

Therapy

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THE NEED FOR THERAPY IN THE LIFE OF A CHILD WITH CEREBRAL PALSY

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(Compiled from available information)



INTRODUCTION

In the management of a child with cerebral palsy THERAPY plays a key role. In order to understand why it does so, one has to understand the simplicity with which the complex nervous system works and what happens when it is damaged.

It is also important to have a sound understanding of normal physical development of the early infant as this explains the emphasis placed on physiotherapy, especially in babies and young infants, for overall development.

THE HUMAN NERVOUS SYSTEM- A BRIEF OVERVIEW

The basic unit of the nervous system is a neuron or nerve cell. This is made up of a cell body, an axon and dendrites.

Each part of the neuron has specific functions. Dendrites bring information, in the form of impulses, to the cell body. Usually, a neuron has more than one dendrite which forms the input source.

The axon takes information away from the cell body. A neuron has only one axon and it forms the output source.

Impulses (signals) must travel along a dendrite and across the cell body to the axon. At the end of the axon there is no direct contact between one nerve cell and another. Instead the impulses travel across a **space** by means of an electro-chemical action. This junction, between the two points of contact of the nerve cells or between a nerve and a muscle cell is called a **Synapse**.

The complex brain is the central controlling area for the nervous system and many parts of the brain co-operate in a functional integration known as **homeostasis**. Some authors compare homeostasis to the 'bedspring effect', i.e. pushing down on one area of a bedspring causes the surrounding areas to be pulled down (or compressed) as well. When the damage occurs in the brain it may thus happen that uninjured parts of the brain may be affected negatively by an injury in another area. On the other hand, the homeostasis of the brain may help to compensate for an injured area, i.e. a neighbouring, intact area of the brain may substitute for or reinforce an area that is in trouble.

In a child with cerebral palsy the damage occurs to an immature brain whose growth is not yet complete. The maturation process and the homeostasis of the brain are capable of bringing about the changes that one sees in a child with cerebral palsy and hence it is not really possible to predict the prognosis of the brain-damaged child.

COMPARISON OF A MATURE AND INTACT CENTRAL NERVOUS SYSTEM WITH THE CNS OF A CHILD WITH CEREBRAL PALSY.

*From birth onwards, our CNS receives stimuli from the external world through the various sense organs. These stimuli (signals) are processed and integrated by the CNS and subsequently initiate our motor responses. These motor responses are in turn guided by feedback from our **proprioceptors** which are detectors placed in the muscles, tendons and joints. These proprioceptors act in a similar way to the detectors in a fire alarm system which "sense" smoke and set off the sprinklers. In other words, they "sense" a change in the muscle, tendon or joint and set off an electrochemical action to cope with the change.*

*The mature and intact CNS is able to absorb a large amount of input and can react appropriately with a **variety of responses** to suit the need of the environment.*

*The CNS of a child with cerebral palsy can absorb the inflow (input) since initially there is no damage to the sensory system. However, later on, as the child's motor response becomes limited to a few **stereotyped** abnormal patterns, his sensory input, especially through the proprioceptors, becomes abnormal as well and **then the nervous system starts registering this as normal**. Hence abnormal patterns of movements are established. This leads to secondary, compensatory patterns which can eventually lead to contractures and deformities, if no action is taken.*

Thus, the fundamental handicap of a child with cerebral palsy is a disorganisation of movement, basically due to faulty connections in the central nervous system.

IMPORTANCE OF PHYSICAL DEVELOPMENT

When a child is born, it has an underlying inherited genetic structure. This structure has its own pattern of development or unfolding which is pre-determined and is based on the maturity of the nervous system.

Intellectual development occurs simultaneously and is highly dependent on the timely development of the motor milestones in the initial stages, because the basic structure and the pattern of unfolding is the same for all children.

According to Maria Montessori, what makes each child's intellectual development different is, firstly the difference in genetic origin and, secondly, the varying experiences through exploration to which the young mind has been exposed at each stage of the structure's unfolding.

