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# **Usefulness of Kinesiotaping for Children Experiencing High Tone and Spasticity as a Symptom of Cerebral Palsy**

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Hailey Koep, Hailey McGuire, & Claire Meyer, 2023

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## **Focused Question**

How useful is Kinesiotape in reducing symptoms that commonly interfere with occupational engagement for children and adolescents with Cerebral Palsy (CP) who are receiving care in an outpatient setting?

## **Case Scenario**

This critically appraised topic focuses on the use of Kinesiotape for improving occupational engagement for children and adolescents experiencing high tone or spasticity related to the diagnosis of Cerebral Palsy treated in the outpatient setting. To develop a better understanding of the different factors in question, Cerebral Palsy and Kinesiotape are first addressed, then the impacts on the quality of life in children with CP, and finally, occupational therapy's role in the use of Kinesiotape and treatment of CP.

## **Cerebral Palsy**

In children, Cerebral Palsy is the most common physical disability that affects their daily life functioning (Kruijsen-Terpstra et al., 2016). In a study by Kruijsen-Terpstra (2016), the authors defined CP as "the general term for a number of neurological conditions that affect movement and coordination" (2016, p. 315). It is caused by a "non-progressive injury to the brain during intrauterine or early postnatal development" (Ozmen et al., 2017, p. 34). Effects of CP that do not include spasticity are poor balance, range of motion, muscle weakness, and decreased motor control (Ozmen et al., 2017). Commonly seen physical postures of children with CP are "internal shoulder rotation, elbow flexion, forearm pronation, wrist flexion, finger flexion, and thumb-in-palm" (Keklicek et al., 2015, p. 27). Children often attend physical and occupational therapy to improve and/or combat these postures and symptoms of CP. In therapy

services, therapists utilize different biomechanical interventions to improve these children's overall quality of life and well-being (Kruijsen-Terpstra et al., 2016).

### **Kinesiotape**

Kinesiotape, also known as KT, is a therapeutic tape that has been used for various conditions, such as musculoskeletal conditions, pediatric diseases, and neurological accidents (Orhan et al., 2016). Kinseotape is an elastic adhesive tape that is stretched and placed on the desired skin location. The intended use of Kinesiotape is to reduce pain and muscle spasms, increase circulation, and improve muscle strength, proprioception, and functional performance (Orhan et al., 2016). These implications raise the question of whether Kinesiotape may be useful when treating individuals with CP.

### **Occupational Therapy**

Cerebral Palsy is a complex condition that affects many occupations of daily living. Occupational therapy aims to help individuals engage in their desired occupations and enhance their overall quality of life. Quality of life is not universally defined. For the purpose of this critically appraised topic, quality of life is defined as "the degree to which a person enjoys the important possibilities of their life. Possibilities result from the opportunities and limitations each person has in their life and reflect the interaction of personal and environmental factors" (Quality of Life Research Unit, n.d., para. 4). This critically appraised topic focuses on the quality of life in children and adolescents. Since CP impacts various skills, functions, and occupations, the course of treatment will vary from individual to individual. Common areas of occupation affected are toileting, sleep, education, leisure/play, eating/swallowing, and driving. In children with Cerebral Palsy, occupational therapists address cognitive and perceptual deficits and work

on developing skills to perform ADLs to increase functional independence (Allegretti et al., 2019).

Previously, occupational therapists have used Kinesiotape for pain management in individuals with carpal tunnel (Randall et al., 2019) and in acute pediatric rehabilitation settings for acquired disabilities (Yasukawa et al., 2006). For these specific conditions, Kinesiotaping improved patients' perceptions of their abilities (Patel, 2006; & Randall et al., 2019). Currently, studies on the usefulness of Kinesiotape in occupational therapy for individuals with CP are limited.

When considering a particular theory, the Ecological Human Performance (EHP) model is the most suitable model for our focus question. The EHP model focuses on increasing the performance range in which an individual can engage. The components of this model are the person, environment, task, and performance range (Dunn, 2017). The person is made up of children and adolescents, ages 5-18, experiencing high tone/spasticity due to a diagnosis of Cerebral Palsy. The environment includes an outpatient clinical setting and the use of Kinesiotape on their body, and the occupational focus is on overall engagement in desired occupations. The components of this model are the person, environment, task, and performance range.

