

# Then

Simulators have evolved from simple positioning chairs into devices with multiple uses and benefits.

Is it time your facility purchased one?

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**A** simulator, according to Webster's dictionary, is "a device that the operator uses to reproduce or represent under test conditions phenomena likely to occur in actual performance."

Today's positioning simulators are a farcry from the simple measuring chair first used by therapists back in 1975 to help position severely disabled children. Those prototypes evolved into the multi-purpose simulator we know today.

Many assistive technology practitioners and suppliers have been simulating clients' posture as part of a comprehensive evaluation process for years. More recently, we have been able to simulate their differing abilities to drive power chairs using a variety of powered wheelchair controls.

Now, therapists can simulate features of an augmentative/alternative communication system by using feature simulation/matching for evaluation purposes such as ACES (Augmentative Communication Evaluation System) or customization of high-end AAC devices for symbol options or board designs.

## Whysimulators?

Facilities benefit in many ways from using simulators:

- **Evaluation of the seated posture.**

Often therapists see clients who come to them in poorly designed seating systems. The systems can be too small, the components incorrect, or the combination of the components inappropriate for the client's present needs.

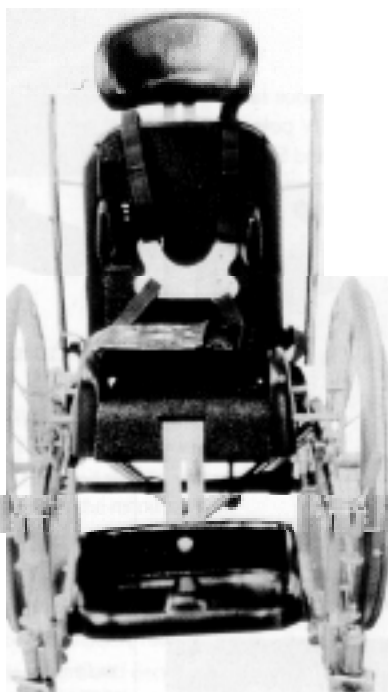
In order to determine the most appropriate system, it is critical that clients be placed in the seated posture in the most appropriate components and configuration. They must also be given the opportunity to try the system for at least a short period of time.

In other words, we simulate the optimum posture before deciding on the final configuration and components. The more accurate our evaluation is, the more likely that the subsequent prescription will be appropriate for the client.

- **Evaluation of function.** From the simulated optimal seated position, clients can then use their available motor skills for functional activities. Operating powered mobility devices, the well-seated person can more easily work AAC or ECU devices. The proximal stability provided by the seating components enhances the distal function often used for other control functions. In addition, simulation enables people with severe and multiple challenges to try several different systems without the purchase of expensive equipment that they might not be able to operate efficiently.

- **Education.** Simulation can allow consumers to physically experience what a therapist means by "best posture." It also clearly demonstrates the concept to their caregivers and third party payers.

- **Communication with technical personnel.** Measurements can be taken from the simulator rather than from the client. For example, gravity will often change a person's measurements for seat back height from the lying or even supported sitting



## LateSeventies:

An early simulator from the University of Tennessee-Memphis Rehabilitation Engineering program consisted of modular plastic components with accessories mounted on a wheelchair.

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posture to the posture in a seating system. Measurements taken from the components themselves are more accurate. There is no miscommunication as to whether the measurement is that of the person (thigh length, say) or the device (length of the seat component).

- **Documentation.** With the client in the optimal posture, photographs can be taken that are useful when seeking third party payment for seating technology.

- **Saving of time and money.** Setting up a simulated posture using a simulator is much quicker than simulating posture by placing components in a wheelchair frame. A simulator can quickly be readjusted for a variety of clients of different sizes, ages and disabilities throughout the day. Evaluation time is efficiently spent. And because the simulator is part of the evaluation, its use can be billed as part of the evaluation process.

- **Documenting outcomes.** Using a simulator enables practitioners to document objective outcomes over time. Specific dimensions will document growth, improvement in range of motion, or a client's ability to sit upright and function.

## History

In 1975, at the University of Tennessee at Memphis, therapists working in the Rehabilitation Engineering program requested a measuring chair to help position more severely disabled children for evaluation and measuring purposes.

At the time, measurements for seating systems were taken with the clients on a mat. When they came back for their system, the seating components, especially the backs, often did not fit. It became obvious that for clients with neuromotor problems in particular, measurements for a seating system needed to be taken while the clients were seated.

A simple measuring chair was built from plastic seating components on a metal frame. It sat on a small table that enabled the therapist to reach the child from all angles. This measuring chair

enabled the therapist to change the size of seat and back components, the length of the seat, and the height of the back. It also accommodated various neck and head supports, a lap belt, and various anterior trunk supports. The original measuring chair allowed changes in recline, but there was no ability to change tilt.

Over time, the simple chair evolved into components that were mounted on a power wheelchair base so that simulation of posture and power wheelchair operation could occur using the same device.

