability of a vicious back positions present themselves to the recovery gym "SPEROMAX Alba", where they were evaluated and measured. The measurements people diagnosed with kyphosis by their agreement (those who were 18 years) and parental consent (under 18) entered in the study, signing a consent form.

Also in the study was followed a procedure sampling of the population on the basis of inclusion and exclusion of subjects. Thus the most important inclusion criteria has been exceeded the normal spinal dorsal angle between 20-50 degrees and the distance between the acromion-wall than 9 cm.

On the demographic characteristics of the sample it is noted that the participants were aged 15-18. They were represented as male individuals (11 subjects) and female (9 subjects), all of whom were Caucasian. Each sample was composed of five subjects, a total of 20 subjects (15 for 5 experimental groups and other 5 for the control group), such as one random sampling



method. Thus, to remove systematic errors that may occur is important selection randomization which refers to the equal distribution of participants in four groups of three are experimental and one control. Also, another feature worth mentioning is that the administration of randomized treatment was one open because both the person who made the intervention and subjects on which intervened knew early on procedural characteristics that were subject, something which is not true of simple type blind studies and double blind.

This research was conducted based on a long study of the literature on the subject, kyphosis correction. The most relevant works were made from Shiraz University of Medical Sciences, Iran, which showed that manual therapy (stretching) is as effective as exercise therapy in reducing kyphosis angle. Another work in Quebec, Canada demonstrated the equipment Spine Cor Dynamic Corrective Brace is promising to correct the angle of kyphosis only if applied to younger patients, also the study from State University, Michigan, USA, demonstrated that the basic exercises and posture at home carried out for 13 weeks are effective in changing the angle of kyphosis.

Moreover, in a study conducted by the University of Medicine and Pharmacy "Gr. T. Popa "University of Iasi, 1867 children from schools and high schools were examined, grades V-XII, of which 391 were found with deviations of the spine. Thus, the incidence of kyphosis in the study group was 97 cases, representing 42% of the total cases. Also, a campaign conducted by the Rotary Club Alba Iulia in collaboration with Alba County School Inspectorate have examined a total of 413 students from six schools, of which 236 received medical letter. In this case, the incidence of kyphosis was 54 cases, representing 13.08% of all cases.

According to the literature, the disease occurs in 60% to 14 years old children, affecting between 0.5 to 8% of the healthy population aged 10 - 14 years.

Verification methods (auditive feedback equipment, neuromuscular electrostimulation and kinetotherapy) in kyphosis and kyphosis attitudes correcting that will be used in order to improve these problems vertebral statics. Referring to the hypotheses of this study, we expect to see an improvement in the dorsal column angle and scapular belt deviation (acromion-wall distance) for all experimental groups as compared to the control group. Moreover, we expect experimental group 3 (kinetotherapy) to have more effective results than experimental group 2 (neuromuscular electrostimulation) or experimental group 1 (auditive feedback). At the same time, we assume that the measurements made for each experimental group will have higher

values at the initial time compared with the intermediate and final time. At the end of the study after the data, they will be compared to determine the most efficient method in correcting these problems of static vertebral.

The subjects of the four groups were evaluated at three different times, as follows: initially - at the beginning of the study; intermediate - after one month; final - after two months. These measurements were made using the angle meter to measure the angle of the column and the square for the distance between the acromion wall. After measurements were obtained objective and accurate values, which were then processed statistically using SPSS, in order to make comparison between the 4 groups, highlight the most effective of method. The ANOVA test is a method used to determine the influence of independent variable (method) on dependent variables (column angle, acromion-wall distance, measuring moments), more specifically, we have helped to compare the mean of the four samples independent of the subjects. In a first step we will analyze the influence of the two independent variables on the column angle, and then on the distance between the acromion-wall. At the same time we used the T test to see if the applied methods caused changes in the three experimental groups. Thus, for all three methods applied, both in the column angle and in the distance between the acromion wall, t values were obtained that allowed the rejection of the null hypothesis, ie acceptance of the research, which showed that the methods applied have made changes.

The present research had as a general objective the investigation of the effectiveness of three methods in order to correct the problems of static vertebral, kyphosis and kyphosis attitudes, and the results obtained were the desired ones. More specifically, all three methods used independently in this study made statistically significant changes in the column angle and the acromion-wall distance, and a hierarchy was established following the results.

At the top of the hierarchy, the best modification was produced by the kinetotherapy program, compared to the ESNM method and auditive feedback equipment. The second hierarchical modification was produced by the ESNM method, and the last one in this hierarchy was the method with auditive feedback equipment. One important aspect to be mentioned is that both kinetotherapy and ESNM were performed by the subjects under close supervision of the kinetotherapist compared to the method with auditive feedback equipment that was performed by independent subjects at home. So, starting from this observation, this is one of the probable

reasons why this method has achieved weaker results compared to the other two methods (kinetotherapy and ESNM).

The best change was produced by the method represented by physiotherapy, compared to the method represented by ESNM and also by the method represented by the postural equipment auditory feedback. The efficiency of kinetotherapy can be observed based on the decreasing evolution encountered both in the case of the alpha angle and in the case of the acromion-wall distance, being statistically proven. So physical therapy remains the most effective method due to active physical exercises that produce voluntary muscle contraction helping to correct vicious posture.

Through a software system created by us, based on several components that aim to monitor the use of postural equipment, we want to be able to achieve the performance of other recovery methods (physical therapy and ESNM). To carry out this research, the old postural equipment with auditory feedback was modified, a microcontroller-based tracking system and an android application were added, all of which have the role of monitoring the subject. The results obtained at the end were the desired ones, so that both postural equipments brought statistically significant changes in changing the value of the alpha angle value and the value of the acromion-wall distance. Therefore, at the end of the research, following the comparisons between the two postural equipments, the most efficient postural equipment for the correction of kyphotic attitudes was established, so the postural equipment with microcontroller and android application won the case. Referring to the hierarchy of methods in the preliminary research, the new postural equipment with microcontroller and android application occupies the second place being more efficient than ESNM (neuromuscular electrostimulation), so physiotherapy remaining in the first place.

In conclusion, voluntary muscle contraction achieved through physical therapy exercises is the most effective method of recovery in correcting kyphotic attitudes. Other equipment that uses proprioception by auditory stimulus or methods that use involuntary muscle contact by electrical impulse can be considered additional to the correction of vicious postures.

More specifically, after a correction of the posture through physiotherapy we can use these equipments and methods to maintain the new posture and at the same time prevent recurrence, the causes of a vicious posture being more common nowadays.

**Keywords:** kyphotic attitude, childrens, posture, exercises, auditory feedback , neuromuscular electrostimulation, kinetotherapy, postural equipment, microcontroler, android application.