### **Purpose Statement**

There is an apparent lack of evidence in understanding the effects of Kinesiotape in children with Cerebral Palsy as it relates to participation in daily occupations. This critically appraised topic aims to discover if children with Cerebral Palsy will benefit from using Kinesiotape in outpatient settings to enhance their occupational engagement.

## **Methodology**

A literature search took place from February 23, 2023, to March 1, 2023. Throughout the literature search, multiple databases were utilized, these included PubMed, Embase, and Cumulative Index to Nursing and Allied Health Literature (CINAHL). An additional journal, the American Journal of Occupational Therapy (AJOT), was also used. The following terms were used to search within the databases and journals: "occupational therapy," "children," "kids," "pediatrics," "youth," "Kinesiotape," "KT," "therapeutic tape," "high tone," "spasticity," and "Cerebral Palsy." Articles were excluded if they included information about older populations, but overall the search was kept broad due to the need for more literature on this specific topic. To ensure a refined search, the terms "AND" or "OR" were added between keywords to create database search phrases. Additional textbooks and websites were utilized as well.

## **Types of Articles reviewed**

A total of 36 articles were reviewed, and 21 articles were selected for further review. Of the 21 articles reviewed, nine were Level I studies (Abdel et al., 2021; Ibrahim et al., 2016; Keklicek et al., 2015; Orhan et al., 2016; Ramirez & de la Cruz, 2017; Simsek et al., 2011; Rasti et al., 2017; Wardhani et al., 2021; Yasukawa et al., 2006), three were Level III (Dose Santos & Rocha, 2019; Ozmen et al., 2017; Randell et al., 2019), five were Level IV (Bingol et al., 2020; Engel-Yeger et al., 2009; Dos Santos & Rocha, 2018; Frade et al., 2022; Russo et al., 2016), and four were Level NA (Graham et al., 2015; Graham et al., 2019; Kruijsen-Terpestra, 2016; Ozkan, 2018). Of the Level I studies, six were Randomized Control Trials (Abdel et al., 2021; Ibrahim et al., 2016; Keklicek et al., 2015; Orhan et al., 2016; Simsek et al., 2011; Rasti et al., 2017; Wardhani et al., 2021), one was a Systematic Review (Ramirez & de la Cruz, 2017), and one a pilot study (Yasukawa et al., 2006). Of the three Level III studies, all were Non-equivalent

pretest-posttest control group designs (Dos Santos & Rocha, 2018; Frade et al., 2022; Russo et al., 2016). Two of the Level IV studies were case reports (Dos Santos & Rocha, 2018; Frade et al., 2022). Two Level NA studies were semi-structured interviews and focus groups. One NA was a Ground Theory study (Graham et al., 2015), and one was a Phenomenological study (Graham et al., 2019).

## Synthesis

### Cerebral Palsy

Cerebral Palsy (CP) is a cluster of disorders that impact motor and postural development due to impairment of the central nervous system at or before birth (Simsek, 2011). The central nervous system consists of the brain and spinal cord and has a significant role in motor functions, such as movement, balance, and posture. CP is a non-progressive and permanent disorder (Ozkan, 2018). As stated previously, Cerebral Palsy is the most common physical disability among children, with a prevalence of 2 to 2.5 per 1000 live births (Kruijsen-Terpestra, 2016). The etiology of CP is not well understood, but risk factors of placental abruption, birth asphyxia, and neonatal medical problems have been found to be associated with this disorder (Ozkan, 2018). Common comorbidities of CP are cognitive, sensory, communication, and intellectual impairments, as well as complications with speech, problems with nutrition, and epilepsy (Ozkan, 2018). CP is a lifelong disorder that impacts the quality of life and overall daily functioning of individuals who are affected.

### *Spastic Cerebral Palsy*

Cerebral Palsy is classified as spastic, ataxic, dyskinetic, or mixed, with more than 70% of children having spastic CP (Mohamen et al., 2021). "Spasticity is the velocity-dependent hypertonia due to hyperexcitable stretch reflex" (Wardhani et al., 2021. Pg. 160). Cerebral Palsy

affects the central nervous system, primarily the brain, impacting the entire body. Muscles of the lower extremity, such as hamstrings, adductors, gastrocnemius, rectus femoris, and soleus, are impacted by Spastic Cerebral Palsy (Wardhani et al., 2021). Muscles of the upper extremity, such as adductors and internal rotators, pronators, elbow, wrist, and flexors, are also impacted (Bingol et al., 2020). The main severity factor of spasticity is age, as there is an increase in muscle weakness, muscle atrophy, contractures, and deformities as individuals get older (Wardhani et al., 2021).

