

# Effect of Kinesio Taping to improve Hand functioning in Cerebral Palsy Children

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## ABSTRACT

### Background:

Kinesio taping (KT) is a relatively new technique, which use in rehabilitation of neurologic diseases. The aim of the study was to investigate the effects of kinesio taping to improve the hand function in cerebral palsy (CP) children. CP is the most common movement disorder in children that is associated with lifelong disability with multiple impairments. Children with CP demonstrate poor fine and gross function due to psychomotor disturbances.

### Methods:

In this experimental study with pre-test and post-test, 30 children with cerebral palsy randomly were placed in control group (n=15) and experimental group (n=15). Kinesio tape was applied on dorsum of forearm and hand. Evaluation was performed initially and after 15 days of regular taping for 2 hrs. per day. Nine hole peg test (NHPT) was used to evaluate active range of motion.

### Result:

In pre-test, there was no significant difference between the control group and experimental group but in post-test after application of KT with  $P < 0.05$  was significant difference between control group and experimental group.

### Conclusion:

Kinesio taping in neurorehabilitation of children with CP can be a useful option to promote hand functioning to make the child more independent somehow by improving their activities of daily living (ADL's) i.e., Eating, drinking, combing etc.

### Key words:

*Cerebral Palsy, Kinesio Taping, Nine Hole Peg Test, Spasticity, Thumb in palm.*

### Background

Cerebral Palsy is the most common movement disorder in children that is associated with lifelong disability with multiple impairments. Children with CP demonstrate poor fine and gross function due to psychomotor disturbances. CP is neurodevelopmental disorder caused by non-progressive lesions in the immature brain implying spasticity, muscle weakness, decreased selective motor control and secondary musculoskeletal problems usually accompanied by sensory and cognitive impairments. It affects muscle tone, movements and motor skills. It hinders the body's ability to move in a

coordinated and purposeful way. It also can affect other body functions that involve motor skills and muscles like breathing, bladder and bowel control, eating, and talking. The prevalence of CP is about 2 to 2.5 per thousand live births.

The most common contracture patterns were the thumb in palm with clasp hand, shoulder adduction with internal rotation and wrist flexion with pronation. This limits reaching, grasping, eating, combing and objects manipulation, interfering also with exploration (Mazzone, Serafini, Iosa, Aliberti, Gobbetti, Paolucci & Morelli, 2011), play, self care and other activities of daily living (Kuo & Huang, 2013).

The rehabilitation and management of the disability and functional problems in CP children is a challenge for the clinician. Various treatment options like CP Bobath NDT, positioning, surgeries and recently KT technique are used with some benefits in improving the hand functions. Kinesio taping technique is a newer technique however, there is a paucity of literature to support its use and effect on hand function in CP (Aisen, Kerkovich, Mast, Mulroy, Wren, Kay, & Rethlefsen, 2011).

Kinesio tape is special therapeutic tape that was developed by the Japanese Chiropractor Kenso Kase in the mid-1970s. KT is made of elastic cotton fibers and acrylic adhesive in a wavy pattern. The distinctive design of KT allows for the longitudinal stretch of 55-60% of its original length and evaporation of body moisture. Additionally, compared to traditional non-elastic.

KT is implemented in addition to current exercise programme in such pediatric age group diseases as CP. There are ongoing studies to prove its efficiency in the pediatric age group. KT application utilized in CP rehabilitation are used especially to maintain postural control. It was reported that the KT in children with CP increased proprioception and tactile and dynamic balance, maintained the control of trunk movements, and thus helped children in improving seating balance and children. The use of evidence-based interventions in CP treatment has gradually increasing and the results of the studies are promising. There are some studies that show the effects of electric stimulation, KT and neurodevelopmental treatment in children with CP and the results are conflicting (Shamsoddini, Rasti, Kalantari, Hollisaz, Sobhani, Dalvand & Bali, 2016).

Kinesio taping (KT) technique is a relatively new technique applied in rehabilitation programs of CP. There are several different applications about KT in children with CP. Shamsoddini et al (2016) in their study find that the impact of technique on gross and fine motor function and dynamic activities is more effective than postural and static activities. Upper limb function improve when function taping was used to daily support the children in their movements (Mazzone, et al, 2011). Another meta-analysis on the influence of KT on the treatment and prevention of sports injuries showed that this technique has little beneficial effects on muscle strength, muscle activation, or active range of motion.

### **Objectives:**

This study was carried out with the aim of determining whether kinesio taping improve the hand functioning of the cerebral palsy children.

### **Methods:**

This study was planned as a randomized controlled parallel group study.

**Participants:**

30 children with cerebral palsy undergoing neurodevelopmental therapy at Arpan Institute For Mentally Handicapped children, Rohtak (Haryana), for 5 days a week were the subjects of this study. The participants were randomly allocated in the control group and experimental group. Patients were considered eligible if they met the following inclusion and exclusion criteria given in table 1.

Children with substantial spasticity on the MMAS of 3 or 4 were also not eligible for inclusion as study participants. They were all evaluated by the same therapist to eliminate the variability found in assessing the degree of spasticity.

