

### **3. Clinical Studies**

#### **A. The Tricycle as a mobility Tool for the child with Brain Damage**

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##### Introduction - Presentation of the Topic:

Mobility is one of the most basic and vital human function. The purpose of adjusting a mobility tool to a handicapped person is to allow the person to achieve maximum functional efficiency (1). The ability to function with the proposed apparatus depends on the physiological, motoric and cognitive attributes and reserves of the handicapped person, on the one hand, and on the physical and social conditions of his environment on the other hand (2).

The tricycle is a mobility tool with which children are familiar and which they love. The possibility to provide handicapped child with a mobility tool, which at the same time serves him as a game and fits his surroundings, removes a great emotional impediment to the child's use of such an aid.

Clinical observations have shown that children, who use aids such as a walker or wheelchair to get around, move more rapidly and with greater energetic efficiency on a tricycle than with their personal mobility tool. We also observed children who were absolutely immobilized when using ordinary means but rode independently over great distances on a tricycle. The literature does not contain much information regarding the use of the tricycle as a therapy and mobility tool for children. One of the few studies published, which examined the efficacy of exercising with a tricycle for strengthening the extensors of children with cerebral palsy, describes the children's obvious enjoyment of tricycle riding (3).

Object of the Study: To examine the possibility of using the tricycle as an effective mobility tool for the mobility-challenged child.

Specific aims:

1. To measure the energetic efficiency of a tricycle adjusted to a handicapped child, against his personal mobility tool.
2. To evaluate the functional benefit from using the tricycle as a mobility tool for children: distance and speed of mobility with the tricycle as compared to the child's personal mobility tool.
3. To determine the degree of functional independence conferred by the mobility tool (tricycle versus personal mobility tool)

##### Contribution to ALYN:

An objective examination of a new approach to mobility therapy and adjustment in handicapped children. The mobility adjustments can be made at the ALYN laboratory.

## Population and Methods:

### Population:

Fourteen children suffering from central brain damage, cerebral palsy and severe post-traumatic brain injury, including children with dystonic, ataxic and spastic symptoms and slight to severe forms of hemiplegia and quadriplegia.

The study will include children who use an aid to get around (aid: wheelchair, walker, crutches).

### Work and Evaluation Methods:

The adjustment of a tricycle to a child will be done by means of a system consisting of two parts:

The first - a fixed seat elevated about a meter above the ground.

The second - the APT (Active Passive Trainer) wheel of Kibbutz Tzora.

The wheel will be installed on a frame enabling the entire apparatus to move up, down, forwards and backwards (relative to the seat). Various pedal lengths and thigh supports can be adjusted to the wheel.

Adjustment method: Each child will try out three initial basic positions: straightened hip extensor ( $0^\circ$ ), bent hip extensor ( $90^\circ$ ) and intermediate position ( $45^\circ$ ).

In each position the child will try out different rotation axes: minimal knee movement, intermediate state, and maximal knee movement.

The order of the tests will be set at random for each child between and during positions. Each position will be given a pedaling adjustment period of 30 minutes, after which the child will pedal for another 30 minutes.

Criterion for determining the optimal wheel: Heart rate/number of rotations per unit time (minimum ratio). Based on the "prescription" obtained, a tricycle will be adjusted to the child.

Word method: On the day of adjustment of the tricycle, the child will undergo, in addition, a short training session in which he will be taught how to mount and dismount from the tricycle and practice moving by means of the tricycle along the hospital's corridors.

Each child will undergo a series of evaluations (described below) with his personal mobility tool and with the adjusted tricycle. The evaluation procedure in respect of each mobility tool will be performed on separate days. The time of the procedure during the day and the order of the evaluations will remain the same.

### Evaluation methods:

1. Measurement of the heart rate at rest and in action by means of a polar pulse, for calculating the energy consumption index (according to the difference between the pulse in action and at rest dividing by the speed of mobility comfortable speed for the child and maximum speed, see par. 2)
2. Speed mobility: Mobility at a comfortable speed, and mobility at a high speed along a course of 12m. The middle 10m. will constitute the distance for measurements of the child's speed of mobility using the tricycle and his mobility

- tool.
3. Distance of mobility: along the hospital corridor. The child will be asked to move until he feels tired (grade 13 on BORG scale - somewhat difficult).
  4. Functioning around the mobility tool. Specific function:  
Accessing the mobility tool from a chair' and vice versa.  
Accessing the WC: entry, transit, exit.  
Accessing of dining table: functioning in a table environment.  
The performance will be graded according to the FIM categoric scale.

Bibliography:

1. Assisted technologies. Cook and Hussey. Mosby. 1995.
2. Warren CG: Powered mobility and its implication. J. Rehab Res Devel: 74-95, 1990.
3. Evaluation of the hip extensor tricycle in improving gait in children with cerebral palsy. King et al. Dev Med and Child Neur. 1993:35:1048-1054.