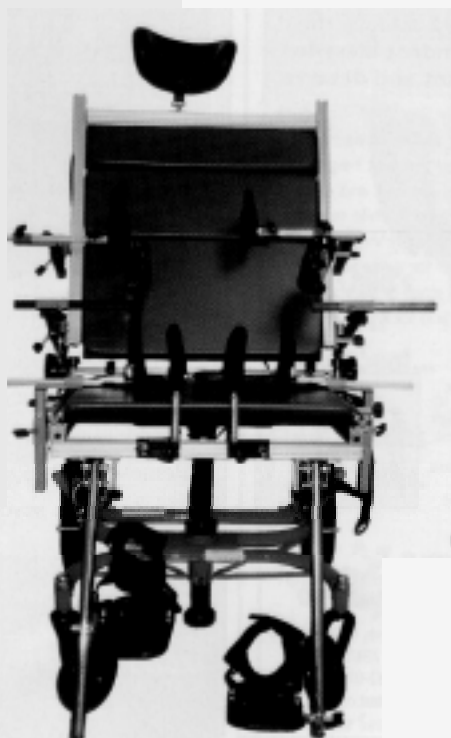
## New Uses

The measuring chair was renamed the simulator at the University of Tennessee when it was obvious that it was being used for much more than measuring children. The therapists had learned what is now common practice: Simulators are useful for persons with neuromotor impairment such as cerebral palsy and for those with traumatic head injuries. Tonal changes often occur with these clients as their positions in space — and therefore the effects of gravity — are changed.

Simulators are also useful with elderly people or those with cognitive impairments because therapists can observe postural changes even if the client cannot articulate such things as discomfort.

As the concept of simulation was accepted in the field, several commercial companies fabricated simulators to fill the market demand or to ensure correct use of their own product.

The Flamingo by Tallahassee Therapeutic Equipment (now defunct) was a simulator that could be used with both planar and custom components. The Kiss was developed for use with PinDot Products ContourU custom seating components (now owned by Invacare Corp.). The PSS-97 was developed as a molding frame for Prairie Seating Corp.'s Reflection custom contoured cushions. More recently, Physipro and Prairie Seating have developed a simulator for planar components.



## LateNineties:

The latest simulators, such as this one from Prairie Seating Corp., are finely adjustable for clinical applications and also used to document other phases of the treatment and funding process.

## Wider Availability Needed

For many potential users, however, simulators are relatively expensive and product specific. Some are no longer commercially available.

Therapists agree that the market needs a low-cost simulator that can be used in simulation of posture for persons who need either planar seating or custom seating or a combination of both. And they would like it to be easily transportable for use at remote sites or in the clinic.

The biggest barrier to widespread use, however, is cost. Ideally, all therapists doing seating evaluations should have access to a simulator either in their own department or from the assistive technology supplier that they work with.

But according to one manufacturer, price is the one component that will not change any time soon. "Low volume makes them expensive," says Adolf Trenkenschuh, director of product development for Prairie Seating Corp. "If I could build 100 at a time, I could build them cheaper. Right now, I'm handmaking them myself."



The Shape Sensor simulator by Invacare Corp. is a direct measuring device for cushions and backs.

List prices can range up to \$7,500, but Trenkenschuh says he keeps his institutional and dealer cost below \$5,000. "More facilities are buying them now," he says. "Dealers don't have time to really play with these things and become familiar with them." He does note that those dealers who have bought

simulators use them to help secure funding by sending photographs along with other documentation to payers.

## Doing Without

Alternatively, therapists can use seating components to simulate the seated posture before recommending the final product combination by temporarily fitting a seating system.

Products such as those designed by Metalcraft Industries, Mulholland Positioning Systems and Freedom Designs are particularly suited to being temporarily fit for simulation purposes.

"Our approach lends itself to simulation in two ways," says Bob Jones, marketing director for Metalcraft. "We have a lot more adjustability and we have standard parts, so you can adjust without taking the person out of the system, and you can put a second person in later with the system set a different way." Modular systems like Metalcraft's generally sell for less than \$1,000.

With a simulator, however, the seating team can perform the simulation much more quickly and consider solutions that

## Sources

### Invacare Corp.

Elyria, OH; 800/333-6900  
www.invacare.com

### Prairie Seating Corp.

Niles, IL; 800/588-0071  
www.prairieusa.com

### Signature 2000

Akron, OH; 800/227-2152

### Physipro

Sherbrooke, PQ; 800/668-2252

### Metalcraft

Oregon, WI 608/835-3232

### Mulholland Positioning Systems

Santa Paula, CA; 800/543-4796

### Freedom Designs

Simi Valley, CA; 800/331-8551  
www.freedomdesigns.com

pass more than one product line. Decisions based on actual trials with products and positions can save both time and money.

## Looking Ahead

Simulation should ideally be done in both the evaluation clinic and in the environment in which the client will be using the seating system for function. Therapy departments or assistive technology service delivery programs that see many clients a week for services might purchase the simulator. Or the supplier might own the device and take it along to evaluations with therapists at different locations.

In this age of service delivery programs' striving for consumer-centered and cost-efficient services, it is a challenge for professionals to provide consumers with every opportunity to make good decisions. What better way is there for clients to participate in the decisions relative to their posture than to try various options and express their preferences based on firsthand experience?

As technology evolves, perhaps the scenario of clients adjusting their own seat and

back angles, changing contours and operating other technologies in their virtual environment with a thought-controlled simulator is not too far in the future.

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## References

Schmeler, M. *Performance validation of a powered wheelchair mobility simulator*. Proceedings of the Eleventh Annual International Seating Symposium, Pittsburgh, University of Pittsburgh Press, 1995; 146-149.

Kjellmann, E. *Project "EMMI (Electronic Man-Machine Interface) Wheelchair Simulator": A computer program used for selecting input devices for powered wheelchairs*. Proceedings of the Thirteenth Annual International Seating Symposium, Pittsburgh, University of Pittsburgh Press, 1997; 352-255.

Hasdai, A, Jessel, AS et al. Use of a computer simulator for training children with disabilities in the operation of a powered wheelchair. *AJOT*, 1998; 52: