## Experiences and Research into Dynamic Seating for People with Severe Extensor Spasms.

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**Summary:**

This session presents outcomes from using a novel dynamic seat with children with whole body spasms, and invites delegates to contribute their own experiences. We will look at the design and use of the seat; examine the nature of spasms; and discuss how dynamic seating might support functioning and development.

**Aims and Objectives:**

The aims of the session are:

1. To present new research in the design and use of a novel instrumented dynamic seat;
2. To invite delegates to share their experience and discuss the use of dynamic seating.

The knowledge shared by delegates will be gathered and presented in a subsequent short article to be submitted to the PMG journal.

**Background, Technique, Standards, Clinical Detail, Results and Testing:**

This session will be based upon recently completed research into dynamic seating for children with whole body extensor spasms. A multidisciplinary team (research engineer / research OT / local physiotherapist / local teacher) designed and evaluated a novel dynamic seat for children with severe extensor spasms. The primary aim of the research was to develop a seat that was comfortable for the children. In addition to improvements in comfort, gains were also observed in accessing and social functioning.

The final design was achieved through an initial biomechanical free-body analysis of the children's movements and the construction and evaluation of a series of prototypes, one of which is still in regular use. The seat is designed to allow the child to move whether the child is experiencing a spasm or is moving functionally. It allows independent movement of the each leg and the back, while stabilising the pelvis. The seat was instrumented, and movements and torques were measured continuously for a period of six weeks while the seat was under evaluation. During this period, school staff also videoed the child in the seat.

The observations of greatest interest from the final long evaluation with one child were:

1. The child strongly preferred the new seat to his usual static seat.
2. The movement afforded by the seat enabled the child to operate a switch that he could not operate in his usual static seat.
3. The child increased his social interaction with staff and peers in the dynamic seat.

4. Torque measurement showed that the intensity of the children's spasms was blunted when the seat yielded, but increased if a positional stop was reached.
5. The emotional state of the child had a very significant impact on the intensity and frequency of spasms.
6. Allowing the dynamic seat backrest to move reduced the mean spasm torque, mainly as a result of a reduction in peak torques.

The main challenges encountered during this work were due to the emotional responses of the children to seating research activities; the complexity and variability of their physical responses to seating; and their general poor health. One of the two children initially in the project later left the project due to significant changes in his condition unrelated to his participation in the research. Configuring the seat so that it was comfortable highlighted the need for a large degree of adjustment not only of the dimensions of the seat, but also of the dynamic characteristics of the seat. For example, if the torque thresholds on the leg movement were set too low, the child became unstable; if they were too high, the spasms became much stronger.

The new seat has provided a child with a seat that is comfortable and functional, when previously he had broken his static seat through fatigue failure caused by his spasms.

**Discussion:**

The seat designed for this work allows a child to move his legs or back, either when experiencing a spasm or moving intentionally. Allowing this movement reduces the forces experienced by the child and modifies his spasmodic response. The children's parents were able to support their children dynamically, providing asymmetric adaptive support during asymmetric spasmodic movement. This approach was taken in the design of the seat, which allowed asymmetric movement of the limbs. By allowing the limbs to move independently during asymmetric spasms, the pelvis of the child was able to be stabilised and spinal symmetry maintained.

This research prompts further questions. It was observed that a child learned to use the movement afforded by the seat during the final evaluation, and employed that movement functionally. Children with cerebral palsy learn postural control through experimentation [de Graaf-Peters, 2007]. Dynamic seating may provide a context in which children with severe disability can improve their functional control. The second part of the session will discuss the authors' and delegates observations of children and adults using dynamic seating, and examine the potential for future dynamic seating to provide a context for functional development. Knowledge will be organised and captured using structured and facilitated discussion activities.

**References**

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