

Literature Review: effects of Elastic Therapeutic Tape use as adjunct to treating spinal disorders. Taping goals, applications and current practice are critically appraised.

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Review of articles discussing the effects of ETT on people of all ages with postural kyphosis and various scoliosis types. The analysis of the applications used and the results obtained are presented and discussed. Thirty studies were found after rigorous online search: 1 literature review, 8 articles with abstracts only & 5 articles describing rigid tape were not included.

Postural Kyphosis

Name	Participants	Taping goals	Results
Postural Rehabilitation and Kinesio Taping for Axial Postural Disorders in Parkinson's Disease. Capecchi M et al. 2014 Italy	Single blinded RCT N= 20. Customized ETT applied 2 x week for 4 weeks. Aged 58-79 years.	Postural (flexion) improvement. Improved balance (BBS) and gait (TUG)	No additional gain seems to arise from adding tape to postural rehabilitation
Immediate effect on Balance after Correcting Postural Hyperkyphosis of Thoracic Spine in Elderly population using Therapeutic Tape. Prabhy & Nandakumar 2013 India	Literature survey & experimental study N=40 Mean age 62.67 Actual application not mentioned.	MDRT test. Postural Thoracic curve correction Improving dynamic balance	Significant increase in MDRT & decrease in thoracic spine angle (flexi curve measure)
The effect of a Combination of Corrective Exercise and Spinal Taping on Balance in Kyphotic Adolescent Mirafzal SF et al 2011 Iran	Four intervention groups. ETT applied in two groups 4 weeks (1xw). N=35 mean age 12±0.31 yrs	Effects on balance. Star Excursion Balance Test before & after taping	ETT & exercises have significant effect on static & dynamic balance & kyphosis correction.
A comparison between chiropractic manipulation and kinesio® taping and the combination thereof on postural kyphosis. Franzsen M. Thesis 2014 South Africa	N= 30 Group 1 spinal manipulation. Group 2 Kinesio® taping rhomboid muscle. Group 3 received both. 3 weeks (2xweek)	Improving Postural flexion (flexicurve/plumb line), improving scapular and acromioclavicular movement.	Group 1 & 2 the mean kyphosis decreased 15.34% & 15.54%. Group 3, the mean kyphosis 6% to 21.02%. Best results found when combining.



Discussion:

In these studies the tape brands and colours, the amount of stretch or application type were not always mentioned making comparing difficult. Functional measures showed significant improvement in two studies.

Neuro Muscular Scoliosis

Authors	Participants	Taping Goals	Results
The effects of Kinesio taping on sitting posture, functional independence and gross motor function in children with cerebral palsy Şimşek TT et al 2011 Turkey	Sitting posture of 31 children aged 8.27 ± 3.43 years with CP GMFM level III, IV or V. PT & ETT group and control group PT	Improve sitting posture, gross motor function & level functional independence. 2x week for 4 weeks	Sitting posture (head, neck, foot position and arm, hand function) was affected positively. No direct effects on GMFM & WeeFIM outcomes.
The effect of Kinesio Taping on seated postural control in Spastic Diplegic Cerebral Palsy Children Badawy WM et al 2015 Egypt	Thirty children with Spastic Diplegic Cerebral Palsy aged 10-16 years. One group PT, one group with PT and ETT	GMFM Sitting subset score & X-ray TS and Cobb angles 12 weeks ETT (2x week)	ETT on the trunk may improve sitting posture and trunk control when adjunct to PT program
The effect of Kinesio Tape on the sitting posture of learners with Cerebral Palsy. Human A et al 2016 South Africa	In 18 children photos pre- and post-tape application in sit. Mean age 11 years ±4,29	Change postural deformities to correct scoliotic or kyphotic postures.	Significant changes in angle measurement of head, thorax and pelvis were noted post-intervention.
Training postural control and sitting in children with cerebral palsy: Kinesio Taping vs neuromuscular electrical stimulation. Karabay I et al 2016 Turkey	Seventy five children divided into control, KT & NMES group. Tape applied 4 weeks NDT for all groups.	Improve kyphosis and sitting using GMFM Sitting subset score and X-ray Cobb angles	KT or NMES application for 4 weeks including NDT is effective on improving kyphosis and balance.
Kinesio Taping Application in a pediatric patient with Spinal Muscular Atrophy. Bayram Kelle et al 2016 Turkey	Twelve year old boy with marked thoracolumbar scoliosis developing back pain and muscle spasm.	Address pain using Star application 3x with 4 day intervals VAS pain scale	Pain relief after 1 hour and after subsequent applications



Discussion:

Functional goals were assessed and sitting improved in all but one study. In most cases correction technique (++) tape stretch) was used. This can potentially harm the skin. Sadly skin damage caused by Kinesiotaping has been added to the list* of skin disorders (related to use orthotics and attachments) in children with CP. Şimşek TT & colleagues are the only ones using very little stretch. Pain relief was discussed in one article. Pain is not mentioned in the other studies. Pulmonary function was not looked into.

Abbreviations
 BBS Berg Balance Scale
 BHS Beighton Hypermobility Score
 ETT elastic therapeutic taping
 GMFM Gross Motor Function Measure
 Kibler palpatory assessment of skin fold
 MDRT Multi Directional Reach Test
 NMES Neuro Muscular Electrical Stimulation
 Ppi Present pain intensity scale
 SAS Sitting Assessment Scale
 TUG Times Up and Go
 VAS Visual Analog Scale used measuring pain
 WeeFIM Functional Independence Measure for children

Idiopathic Adolescent Scoliosis

Name	Participants	Taping goals	Results
Het effect van medical tape op de houding van scoliose patiënten " Literature study. Bachelor Thesis Burgel A & Paulsen B 2008 Netherlands	Tapes applied to various muscles on 3 patients aged 15-18 years (treated in German orthopaedic clinic	Can ETT add value in treatment scoliosis patients? Assessment Diers Formetric 4D before and after 1 week applying tape	Tape can have both positive (1) and negative (2) effects on scoliosis measured by Diers
Efficacy of Kinesiology Taping in the rehabilitation of children with low-angle scoliosis Bac A et al 2009 Poland	Two groups, control with PT and KT+PT mean age 10 years (8-12)	Changing spinal mobility, paravertebral muscle tone, pain ADL and child's mobility. 3 week program taping 3 x week	No significant effect on analysed parameters. Reduced pain intensity lead to better motivation to exercise.
The effects of Spinal Tractions and Kinesio Taping in the rehabilitation of scoliosis. (scoliotic posture) Dobreci DI & Zahara A 2014 Romania	Fifty two adolescents aged 13-15 taped along the thoraco-lumbar spine	Thoracolumbar X-ray, Cobb angle before and after 3 month taping + aerobic gymnastics+ traction.	Mean Cobb angle before taping 5.7692 degrees and after taping 1.1538 degrees = significant improvement
Kinesio taping in the rehabilitation of an adolescent idiopathic scoliosis-effects of a two month treatment program. Kiselak D 2015 Croatia	Fifteen year old patient, taping added to neuro-muscular therapy (PNF), virtual reality exercise. Tape applied 2x week 8 weeks	Functional re-education (not only postural correction) using 4 therapy measured. Postural state measured before and after 8 weeks.	Significant improvement over 2 months of this integrated approach
The effect of Kinesio taping on back pain in patients with Lenke Type 1 adolescent idiopathic scoliosis: a Randomized controlled Trial. Atici Y et al 2016 Turkey	Two groups of 20 patients aged 16.1 (14-18years) with back ache were taped. Difference: ++ stretch (25-50% convex/ 15-25% concave sides) or paper off tension. 4 weeks (1x week)	Thoracic vertebral area taped (T3-L1) QoL SRS section of SRS-22 and VAS pain assessed	KT with tension effectively led to back pain relief. KT had positive impact on QoL
Effect of Therapeutic exercised augmented by Kinesio tape in treatment of scoliosis in adolescent females. Mohamed .A. et al 2016 Egypt	Both groups of 40 females aged 11-17 years performed exercises 3 x week for 6 weeks (stretching and strengthening. Tape applied 1xweek for 5 days.	Effect of exercise and KT useful on pain and Cobb angle. X-ray Cobb angle & Ppi for pain after 6 weeks	Significant improvement Cobb angles (approx. 65%) both groups. Improvement pain in both and significant reduction KT group.
Efficacy of Kinesio taping application in the complex rehabilitation of children with idiopathic scoliosis.(7.30 ± 1.23 degrees) Gorsha AV et al 2017 Ukraine	134 children aged 12-17years in 2 groups; 1 group standard restorative treatment (protocol) & 1 group same with KT.	Phosphorus, creatinine, in blood, CPK in urine, X-ray, bone density, pain (VAS), hypermobility (HMS) & QoL were measured before and after 1 year	Clinical, functional, instrumental & biochemical markers closer to normal values in KT group compared to standard group. Results lesser in cases of scoliosis with osteopenia



Discussion:

In a number of studies taping was included as part of a whole program with many other modalities. Most studies look into scoliosis with low angles only. Many authors refer to taping aiming 'to inhibit' or to 'activate' muscles. Applying tape according to this 'taping rule' is no longer recommended. As skin mechanisms have not been taken into account, this old taping 'rule' is not always correct. Not a single study looking into the effects of taping post surgically has been found. This is especially worrisome because of the positive effects on swelling, pain and pulmonary function reported in numerous studies on this topic.

Results:

Taping aims are not mentioned in most cases and remain unclear. Not one study refers to the age of onset scoliosis, the Risser scale or vertebrae torsion measure. Pain is mentioned often as treatment goal in IAS. It seems that pain is underdiagnosed in patients with kyphosis and NMS as it is never mentioned as treatment goal. In most cases there is no mention of skin care or test patching.

Take home messages:

- Every tape crossing the midline will be counterproductive as skin 'changes movement direction' at the midline. (Fukui**)
- Check for pain in every patient with kyphosis and/or scoliosis.
- Consider using tape to address pulmonary dysfunction.
- Consider using tape (lymph technique) post-surgically.
- Using tape to facilitate movement without specific knowledge of skin movement might prove useless as skin movement does not always follow muscle anatomy and muscle movement direction.
- Using tape without sufficient knowledge of working mechanisms and physiological reactions can actually do harm.
- Skin care, tape brand and colour, tape stretch all need to be mentioned in studies. Test patching is advocated to prevent adverse skin reactions.
- Minimal stretching of the tape is recommended.
- Appropriate assessment tools to measure effects tape required.

* Villareal-Parra L Skin findings in patients with Cerebral Palsy and their classification. Dermatologia Rev. Mexico 2017
 ** Fukui T, Otake Y, Kondo T 2015 In which direction does skin move during joint movement? <https://doi.org/10.1111/srt.12248>
 ** Fukui T, Otake Y, Kondo T 2017 The effects of new taping methods designed to increase muscle strength. JK Phy. Thischi 29:70-74 2017
 ** Taro Kato & Tsutomu Fukui. 2013 Thoracic and Abdominal Skin Movement during Respiration January 2013 Rigakuryoho Kagaku 28(2):279-283 / DOI10.1589/rika.28.279