

Client: Daniel

Parent(s): Mary

PT/OT/Supplier: TD Schenck, Numotion

Location: Centennial, Colorado



Daniel is a 15 year old young man with the diagnosis of cerebral palsy and seizures. Daniel has high tone in his extremities and low tone in his trunk and neck. His tone is so extreme that he has broken components of his wheelchair frame in the past as well as dislocated both of his elbows and ruptured both patellae.

Extension and Injury Risk

Over the years, Daniel has used a number of different types of seating systems, as well as manual wheelchair bases. When he was 6 years of age, he used a linear seating system with an antithrust seat, a semi-rigid pelvic positioner (Acrufit), lateral chest pads, a chest harness, shoeholders with ankle straps and a Stealth head support. In this system, he tended to extend his pelvis, push against the head support and hook under it and he assumed the pattern of upper extremity adduction, extension and internal rotation in combination with scapular protraction in an attempt to hold his head upright. He required additional support and stability to reduce the need for this patterning. Prolonged posturing in this pattern had led to very narrow shoulders, anterior shoulder subluxation and elbow hyperextension. We felt he was at risk for long term orthopedic consequences including deformation of the rib cage, shoulder dislocation, elbow dislocation and permanent losses in range of motion. We recommended a sub-ASIS bar to maintain the position of the pelvis and reduce overall extension, a Y strap across the shoulders to reduce scapular protraction and armtroughs with straps to maintain the upper extremities in a more neutral position (see figure 1).



Figure 1: Armtrough to maintain upper extremity flexion

Daniel tolerated the sub-ASIS bar well and this did reduce his overall extension. The Y straps were not effective and we had custom shoulder pads fabricated for him by Aspen Seating. His shoulder girth increased from 9 – 13” as a result. Daniel did not tolerate the armtroughs.

Quick Notes

Challenges:

- ✓ Equipment Breakage
- ✓ High Tone
- ✓ Extension
- ✓ Pain & Tolerance
- ✓ Client Injury

Areas affected:

- ✓ Head
- ✓ Back
- ✓ Trunk
- ✓ Knees
- ✓ Feet

Equipment Used:

- ✓ [Dynamic Rocker Back](#)
- ✓ [Dynamic Footrests](#)
- ✓ [Dynamic Head Support](#)
- ✓ [Sunrise Medical Quickie IRIS Wheelchair](#)
- ✓ [Aspen Seating Orthosis](#)

Client Injury

At age 10, Daniel was extending within this linear seating system, but was getting a Baclofen pump which, we hoped would reduce his overall muscle tone. He had grown, and a new linear seating system was recommended. By this time, Daniel was using a Stealth i2i head support and was doing well with this. Unfortunately, Daniel has serious complications with the pump placement and his Baclofen dosage was greatly reduced, leading to an increase in tone. After receiving his new linear seating system, Daniel experienced a hairline fracture of the lower right femur and had some tendon tearing bilaterally below and lateral to the knees. His orthopedist diagnosed Daniel with Osgood-Schlatter disease and recommended that Daniel be positioned in increased knee extension to reduce force through the knee. Daniel was no longer using the sub-ASIS bar as this caused pressure over the pump and the pelvic positioning belt was not maintaining the position of his pelvis.

Dynamic Seating

After continuing to try various seating modifications, we trialed the Kids Rock 2 manual wheelchair with Reaction Dynamic Seating at age 12. We hoped to diffuse his muscle tone by allowing movement of the seating system in response to Daniel's movement (see figure 2). Daniel was still extending quite a bit and when he relaxed, he tended to collapse due to low trunk and neck tone. Daniel continued to grow and was hitting puberty and we were concerned about spinal curvatures. We recommended an orthotic molded seating system (the Aspen Seating Orthosis). This is typically a one-piece system, however this was modified to work with the Kids Rock, as the seat to back angle opened in response to Daniel's extension. A Stealth tone deflector was added to absorb force behind the head, as well.

Figure 2: Daniel in the Kids Rock 2 and Aspen Seating Orthosis



Daniel eventually outgrew the Kids Rock 2 at age 14. He was so long that he no longer was aligned with the pivot points. A Kids Rock 3 was ordered; however, this system was so wide that the family returned it. They were unable to get the chair in and out of the van and school bus. We were very reluctant to put Daniel back into a static wheelchair frame.

We chose instead to try the Seating Dynamics Rocker Back Interface and Dynamic Footrests on a Quickie Iris tilt manual wheelchair base. The Rocker Back opened in response to Daniel's extension, absorbing and diffusing force (see figure 3). Various elastomers are available, allowing us to find the right amount of resistance. If the resistance was too "soft", the back tended to open in response to the frame being tilted. If the resistance was too "hard", Daniel's extension did not activate the dynamic movement. The Dynamic Footrests elevate and telescope in reaction to Daniel's extension and the footplates can move into a dorsi and plantar flexion position. These were mounted at a starting position of 60 degrees, which was what was required for Daniel. The footplates were also

mounted in a position to accommodate his tibial torsion. Shoeholders were mounted on the footplates to maintain contact to activate the dynamic feature (see figure 4).



Figure 3: Rocker Back



Figure 4: Dynamic Elevating Footrests

Results

Now, at age 15, Daniel has been using these new dynamic components for a year (see figure 5). I saw Daniel recently and his Mom told me that she likes the Seating Dynamic components better than the Kids Rock dynamic system. I asked her why. She stated that these components work even when the wheelchair is grown to accommodate Daniel's continued growth. She also stated that he can activate these components separately, where the Kids Rock tends to extend at the hips and knees simultaneously and the knees always extend at the same time. The Seating Dynamics Dynamic Footrest also provides individual movement at the knees. Daniel tends to "elevate" one of his legs and "telescope" the other. Although the Kids Rock dynamic movement can be locked out, Mom finds the lock out on the Rocker Back to be easier to use and more durable.

Mary
Daniel's Mother
Centennial, CO

"If it weren't for Seating Dynamics my son's knees would still be swollen & bruised and he would still be breaking wheelchairs by shearing screws in half when he pushes with his high muscle tone. The moving parts allow him to be comfortable for longer periods of time and alleviates his pressure points, along with more options for positioning adjustments."



Using dynamic components has helped Daniel to better tolerate his seating system, to posture less and be more functional. He has not broken anything on his wheelchair frame for a long time either!

About the Author

Michelle is an occupational therapist with 30 years of experience and has been in private practice, Access to Independence, for over 10 years. She is a well-respected lecturer, both nationally and internationally and has authored numerous texts, chapters, and articles. She is the co-editor of *Seating and Wheeled Mobility: a clinical resource guide*, editor of *Fundamentals in Assistive Technology*, 4th ed., NRRTS Continuing Education Curriculum Coordinator and Clinical Editor of *Directions* magazine. Michelle is on the teaching faculty of RESNA. Michelle is a member of the Clinician Task Force. Michelle is a certified ATP, certified SMS and is a Senior Disability Analyst of the ABDA.