### ***Experiences of Cerebral Palsy***

One qualitative study conducted by Graham et al., (2019) explored the experience and perception of engaging in the play of 6 children with Cerebral Palsy. Two themes that emerged from the study were that children with Cerebral Palsy participated and connected with their peers in play differently than a typical child. The authors found that these children experienced compromised play participation when compared to their peers. Often, children with CP watched and used their voices to be heard when engaging with others (Graham et al., 2019). Graham et al., (2015) also completed an exploratory study to examine the experience of play as an everyday occupation for seven children with severe Cerebral Palsy from their parent's perspective. The study data indicated that parents felt they needed a significant amount of energy and time to contribute to facilitating play with their children with Cerebral Palsy. One theme that emerged from the study was that children experienced play without being able to partake in the activity physically. Parents stated that their children tended to engage in play by watching others play and encouraging them through communication (Graham et al., 2015).



## *Impact of Cerebral Palsy on Occupations*

Cerebral Palsy impacts various occupations in daily life due to the spasticity of the limbs. According to Rasti et al., (2017) CP affects the body structures (e.g. limbs), body function (e.g. intellectual function), activities (e.g. standing/walking), and participation (e.g. sports). Rasti et al., (2017) also stated that Psychomotor disorders in children with CP resulted in a limitation of the use of their limbs, more paralysis, difficulty in performing activities of daily living (ADL), more dependence on others, and ultimately an overall lower quality of life.

Cerebral Palsy impacts motor and postural movement, which often leads to a decrease in a child's ability to engage in occupations. Children with Cerebral Palsy often engage in less of a variety of leisure activities than children without disabilities, have fewer social activities, and require quiet activities (Engel-Yeger et al., 2009). Engel-Yeger et al., (2009) administered the Children's Assessment of Participation and Enjoyment to twenty-two children with Cerebral Palsy and thirty typically developing peers to examine the effects of Cerebral Palsy and gender on youth participation in activities outside of school. Compared to children with Cerebral Palsy, typically developing peers participated in social activities and formal activities that involved the structure of rules and goals. Engel-Yeger et al., (2009) found that when most children with Cerebral Palsy engaged in occupations, they required aid from adult peers and felt most comfortable in environments that provided adaptation, which resulted in social isolation; this decreased their opportunities to engage in social activities.

## **Kinesiotape**

### *Effective*

**Balance.** Currently, there is a lack of evidence on the usefulness of Kinesiotape for individuals with Spastic Cerebral Palsy. Individuals with CPs' balance and overall gait

performance tends to be less functional when compared to the typical population. When these are impaired, there is a higher risk of falling and more of a "conscious effort to compensate for abnormal sensations," (Ibrahim et al., 2020, p. 6). In a Randomized Control Trial conducted by Ibrahim and others, (2020), the researchers concluded that there was a significant improvement in balance, which they believe to be due to the positive effect ankle Kinesiotape had on forward-backward control of balance. They also believed this could be due to the stimulation and increased sensory awareness of the individual's skin receptors when the Kinesiotape was applied (Ibrahim et al., 2020). Another study was conducted by Ozmen et al., (2017), to understand the effects of Kinesiotaping on balance in children with hemiplegic Cerebral Palsy. The authors concluded that there was an improvement in the overall balance of these children after wearing the tape for 48 hours (Ozmen et al., 2017). The above studies' findings suggest evidence of the usefulness of Kinesiotape application for balance in individuals with CP.

**Gait Patterns.** Individuals with CP often have abnormal gait patterns, which "can negatively affect their functional abilities and quality of life" (Mohamed et al., 2021, p.1). A Randomized Control Study was conducted by Mohamed et al., (2021), to understand the effectiveness of combination taping with an ankle foot orthosis (AFO) to improve gait parameters in children with Spastic Cerebral Palsy. The study data results indicated that when using Kinesiotape as an alternative technique to an AFO there was an improvement in overall "spatio-temporal gait parameters" short term for these children (Mohamed et al., 2021). Ozmen et al., (2017), also looked at the effects of Kinesiotaping on gait performance in nineteen children with Cerebral Palsy. They concluded that along with balance, there was also an improvement in the overall gait performance in these children after wearing the tape for 48 hours (Ozmen et al., 2017). Both research teams found usefulness in the short-term effects of Kinesiotape application

on overall gait performance for individuals with CP. "Improving gait quality is an essential prerequisite for efficient walking in children with spastic CP to be independent in functional activities and take part in society" (Mohamed et al., 2021, p.6).

