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### **Little Movers: A pediatric PT uses Pilates to treat children with neuromuscular disorders by Christine Egan, PT**

The practice of Pilates for rehabilitation is flourishing throughout the ranks of physical therapists and clinicians. It has become a popular method to treat a variety of orthopedic injuries and age-related ailments like osteoporosis. Now Pilates has also become an effective mode of therapy in a whole new area—children with neuromuscular disorders.

As a pediatric physical therapist with a background in Neurodevelopment Treatment (NDT), I began to incorporate Pilates into my practice in 1999 after taking classes in the exercise and then becoming a certified instructor. Pilates already had many of the existing principles of NDT incorporated into it, and looked like it could help the kids I worked with.

It must be understood that the principles of Pilates for rehabilitation are different than Pilates as a general conditioning tool. Many of the differences center on modifying the exercises to meet the needs of a specific patient. It also requires more of an intuitive mindset and critical reasoning skills from the therapist in order to best identify the objectives that will create a positive movement experience.

However, using Pilates for children with neuromuscular disorders like cerebral palsy or hypertonia differs from Pilates for general rehab. Here, the therapist must understand the social, emotional, behavioral and developmental implications of neurological damage.

For the most part, a normal person using Pilates as a conditioning tool or for rehabilitation has an intact nervous system. That is not the case for children with neurological disorders. They may have decreased muscle strength, decreased muscle control, impaired coordination and balance and sensory disorders.

Of these, the sensory disorders can be the most challenging, as the children don't have the proprioceptive and kinesthetic feedback that a normal adult or child might receive.

### **Reformers Allow for Controlled Movements**

Where Pilates and its associated equipment, namely the Reformer, come into play is allowing the therapist to control a movement, as well as allowing for movements that are not possible in an upright position.

The Reformer consists of a gliding carriage attached to rails inside a wooden or metal frame and connected to a system of springs, pulleys and ropes. Users sit, kneel, stand or lie on their front,



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back or side on the carriage and push and pull off the foot bar using the arms, legs, wrists and ankles. The exercise involves sliding the carriage along the rails and moving the body in a controlled manner while the tension in the springs works the muscles. A PT can use the Reformer and the springs to assist a movement, not just to resist a movement. They can then resist the same movement as the child progresses.

Children with neuromuscular disorders will have challenges moving the carriage on their own. However, if they're on the Reformer, the therapist can control the speed at which the carriage is moving with a hand or foot in order to give children the feeling of how they are supposed to do it. It is actually working from the outside in, as opposed to inside out.

Reformer work is an effective method of showing patients how to control their movement themselves, as these children have difficulty modulating an appropriate balance of flexion and extension. When you have control of your movement, it's like having a dimmer switch—your body automatically knows what percentage to flex or extend.

For children with neuromuscular disorders, it's more like an on/off switch. The knee is either straight or bent. But because they are getting resistance from the equipment and they're feeling the contact with the footbar or jumpboard on the Reformer, they're getting more feedback and a better sense about where the body is in space in a variety of positions.

Another key element is to have the child on the Reformer in the supine position. Because of poor alignment and the muscle weaknesses involved, these children can't hold their bodies against gravity, as they don't have enough force in their muscles to keep them upright. The benefit of the supine position is that children who have difficulty maintaining postural alignment versus gravity can move with greater ease and control on the Reformer. It helps contribute to a positive movement experience.

### **Modified Equipment is Crucial**

As one would think, size is an issue and standard equipment must be adapted to accommodate "little people." Although various heights are now available, the standard Reformer was too tall for what I needed to accomplish at that time. I selected a Reformer that is much closer to the ground and easier for kids to get on and off.

There are also options when it comes to footbars. Footbars that can accommodate a child better than others on the Reformer are available. The manufacturer of the Reformer I chose also created shoulder blocks that decreased the amount of space between the shoulder rests and the footbar, so a child can fit better on the Reformer. In addition, I use pillows, towels and others items to further secure the child on the carriage.



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Having a jumpboard is also essential. This is basically a flat board attached to the foot-end of the Reformer. With these children in supine position, a flat surface is needed to get a lot of movements going. And depending on the severity of condition, sometimes a child can't maintain his feet in a fixed position, so I put Velcro on the jumpboard as well as on orthopedic sandals. This adheres the child to the jumpboard in a fixed position and allows for work on the flexion and extension of his knees without having to worry if the child can keep his feet up.

A standing board for doing standing abduction and balance work can also be very useful for more advanced exercises on the Reformer.

### **Case Studies**

Here are two examples of how Pilates has been used as part of neuro rehab for children.

Cosmo is a 2-year-old with an unknown diagnosis. He presents with overall muscle weakness and delayed motor development. I have been working with Cosmo for close to one year and recently began having him work on the Reformer. He is the youngest patient I've worked with on the equipment. Cosmo is only able to walk with a walker or by pushing a cart. His legs are very stiff during gait in an attempt to maintain his stability.

One of my goals with him was to improve his active hip and knee flexion during gait. Another was improving his graded muscle control in his LEs to allow more mid-range control during transitions, for bending and so on. I adapted the Reformer by putting the footbar at its closest setting and placing a large firm pillow at the headrest and shoulder pads.

Holding his feet onto the bar and using the lightest resistance spring, I guided him through simple flexion and extension. I then assisted him by gently pushing the carriage as he extended and resisted it on the return, so he could feel what a slow, controlled, eccentric contraction was like. We took that into unilateral flexion and extension. Our repertoire now includes the following Pilates exercises:

Legwork on the bar; Trunk stabilization/bridging; Leg straps/stabilize trunk with active hip flexion, extension, abduction and adduction with assistance; Elephant/active hip extension; Modified mermaid for trunk flexion and rotation; Modified rowing/pulling straps; Standing splits with assistance.

Cosmo uses bilateral AFOs (ankle foot orthosis) to maintain his foot and ankle in proper alignment and to provide a stable base of support. I also use Theratogs with him to improve his body awareness and postural control. He is now able to move smoothly on his own without me controlling the carriage movement.



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Another example of Pilates in action is Marissa, a 10-year-old who underwent a brain resection to remove a rare tumor at age 2 and a half. Following the surgery, she presented with marked right-sided weakness of both her UE and LE with distal spasticity in both her wrist and ankle.

For this patient with hemiparesis, I focused on bilateral activities, as well as targeted work on the involved LE. Ankle ROM using the footbar is a simple, yet extremely effective method of using Pilates with children with neuromuscular disorders.

Performing manual therapy to lengthen shortened structures while the foot is in a weight-bearing position can be accomplished on the Reformer. Marissa's program included the following Pilates exercises on the Reformer:

Leg work on the footbar; Unilateral flexion and extension; Jumping on the jump boards; Elephant/hip extension; Trunk stabilization using leg straps; Standing spring work; Gait training and UE strengthening.

Over the course of several years, Marissa has progressed to the point that you would not know she has any motor deficits at all.

The concept of core strength and stabilization is critical for both children and adults with any neuromuscular or tonal (muscle tone) disorder. Providing alignment, resistance and assistance for difficult movement helps in learning new movement patterns.

An understanding of the concepts of Pilates as well as therapists' own movement education by actually doing Pilates themselves will open their treatment repertoire to an amazing, fun and effective means of achieving the very best for clients both big and small.

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