

DEVELOPMENT OF MUSCLE TONUS AND POSTURE IN CORELATION WITH LONG-TERM KINESIO® TAPING APPLICATION IN CASE OF PREADOLESCENTS WITH SCOLIOTIC ATTITUDE

Eva ILIE, Luminița CĂLINESCU, George IONESCU, Alin BURILEANU, Ana Maria KESSE

Faculty of Physical Education and Sport, University of Craiova, Romania

**corresponding author: eva_moldoveanu@yahoo.com*

Abstract

Background: In the century of technology, posture plays an important role in the development of children's body. Our goal for this study was to prevent the evolution of vicious attitudes such as scoliotic attitude with the help of modern recovery methods such as complementary Kinesio® Taping therapy.

Methods: The study included 13 patients between the ages of 8 and 10 years, diagnosed with postural deficiency in the area of functional scoliosis. The main postural evaluation method included the GPS (Global Postural System), which registered the postural deficiencies by using a special software, that shows anterior and posterior angulation, also anterior and posterior translation. For muscle tonus, Myoton device measured the elasticity and tonus parameters. We followed the effect of the complementary method Kinesio®Taping, used for a period of 4 months, applied once every two weeks. The subjects had an initial evaluation and a final evaluation after 4 months.

Results: The results showed an improvement in the case of Longissimus Lombar muscle for the elasticity parameter. This result indicates that Kinesio®Taping applications influences muscle tonus, with the mean difference being statistically significant at a threshold of $p < 0.05$. In case of postural evaluation, GPS recorded a modification of posture in both anterior and posterior view, the most significant being the posterior angulation, at a threshold of $p < 0.05$.

Conclusion: In the case of functional scoliosis, it seems that, with a proper application a complementary therapy such as Kinesio®Taping, could indeed have an influence on posture and muscle tonus, making possible an intervention in the case of long-term treatment and correction of postural deficiencies.

Keywords: *Kinesio®Taping, functional scoliosis, muscle tonus*

Introduction

In clinical practice, postural deficiencies are well known and treated. Literature review estimated that more than 80% of cases are diagnosed with postural deficiencies, but not all of this cases are being treated so that the problem will not evolve.

Gravitational forces move along the spine and may cause changes in posture that can lead to postural deformity including scoliosis, lordosis and kyphosis [1]. Scoliosis is the most common type of spinal curvature disorder, and is classified as structural or functional depending upon whether or not the change is fixed [2].

Unlike structural scoliosis, functional scoliosis (scoliotic attitude) has not been

given the same importance. Many studies show the importance of physical therapy in case of structural scoliosis with different kind of methods and approaches, while functional scoliosis has been less valued, though it can also have a rapid and important impact upon a child's development.

While children grow until they have fully matured, there are certain times with more or less growth during childhood and adolescence and curvature progression is more or less probable during different phases of growth [3]. This are considered the breaking points in introducing treatment programs for this kind of postural behavior. The most common of this postural behavior is called idiopathic scoliosis.

The treatment of the so-called idiopathic scoliosis is determined by the deformity itself. As most of the scoliosis progress during growth, some also in later life, the main aim of any intervention is to stop curvature progression [3].

The purpose of this study was to provide the same type of interest for functional scoliosis as in the case of structural scoliosis. The treatment provided new and modern methods of treatment for functional scoliosis, just as Kinesio® Taping technique.

Kinesio® Taping (KT) developed by Dr. Kenzo Kase in the 70s is currently manufactured by one company and is a thin, cotton, porous fabric with acrylic adhesive that is non-mediated and latex-free [4]. Although KT research is limited, several studies have supported the efficacy of this treatment technique for addressing acute injury inflammation, promoting a faster return to activity, enhancing proprioception training, reducing pain, promoting neurological

function post injury, and reducing muscle imbalances [5].

An incredible advantage of this method is its 24-hour continuity, and it is sometimes described as a round-the-clock presence of the therapist's hand touch. Kinesiology taping was developed with the idea of relieving pain and providing support to accelerate recovery of overstrained soft tissues, and its suggested effects include proprioceptive facilitation, inhibition of pain, and normalization of muscle tone, oedema therapy enhancement, and blood circulation improvement [6].