**Knee Extensor Torque.** Muscle weakness is a common symptom of CP, often leading to the imbalance and abnormal gait patterns they present (Dos Santos & Rocha, 2018). Three Case reports were completed to understand the immediate effect of Kinesiotaping on knee extensor torque of children with Cerebral Palsy. The authors concluded that there was an overall improvement in knee extensor peak torque after Kinesiotaping application. This made them come to the hypothesis that "individuals with muscle weakness and deficits to receive sensory stimuli might benefit from the additional sensory stimulation provided by KT" (Dos Santos & Rocha, 2018, p. 522). A placebo-controlled, repeated measure design study was conducted in 2019, by Dos Santos et al., to develop an understanding of the effects of Kinesiotaping in the performance of sit-to-stand movements in eleven children with CP. The findings were that "Kinesiotaping decreased trunk, hip, and knee peak torque flexion" (Dos Santos et al., 2019, p. 2056). This allowed for the sit-to-stand movement to be improved, which they believe was due to an activation of the rectus femoris muscle (Dos Santos et al., 2019). Results of both studies found that the sensory stimulation of Kinesiotape application on the skin improved muscle weakness and over-flexion of muscles affecting gait performance for these individuals.

**Postural Control.** A common issue experienced by children with Cerebral Palsy is the disturbance of normal postural control mechanisms (Simek et al., 2011). "Parents were taught the importance of maintaining the proper posture of the limb throughout the day to keep a range of motion and prevent postural patterns, anteroposterior capsule retraction, contracture, and deformities" (Fade et al., 2022, p. 6). A Case report was conducted to examine the effects of

Kinesiotape on children who experienced paralysis, a common symptom involved in children with Cerebral Palsy. Kinesiotape was applied to affected muscle groups to examine if it facilitated muscle work and postural pattern (Fade et al., 2022). The authors concluded that Kinesiotape allowed better alignment of bone structures and favored the activation of muscle function (Fade et al., 2022, p.14). Simek et al., (2011) conducted a non-randomized control study to investigate the effects of Kinesiotape on muscle function, joint structure, and body alignment maintenance in children with Cerebral Palsy who rely on inappropriate control strategies when learning to maintain sitting posture. Relying on inappropriate strategies while learning to sit statically and dynamically results in postural dyscontrol and functional dependency (Simek et al., 2011). After application, the Sitting Assessment Scale (SSS) was administered to thirty-one children with Cerebral Palsy included in the study to assess sitting posture (Simek et al., 2011). Simek et al., (2011) found that Kinesiotape had a positive effect on sitting posture, including the head, neck, foot position and arm, and hand function. Findings from Simek et al., (2011) indicated that postural control was positively affected through the application of Kinesiotape on upper extremity muscles to improve muscle work and function.

**Constipation.** Due to CP often resulting in some form of paralysis, muscle weakness, immobilization, or spasticity, constipation has also been found to be a common difficulty that individuals with CP deal with. "Constipation is associated with decreased quality of life and can cause many complications such as megarectum, variation in bowel movements, anal fissures, and soiling if it is not treated in early stage" (Orhan et al., 2018, p. 10). A Randomized Control Trial was conducted to understand better the effects of connective tissue manipulation and Kinesiotaping on chronic constipation in children with Cerebral Palsy (Orhan et al., 2018). The authors concluded that Kinesiotape is an effective intervention strategy to alleviate constipation-

related symptoms, which then improves the individual's overall quality of life (Orhan et al., 2018).

**Upper Extremity Control.** Kinesiotape has become a new, commonly used rehabilitation technique for alleviating upper arm and hand pain (Yasukawa et al., 2006). A Pilot Study was conducted by Yasukawa et al., (2006), to investigate the effects of Kinesiotape as a method for enhancing functional motor skills in children. Their findings were that taping the upper extremity in these individuals appeared to have improved purposeful movement (Yasukawa et al., 2006). A Randomized Control study was conducted by Rasti et al., (2017), to understand the effect of Kinesiotaping on handgrip and range of motion of the hand in children with Cerebral Palsy. Their findings were that Kinesiotaping "can be a useful option to promote power or grip strength and active range of motion of the wrist and thumb" (Rasti et al., 2017, p. 43). Both studies concluded that using Kinesiotaping as a rehabilitation technique for children with Cerebral Palsy may improve the overall range of motion and movement in the upper extremity. When considering the results found from these studies, it is important to consider the need for more generalizability due to the small sample sizes.

