

# DYNAMIC SEATING

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According to Wikipedia, the online encyclopedia, Yin and Yang are "opposite contrary forces that are actually complementary, interconnected, and interdependent as they interrelate to one another." "Dynamic" and "static" have these similar properties as we apply them to seating. The definition of "dynamic" is "of or concerned with energy or forces that produce motion," as opposed to static, which affects development or stability (Dictionary.com). For seating we'll use the word stable. For example, stabilize the pelvis to allow the user to engage in a dynamic or functional activity.

Client populations who would benefit from dynamic seating include:

- Pediatric
- Adolescent
- Adults
- Geriatric
- Frail Elderly
- Bariatric

Clients with the following diagnoses may also benefit from dynamic seating:

- Developmentally Delayed
- Autism
- Cerebral Palsy
- Spina Bifida
- Juvenile and Adult onset Arthritis
- Arthrogyrosis
- Spinal Muscular Atrophy (SMA)
- Muscular Dystrophy (MD)
- Parkinson's Disease
- Spinal Cord Injury
- Multiple Sclerosis (MS)
- Brain Injury
- Huntington's Disease
- Amyotrophic Lateral Sclerosis (ALS)

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The term dynamic in seating can refer to the end user, the seating or the mobility base. Clinical goals for dynamic seating are to promote functional activities, to manage pressure and to accommodate voluntary and involuntary movements.

End user dynamic movements may range from small movements (i.e. in the ability to use an arm, hand or finger to drive a joystick) to large movements (such as extension patterns due to spasticity, dystonia or behavior that may put stress on the frame of a wheelchair). Some end users who appear to be sedentary, present with fixed deformities or minimal visible movements actually have subtle dynamic movements within their posture and supportive surface tissue. Dynamic voluntary and involuntary movements can be observed as coordinated and intentional or abnormal muscle tone such as spasticity, ataxia and dystonia.

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Dynamic seating can be applied to the primary support surfaces (the seat and back), as well as secondary support surfaces (to support the head, pelvis, trunk and extremities).

Dynamic seating components are mounted and integrated into the seating system to achieve postural support in a variety of planes. For example, anterior and posterior movement may be required to address flexion and extension.

Cushions can provide both static and dynamic support for the end user. Adjustable skin protection cushions using air are dynamic and require proper inflation to maximize clinical benefits. Positioning cushions with foam, honeycomb and similar materials provide support for stability. Hybrid cushions use a combination of stability (i.e. dense foam base) with dynamic components (i.e. air or fluid) and both support and protect the end user in wheelchair sitting. Custom molded cushions provide more stability to support fixed deformities in seating while the end user benefits from dynamic positioning through the

wheelchair base (i.e. tilt). Mechanically dynamic seat cushions use alternating pressure cells.

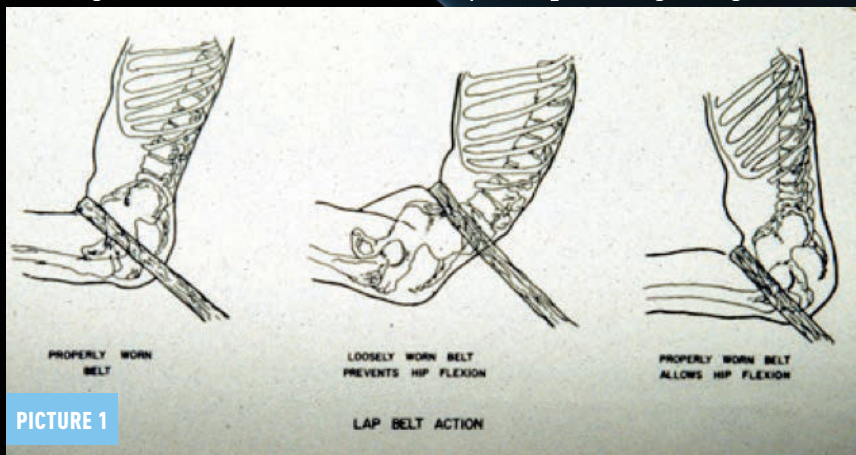
Positioning through both manual and power wheelchair bases can provide dynamic changes of position to manage pressure and provide functional positions to perform Activities of Daily Living (ADL) such as feeding. For example, a specialty seating company developed

a power lateral tilt to allow an end user to drink with an adaptive cup independently and without aspirating. Another company developed a dynamic frame that allows an end user to posture into total body extension and return to a baseline position. Some wheelchair bases offer dynamic positioning in multiple

planes of tilt and recline including lateral tilt, anterior tilt, and precline. Other dynamic options that do not change the seated angles include seat elevators and a power feature that brings an end user down to floor level for transfers and/or peer interaction for children.