Materials and methods

The research covered 13 patients between the ages of 8 and 10 years, diagnosed with postural deficiency in the area of functional scoliosis. The main postural evaluation method included the GPS (Global Postural System), which registered the postural deficiencies by using special software that shows anterior and posterior angulation, also anterior and posterior translation. (fig.1, fig.2, fig. 3, fig.4)

Anterior View

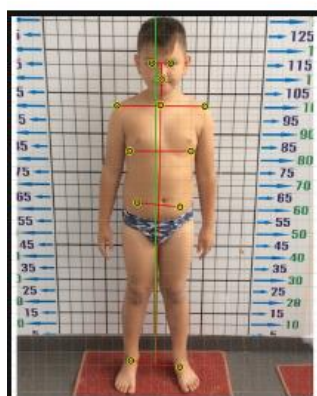


Fig.1

Posterior View



Fig.2

Body Region	Anterior Translation	Anterior Angulation	Body Region	Posterior Translation	Posterior Angulation
Head	0,69" left	0°	Head	1,65" right	1,3° right
Shoulder	0,24" left	0°	Shoulder	5,41" right	4,9° right
Ribcage	1,21" left	n/a	Ribcage	3,31" right	n/a
Hip/Pelvis	2,54" left	5,9° left	Hip/Pelvis	5,73" right	4,9° right
Knee	n/a	n/a	Knee	n/a	n/a

Fig.3

Fig. 4

For muscle tonus, Myoton device measured the elasticity and tonus parameters. Myotonometry provides an objective way to quantify physiological properties of muscle tone. In our study we focused mainly on muscles that imply a modification of posture. The measures were made only after the subject was well aware of the measuring technique, and with the subject lying first in prone position, we could evaluate the following muscles: *erector spinae*, *longissimus lumborum*, *trapezius superior*. After measuring the back muscles, the subject turned into supine position for the evaluation of *pectoralis major* muscle.

The non-invasive method registered the information of muscle activity and all data were calculated with the device's software, releasing a PDF format that contains graphs with values for *frequency* and *decrement* parameters related to the muscle groups that have been evaluated.

Kinesio® Taping was applied after the evaluation and it included a procedure that has been refined in years of experience and research, and has taken into account the muscles involved in the appearance of the vicious postural attitude in the scoliosis area. The characteristics of the affected muscle were evaluated, taking into account which muscles are shortened and which muscles are elongated in the case of functional scoliosis.

The applications were made for 4 months, once a week, twice a month, giving the opportunity for the muscles to get used to the

extra layer of skin that was represented by the kinsiotaping.

All taping was applied by the primary author, an experienced kinesiologist practitioner.

Standard 5 cm colored tapes was used for the experimental group. The length of the tape was individualized and added on the connective tissue, corresponding to the affected muscles, as followed:

- For the *erector spinae* and *longissimus lumborum* muscles, considered to be weak muscles, the application was applied from the proximal to the distal (origin-insertion), the application being to facilitate the weak muscle. Tape tension was 35%,

- For the *trapezius superior* muscle, considered to be a tense muscle, the application has been designed to inhibit overworked muscles, so it was applied from distal to proximal (insertion-origin). Tape tension was 25%,

- For *pectoralis major* muscle, also considered to be a tense muscle, the application has been designed to inhibit overworked muscles, so it was applied from distal to proximal (insertion-origin). Tape tension was 25%,

- The added high hip projection (as seen in most of scoliosis) tape, was applied so that it will translate the hip, avoiding a compensatory postural projection.

All of the applications were made in standing position, with a stretched tissue, adding in this way a proprioceptive factor with the purpose of influencing a correct posture by using neuro-proprioceptive input. (fig.5)



Fig.5

Results

Non Parametric test, Wilcoxon, was used in order to highlight the differences in the initial and final testing, the significant level being at $p < 0.05$, which shows us if there is a significant difference / association in our study.

Table 1 presents comparative results between the initial postural assessment before applying Kinesiotaping and final postural assessment after 4 months of wearing Kinesiotaping applications. Final results show an improvement in the evaluation of *posterior*

view, for *posterior angulation*, which is the sum of the postural changes by modifying the postural angle, or in other words, the inclinations appearing at the topographical level of the head, shoulders, thorax, hips / pelvis. Using the Wilcoxon test, a value framed at a threshold of significance $p < 0.05$. This result indicates that the complementary method represented by Kinesiotaping, applied to the scoliotic attitude shows an improvement in the posterior angulations, the mean difference being statistically significant at a $p < 0.05$ threshold.