### *Ineffective*

**Upper Extremity.** When examining the impacts of Kinesiotape on the upper extremity, two studies were conducted on hand taping and scapular stabilization. The first single-subject design study by Russo et al. (2016), assessed whether Kinesiotaping for scapular stabilization affected joint function in children who experienced muscle weakness and range of motion (ROM). Before and after the application of Kinesiotape on twenty-six children, motion data was collected in seven positions. The authors found in hand to neck position; there was no significant change in overall motion. In the same study, findings included no change in the overall

performance of positions (Russo et al., 2016). The second study investigated the effects of Kinesiotape on hand function (Keklicek et al., (2015). Forty-five children with Cerebral Palsy were randomly divided into one of two groups, either with the treatment of Kinesiotape or without tape. The researchers applied the Kinesiotape for 20 minutes and documented data before and after. The authors found that there was no significant difference between the group of children who had Kinesiotape applied and those who did not (Keklicek et al., (2015).

**Lower Extremity and Trunk Performance.** The implementation of Kinesiotaping for improvement in the function of the lower extremity and trunk was deemed not useful by two studies that examined the effects of Kinesiotape on spasticity in children with Cerebral Palsy. A pretest-posttest study conducted by Ozmen et al., (2017), proceeded with the application of Kinesiotape over the gastrocnemius and tibialis anterior muscle of the hemiplegic side. The results of this study indicated that the application of Kinesiotape showed to have no immediate effects on ankle plantar flexor muscle spasticity and ankle range of motion. Another non-randomized control study conducted by Simek et al, (2011), examined the effects of the Kinesiotape method on areas relating to function and posture of children with Cerebral Palsy who experience spasticity. In this study, Kinesiotape was applied longitudinally between S1-C7 with minimal tension, focusing on changes in posture, gross motor function, and functional independence. Simek et al., (2011) determined that the use of Kinesiotape had no direct observable effect on gross motor function or functional independence. The conclusions following these studies indicated that Kinesiotape does not provide significant improvement in spasticity related to ankle plantar flexion, ankle range of motion, gross motor function, or functional independence associated with the trunk and lower extremities for children with Cerebral Palsy.

When considering the results found from these studies, it is important to take into account the need for more generalizability due to the small sample sizes.

## **Conclusions**

The authors of many studies examined the effectiveness of Kinesiotape as a rehabilitation technique to improve overall function and quality of life for individuals with Cerebral Palsy (Dos Santos et al., 2019; Dos Santos & Rocha, 2018; Fade et al., 2022; Ibrahim et al., 2020; Keklicek et al., 2015; Mohamed et al., 2021; Orhan et al., 2018; Ozmen et al., 2017; Rasti et al., 2017; Russo et al., 2016; Simek et al., 2011; Yasukawa et al., 2006). The authors of a few studies found that the short-term effects of Kinesiotape on balance, gait performance, knee extensor torque, constipation, postural control, and upper extremity control were positive and improved overall function for these children (Dos Santos et al., 2019; Dos Santos & Rocha, 2018; Fade et al., 2022; Ibrahim et al., 2020; Mohamed et al., 2021; Orhan et al., 2018; Ozmen et al., 2017; Rasti et al., 2017; Simek et al., 2011; Yasukawa et al., 2006). This led some authors to hypothesize that the sensory stimulation of Kinesiotape application on the skin is why there was a short-term improvement for them (Dos Santos & Rocha, 2018; Dos Santos et al., 2019). Authors of other studies found no effect from the application of Kinesiotape for hand and thumb repositioning, scapular winging and stabilization, ankle flexion, plantar flexor muscle spasticity, and ankle range of motion for children with CP (Keklicek et al., 2015; Ozmen et al., 2017; Russo et al., 2016). When taking into account the small sample sizes, and lack of generalizability of the study results, further research should include more diverse populations and larger sample sizes to better represent the population.

### **Focus question**

How useful is Kinesiotape in reducing symptoms that commonly interfere with occupational engagement for children and adolescents with Cerebral Palsy (CP) who are receiving care in an outpatient setting?