**Interventions:**

In our study kinesiotape was used for its nonirritant properties. The tape is latex free, very thin, stretches in the longitudinal plane and conforms to the body, allowing for movements. Kinesiotape was applied with the rationale of partially inhibiting thumb in palm via a tape on the extensor surface of the thumb and an additional three piece tape starting from the anterior proximal wrist crease crossing the first web space then descending to the posterior wrist. All four pieces of the tape were secured with a circumferential wrist piece.

In the control group along with normal elastic tape we give physiotherapy to avoid biasness. In experimental group we were applied kinesiotape along with physiotherapy.

Table 1

**Inclusion and Exclusion criteria**

Inclusion criteria	Exclusion criteria
Age: 4-14 years old.	
Hand /wrist spasticity 2-3 grade according to MMAS scale.	
According to MMSE cognitive scale used in pediatric to understand the aim of study and to follow the instruction.	

**Exclusion scale**

- Undergone surgery for the upper extremity since last 6 months.
- Used an orthosis for upper extremity.
- Has motor or sensory loss (muscle grade zero to trace) in the area to be taped.



#### Outcomes:

Every child was evaluated with the following assessment tools:

Measure fine dexterity and involves placing and removing nine pegs in a peg board (NHPT).

Count the number of pegs placed and removed from the pegboard in 25 s.

We use the nine hole peg test to measure the outcome of our intervention because the performance of many tasks of daily living, school activities, and play requires fine motor dexterity and the nine hole peg test is an effective test which measure fine dexterity. Several researchers have tested the NHPT to establish norms, test validity and reliability.<sup>11</sup> The results have shown that the NHPT is valid and reliable and can be used to determine the effects of treatment in children. In our study we utilized nine hole peg test treatment effects because children like colorful and purposeful nature of the test enables the child to comply and thrive to finish the test without becoming bored and resembles features of the nine hole peg test and being a timed test measuring velocity and coordination and also requires small pinch grasp. The children were tested at a desk and a chair of appropriate height with their feet supported on the floor. The pegboard was centered in front of the child with the container on the same side as the hand being tested. All the subjects were taught the test one day before the application to eliminate the learning effect.

A stopwatch was used for timing and mean of three trials ( maximum time – 5 minutes ). After completion of the test the scores of the children were recorded in a random manner so that the evaluator is not aware of the type of

taping placed. The participants not tolerating the tape for 2 hours were excluded from the study, however were taken into account of compliance score of the study.

We also measured the:

- Numbers of pegs removed in the NHPT pre application of KT.
- Numbers of pegs placed in the NHPT post application of KT.



Fig. 2 patient trying to remove the pegs pre application of KT.



Fig. 3 patient trying to remove pegs post application of KT.

**RESULT:**

30 subjects participated in the study, demographic details and descriptive analysis of the sample is represented using the mean and standard deviation in the following tables, also prior to applying the Chi square test, Mann whitney U test and Wilcoxon sign rank pair test the normality of the data was also found as obtained in the SPSS software version 24.

The age group of control group was  $9.7 + 5$  years and the age of experimental group was  $9.11 + 4.1$ . Intra group analysis showed that there was no significant difference in the control group while in experimental group there was significant differences in favour of post application values. When control group and experimental groups were compared initially there is no significant difference between the spasticity and functional levels. After application of treatment for 15 days there was significant difference between the values experimental group.

*Table: 2*

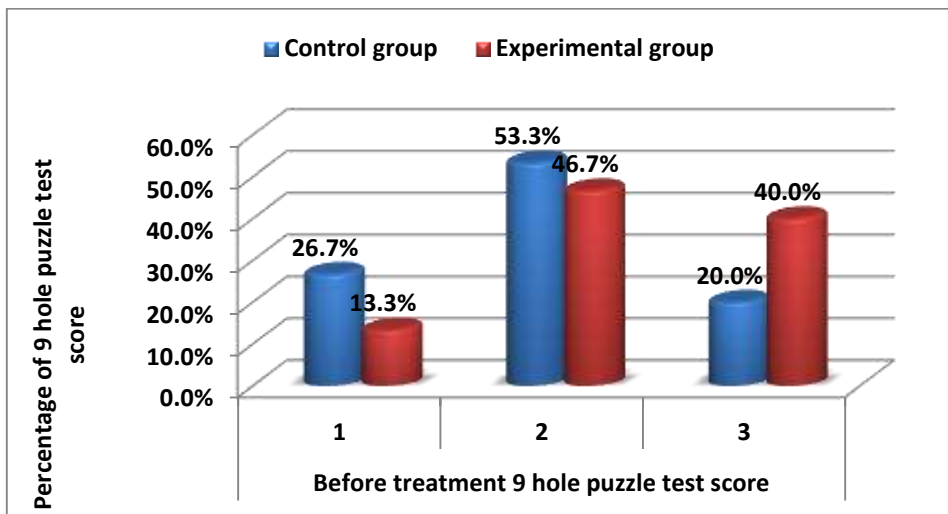
Groups	Age			
	Mean	Std. Deviation	Critical value	p-value
Control group	7.15	1.57	-0.060	0.952
Experimental group	7.18	1.58		

The mean age of study population among Control group was  $7.15 \pm 1.57$  years and Experimental group was  $7.18 \pm 1.58$  years.