*Thus, it is necessary to appreciate that motor development is **not** a separate entity but very much an integral part of the child's overall development.*

*Learning is based on sensory-motor development, so when a child is exposed to the environment initially, he just absorbs or receives impressions. This, however, is not passive. The child's mind processes these impressions, categorises and fits them into an inherited intellectual structure. In order to do all this, he needs a **stable point of reference** and his **own body** serves the purpose. Thus he begins by exploration of his own body. He learns to reach out for objects, feel them, mouth them. He understands about his own size by reaching out for objects, by moving under or over them. He learns to adjust himself to changes of posture and finds different ways to move. In this way, the*

child's perceptual and visuo-motor development goes hand-in-hand with his physical development and therefore it is absolutely essential to facilitate the physical development of a child with cerebral palsy as soon as possible.

A child can only use what he has experienced before. We learn through our sensations; and movement can also be thought of as a sensation. A normal child uses and modifies his normal motor patterns by practice, repetition and adaptation. A child with cerebral palsy will continue to use and repeat his abnormal motor patterns which consequently become 'normal' for his system by continuous repetition.

For example: If the child, right from a very young age, knows only abnormal motor patterns, such as scissoring of the lower limbs, because of stiffness and tightness of the muscles, he perceives this as the way to move.

BASIS OF THERAPY

- 1. Repetition: By a continuous bombardment of impulses it is believed that the electro-chemical resistance across a synapse is reduced. This helps to lower the threshold for stimulation after which transmission of an impulse can occur. It is easier to facilitate activity along a pathway which is continuously used actively. Facilitation sets the stage for a reaction. It is a conditioning process.*
- 2. Re-routing: It is also believed that the three dimensional (3-D) aspect of neuronal arrangement enables a single neuron to be stimulated by axons coming from many different directions in the brain. Therefore, if a nerve impulse cannot reach a*

particular neuron through one route, there may be other directions, by way of undamaged neurons through which to re-route the impulses so that learning can take place. A simple analogy would be taking a detour on a journey to reach your destination on time, when road-works are hindering your usual route.

3. *Plasticity: Plasticity is the inherent property of the neuro-muscular system to change in response to stimuli from the internal or external environment. Adaptive plasticity of the nervous system is a result of formation of new pathways and increasing the effectiveness of the already existing pathways.*

Therapy must be able to 'tune into' the child's system and provoke this 'plastic adaptation'.

Example: Spasticity may develop because of inappropriate adaptation of the CNS, but appropriate handling techniques guide the system towards a more normal pattern and, therefore, to improvement in function in the long term.

If a child does not receive therapy he continues to use his abnormal movement patterns. If plastic adaptation to abnormal movement is allowed then, in the long term, the abnormal movement will become more established, function will decrease and the aim of rehabilitation will be lost.

HOW GOALS OF THERAPY CHANGE WITH THE AGE OF THE CHILD

In a young child, the importance of therapy is to give him as normal a background in movement as possible in order to

provide a stable reference point before the abnormal patterns are established and sensory input altered. Hence therapy is more intensive but also relatively easy, as it is not so difficult to work with a young child. Furthermore, there are no abnormal patterns to counteract, nor any other secondary problems. Later on, as the child grows older, abnormal patterns become a part of his repertoire of movement and secondary perceptual and visuo-motor problems are superimposed. The aim of therapy at this stage is not only to provide a stable background but also to counteract these secondary problems. It tends to be less effective as throughout the day the child uses his abnormal patterns and only a small portion of the day is spent on therapy where input is altered to encourage better patterns. At this stage (7-8 years of age), one has to accept that the pathways of abnormal motor patterns are firmly established. Now throughout the day the child uses these motor patterns and even 2-4 hours of therapy per day, where facilitation is given to correct the abnormal pattern, is not enough to establish new pathways. Some change may be possible, but to provide him with a varied motor response and improve voluntary movements is still considered difficult, within the limits of present-day knowledge.

It follows, therefore, that the only reasonable way of helping this child is to teach him to make the best use of his abnormal motor patterns for voluntary movement and help him use it optimally and efficiently. We have to support the child in developing compensatory, abnormal patterns and help him to adapt them as best as he can for functional use.

CONCLUSION

The necessity of performing his day-to-day activities is most important to the child as well as his family and one may

have to use certain special aids or assistive devices to help him function as independently as possible in his environment.

The final goal of any rehabilitation has to be towards functional independence and therapies must ultimately help the individual achieve this by making the most of his potential.

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