### **Clinical bottom line**

The use of Kinesiotape as an intervention for improving occupational engagement for children and adolescents with spasticity related to the diagnosis of Cerebral Palsy has shown to have an impact on a limited number of symptoms related to spasticity due to Cerebral Palsy. Reviewed studies have indicated that Kinesiotape has improved outcomes related to gait performance and balance (Ozmen et al., 2017). Other positive outcomes following the implication of Kinesiotape include grip, strength, and range of motion in the wrist and thumb for children with Cerebral Palsy (Rasti et al., 2017). Furthermore, balance, gait performance, knee extensor torque, constipation, postural control, and upper extremity control were all found to improve after the short-term application of Kinesiotape on individuals with CP (Dos Santos et al., 2019; Dos Santos & Rocha, 2018; Fade et al., 2022; Ibrahim et al., 2020; Mohamed et al., 2021; Orhan et al., 2018; Ozmen et al., 2017; Rasti et al., 2017; Simek et al., 2011; Yasukawa et al., 2006). On the other hand, neutral outcomes indicating the lack of effectiveness of Kinesiotape were concluded for areas related to ankle flexion, plantar flexor muscle spasticity, and ankle range of motion for children with CP (Ozmen et al., 2017). For the upper extremity, there was little to no impact on hand and thumb repositioning and scapular winging and stabilization (Keklicek et al., 2015; Russo et al., 2016).

Following the review of the literature on this use of Kinesiotape, it is concluded that more research is needed to make adequate conclusions on the effectiveness of Kinesiotape in



improving occupational performance for children and adolescents with Cerebral Palsy. The inconsistency in the literature indicates the need for more research in this area to solidify the ethical use of Kinesiotape in occupational therapy practice, specifically regarding children with Cerebral Palsy experiencing spasticity.

### **Usefulness in Practice**

After reviewing research pertaining to the use of Kinesiotape for children with Cerebral Palsy experiencing spasticity, intervention strategies for specific functions were identified as useful, and the roles of stakeholders and team members were better understood. Furthermore, cultural characteristics and potential biases were recognized as evidenced by the literature. Kinesiotape is stretched and applied to the skin in areas where an abnormal function is present to stimulate the muscles to work properly (Dos Santos & Rocha, 2018; Dos Santos et al., 2019). Using Kinesiotape as an intervention for children with CP aligns with the occupational Ecological Model of Human Performance, due to evidence that the application of Kinesiotape has been shown to enhance the performance range for these individuals, and quality of life is improved (Dunn, 2017). Previous studies indicated that short-term effects of Kinesiotape showed improvement in the areas of balance, gait performance, knee extensor torque, constipation, postural control, and upper extremity control were positive and improved overall function for these children (Dos Santos et al., 2019; Dos Santos & Rocha, 2018; Fade et al., 2022; Ibrahim et al., 2020; Mohamed et al., 2021; Orhan et al., 2018; Ozmen et al., 2017; Rasti et al., 2017; Simek et al., 2011; Yasukawa et al., 2006).

The stakeholders include children with Cerebral Palsy, caregivers, insurance companies, and healthcare workers. Team members who work in conjunction with occupational therapists in the pediatric outpatient setting with children diagnosed with CP include professionals such as

physicians, physical therapists, and speech therapists (Center for Health Professions Education, 2023). Occupational therapists may make referrals to these professions if additional services are needed that are outside of their scope of practice.

Current studies have failed to address the cultural characteristics of the populations of children with CP in previous research and have often been unsuccessful in addressing biases related to Kinesiotape as a rehabilitation technique. Bias was present through the recruitment of children with Cerebral Palsy as families were only included if they were willing and highly motivated to participate (Graham et al., 2019). The findings of the studies may not be generalizable due to the small population size and no control group for comparison (Özmen et al., 2017). These small sample sizes do not allow for a wide range of diverse populations to be well represented. Lack of generalizability is evident in the inclusion criteria as children with Cerebral Palsy had to be able to follow verbal instructions for multiple studies (Keklicek et al., 2015; Mohamed et al., 2021Özmen et al., 2017; Rasti, et al., 2017). Factors that excluded certain participants with CP who were studied included an allergic reaction to tape adhesive, any intellectual, auditory, or vision deficits, and individuals with more severe motor impairment (Özmen et al., 2017; Rasti, et al., 2017; Simek et al., 2011). This limited the diversity, transferability, and generalizability as the whole population of children with Cerebral Palsy was not represented.

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