Table 1. Results showing the comparison between the initial and final (after 4 months) evaluation of postural assessment

	Before	After	Wilcoxon (p)
Anterior Translation	10.38 (3.73/17.17)	6.32 (3.50/8.10)	0.10
Anterior Angulation	6.70 (4.20/9.70)	3.70 (2.70/7.40)	0.09
Posterior Translation	10.97 (4.41/16.07)	7.18 (4.24/10.87)	0.10
Posterior Angulation	8.7 (5.6/9.6)	5.80 (3.10/7.10)	0.05

Table 2 represent the comparison between the first tonus evaluation, before applying Kinesiotaping, and the final evaluation of tonus, after 4 months of Kinesiotaping applications. In the case of tonus evaluation, results show significant improvement in the *decrement parameter* for *longissimus lumborum* muscle, by applying the Wilcoxon test, a value is assigned to a significance threshold of $p < 0.03$. This result indicates that kinesiotaping applications recorded an improvement in elasticity parameter, the mean difference being statistically significant at a $p < 0.05$ threshold.

Table 2. Results showing the comparison between the initial and final (after 4 months) evaluation of muscle tonus

	Before	After	Wilcoxon (p)
Frequency of m. Erector spinal	2.44 (0.28/5.99)	0.67 (-1.57/3.18)	0.15
Decrement of m. Erector spinal	7.30 (3.23/12.76)	12.76 (10.35/15.98)	0.13
Frequency m. Longissimus lombar	0.81 (-3.10/1.63)	1.13 (-1.28/3.35)	0.17
Decrement m. Longissimus lombar	-3.26 (-6.45/0.00)	4.68 (-1.20/8.71)	0.03
Frequency m. Marele pectoral	-0.95 (-3.38/1.02)	-3.12 (-6.12/2.62)	0.13

Decrement m. Marele pectoral	0.00 (-8.40/4.59)	-3.09 (-5.19/4.26)	0.65
Frequency m. Trapezul superior	-7.23 (-8.61/1.23)	-2.44 (-12.00/4.40)	0.80
Decrement m. Trapezul superior	-0.40 (-6.33/4.60)	-4.73 (-12.94/-0.37)	0.19

Conclusion

Kinesiotaping applications led to improvements within the evaluated parameters regarding the posture of the subjects in the experimental group, yet the differences are statistically insignificant.

Relatively small progress in its value may have various determinations, such as the insufficient number of cases for the statistical certification of hypotheses formulated, the mode of application of the kinesiotaping method that can be approached in another way, the tension in the applied band that can influence in various ways subject's perception of treatment.

However, statistically improved postural evaluation results, improvements with favorable values in the *posterior angulation*, have been recorded, as evidenced by the Wilcoxon test, which records a value at a significance threshold of $p 0.05$. This shows that even though the tape cannot have a significant influence on global posture it can, in fact, improve certain posture deficits like *angulation*.

In the case of its influence upon muscle tonus, kinesiotaping can create a movement in the fascia corresponding to the muscles implicated in the postural deficiency, improving the *decrement parameter*, showed with the Wilcoxon test, which records a value at a significance threshold of $p 0.05$.

Taking all the results in consideration, we can find kinesiology tape useful in the approach of functional scoliosis, and we encourage more research upon this topic, to evaluate its effect on long term upon postural deficiencies.

References

- [1]. Burwell RG, Cole AA, Cook TA, et al. (1992). *Pathogenesis of idiopathic scoliosis. The Nottingham concept*. Acta Orthop Belg; 58(Suppl 1): 33–58.
- [2]. Alves de Araujo ME, Bezerra da Silva E, Bragade Mello D, et al. (2012). *The effectiveness of the pilates method: reducing the degree of non-structural scoliosis, and improving flexibility and pain in female college students*. J Bodyw Mov Ther 16: 191–198.
- [3]. Goldberg CJ, Moore DP, Fogarty EE, Dowling FE (2002). *Adolescent idiopathic scoliosis: natural history and prognosis*. Stud Health Technol Inform, 91:59-63.
- [3]. J Parkkari, UM Kujala, P Kannus (2001). *Is it impossible to prevent sports injuries?*, Sports medicine – Springer, Volume 31, Issue 14, pp 985–995
- [4]. Teitz CC, Hermanson BK, Kronmal RA, Diehr PH (1987). *Evaluation of the use of braces to prevent injury to the knee in collegiate football players*, The Journal of Bone and Joint Surgery. American Volume, 69(1), pp 2-9
- [5]. Jaraczewska E, Long C (2006). *Kinesio taping in stroke: improving functional use of the upper extremity in hemiplegia*. Top Stroke Rehabil, Volume13, Issue 3, pp 31-42.
- [6]. SL Weinstein, LA Dolan, JCY Cheng, A Danielsson et al. (2008). *Adolescent idiopathic scoliosis*, The Lancet, Volume 371, Issue 9623, pp 1527-1537