Back supports typically provide stability. However, dynamic back supports with hardware attached to the back canes, allow dynamic movement by the end user. It is possible to limit and/or grade the distance and force of movement. Dynamic back canes which absorb force and flex with the movements of the user are available. For example, repetitive and/or extreme movements, often seen in Huntington's chorea, spastic or dystonic extension, athetoid movements or self-stimulating movements, often stress the frame of the wheelchair. Allowing the frame components to flex may reduce repeated repairs and replacement.

Placement of a support such as a



PICTURE 1

Picture 1: Submarining



PICTURE 2



Picture 2: Dynamic pelvic belt

PICTURE 3



Picture 3: Dynamic Pelvic Stabilization

pelvic belt is important for the safety of the end user. For example, if improperly placed or mounted, “submarining” can occur and cause soft tissue trauma of the abdomen (see picture 1). This would be potentially harmful if a client is riding in the wheelchair as a passenger, especially if there is a sudden turn or stop during transportation. Dynamic pelvic belts are available which stabilize the pelvis and prevent submarining (if mounted at the correct angle), yet dynamically move with the end user for functional active movements (see picture 2).

Another solution is Dynamic Pelvic Stabilization (see picture 3). This intervention attaches to the wheelchair or other solid seating surface. Dynamic pelvic stabilization provides pelvic control and stability while allowing anterior and posterior pelvic tilt that may improve functional reach and overall postural stability (see picture 4 and 5).



PICTURE 4

Picture 4: Reach with no pelvic stability



PICTURE 5

Picture 4: Reach with a dynamic pelvic stabilizer mounted to the frame

Many other dynamic components can be mounted to or integrated into wheelchairs such as caster forks, rear suspension, head supports, footrest hangers and armrests.

A single dynamic component, such as a dynamic head support, may have multiple applications for function as described in these three case studies.

## ASYMMETRIES DUE TO SEVERE SPASTICITY

Donald is a 44-year-old male with a primary diagnosis of cerebral palsy. He has severe spasticity in all his extremities. Although he wears a chest harness and a pelvic belt, his spasticity often causes him to be displaced from midline and his head then falls behind the head support. Once out of position, Donald requires assistance to reposition his head. Frequent tightening and adjustments to his head support are required secondary to the force of his spasticity. A dynamic head support was installed. When Donald extended, the dynamic head support moved with him and assisted with return to his resting position. A larger head support was installed on the dynamic hardware, which also aided in proper positioning of his head.

## BEHAVIORAL

Daniel is 23-year-old male with a primary diagnosis of cerebral palsy. His previous wheelchair was a manual tilt in space wheelchair with a custom molded seating system. Daniel cannot verbally communicate, and when

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he gets frustrated, he violently thrusts against the back and head support. The back posts, seating mounting brackets and head support have been repaired and replaced numerous times. Daniel received a new manual tilt in space wheelchair that had a dynamic back-rest. The new dynamic option reduced back cane breakage, but due to the intensity of his thrusting, the static head support still broke. Since a dynamic head support was installed, repairs and adjustments have not been needed.

## REPOSITIONING

Mitzi is a 21-year-old female with a primary diagnosis of cerebral palsy. She is a student at a university who uses a power wheelchair with a tilt system for all of her mobility and positioning needs. Due to her severe spasticity, she has to frequently reposition herself throughout the course of the day.

To do so, she tilts back to 50 degrees and then pivots off of her head support to move her body back into proper position. The head support was set in a very specific position to facilitate this repositioning. The slightest deviation makes her repositioning significantly more difficult. Numerous repairs were required due to the pressure that she placed on the static head support. Once this was replaced with the dynamic head support system, no further repairs have been needed and required adjustments have been significantly reduced.

The initial dynamic head support fitting took approximately 45 minutes to properly adjust this to meet her repositioning needs. When the head support was too far forward, the dynamic forces did not allow her to position herself back far enough on the seat. When the head support was too far back, she could not activate the dynamic force. Eventually, the correct position was achieved where she could use the dynamic force to reposition herself.

Finding a balance of stability and movement is key to client function. Dynamic seating can facilitate this balance through the primary and secondary seating supports, the wheelchair frame and seating options such as tilt.

**FINDING A BALANCE OF STABILITY AND MOVEMENT IS KEY TO CLIENT FUNCTION. DYNAMIC SEATING CAN FACILITATE THIS BALANCE THROUGH THE PRIMARY AND SECONDARY SEATING SUPPORTS, THE WHEELCHAIR FRAME AND SEATING OPTIONS SUCH AS TILT.**

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