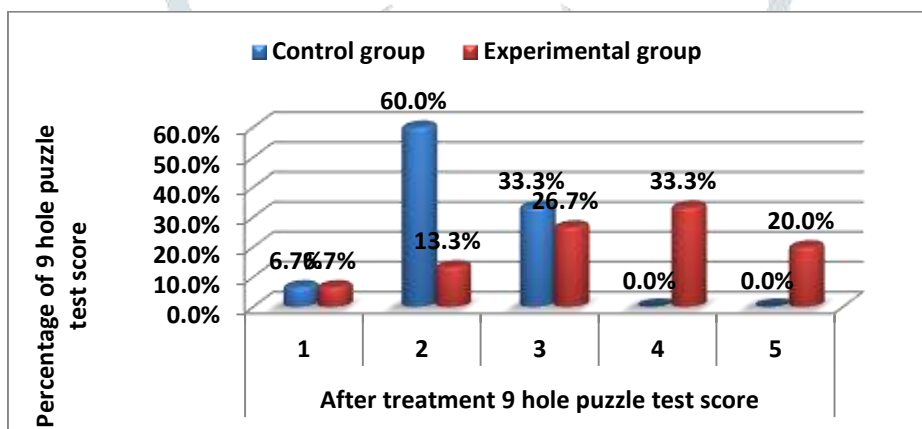
	Minimum	Maximum	Mean	Std. Deviation
Age	4.11	9.70	7.17	1.55

*Table: 3*

The age range of the study population was 4.11-9.70 years with a mean age of  $7.17 \pm 1.55$  years



Graph: 5: Distribution of before treatment 9 hole peg test score (annexure2, table-2).



Graph: 6: Distribution of after treatment 9 hole peg test score(annexure2, table-3).

**DISCUSSION:**

Cerebral palsy (CP) is a neurological non-progressive disorder resulting from brain damage occurring before, during, or after birth along with permanent disorder of movement and posture. It is the most common movement disorder associated with lifelong disability and motor deficit. This disorder results from insult or injury to the brain before or in early childhood that causes neural connection to be form in aberrant way and leads to persistent abnormal limb strength, control, or both(Aisen et al, 2011). The aim of our study was to see the effectiveness of the use of KT technique to improve functional hand movement in CP children.

The Results of this study shows statistically significant improvement in Hand function in Experimental Group after applying Kinesio Tape along with physiotherapy. There was no statistically significant difference in both study Groups before intervention. Although there was improvement in Control group Hand Function but that was attributed to Physiotherapy alone. Kinesio tape show encouraging results in improving hand function in cerebral palsy children. physiological effect of kinesio tape is by opening distal sensation areas for sensorial stimulation and improve the function of thumb and other fingers.

We use the nine hole peg test to measure the outcome of our intervention because the performance of many tasks of daily living, school activities, and play requires fine motor dexterity and the nine hole peg test is an effective test which measure fine dexterity. Several researchers have tested the NHPT to establish norms, test validity and reliability.<sup>11</sup> The results have shown that the NHPT is valid and reliable and can be used to determine the effects of treatment in children. In our study we utilized nine hole peg test treatment effects because children like colorful and purposeful nature of the test enables the child to comply and thrive to finish the test without becoming bored and resembles features of the nine hole peg test and being a timed test measuring velocity and coordination and also requires small pinch grasp.

We used kinesio tape along with physiotherapy to improve the hand functioning to make the child more independent by improving their ADL's (activities of daily living). This application was according with teachings of Brunnstrom and Bobath, widely practiced by therapists, in upper limb to releasing tension in flexors muscles of fingers and thumb to improve the grip of the patients. It has been shown that direct manipulation of proprioceptors by pushing or pulling on a muscle belly or attachments is also very effective. Our hypothesis was that prolonged stretching of a muscle, causing a relaxation in hypertonus and the application design would allow sensorial input during movement.

The positive effect of taping on the proprioception has also been reported by Simoneau et al and Callagan et al. We assumed that the effect of kinesio taping could be due to the cutaneous stimulation of the sensorimotor and proprioceptive systems. The result of these effects would be the enhancement of functional activities.

Hilal Kekliceck ,2014. In their study on thumb in palm deformity concluded that taping can be an effective option for repositioning the thumb and improves upper extremity function by controlling the thumb in palm mechanically and enabling sensorial input by maintaining the correct hand position.

Carda and Molteni showed that the application of kinesio taping could lead to higher and faster hypertonus reduction on the wrist and finger flexors compared to other treatment options. Their study did not investigate the reduction in spasticity cause an improvement in functional activities.



**Conclusion:**

From the result we obtained that the use of kinesio tape is effective in improving the hand function in cerebral palsy children. However, limited data exists to support its use to facilitate the functional motor skills in the hands of children with cerebral palsy and can be used as an adjunct to treatment. Kinesio tape is an innovative technique that can be use to improve the ADL's of the children by improving hand functioning. KT along with physiotherapy give encouraging results for the additional benefits, however further long term studies are required to explore its real potential.

