Cerebral Palsy Part II
Treatment of Cerebral Palsy

by

Physiotherapists of the Pretoria School for Cerebral Palsy

A. SPASTIC

1. **Spastic Quadriplegia**
The treatment, which is described in detail, is for the spastic quadriplegic. It is adapted for the other spastic types, athetoids, ataxias and hypotonic spastics.

I. USE OF THE NORMAL DEVELOPMENT PATTERN

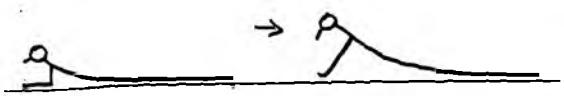
It is essential to try and follow this pattern in the treatment programme. It is of no use to teach a child standing, when the head control is still extremely weak. The direction of motor development is cephalo-caudal.

(i) *Head control:* It is first taught in lying, then prone lying, sitting (with or without support) and prone kneeling.

(ii) *Rolling:* At first the child rolls the body as a whole, i.e. if the head is turned, the shoulders and hips follow simultaneously. Later the child learns to rotate on its own axis, i.e. if the head is turned, the shoulders follow and then the hips follow till the rolling is completed. Teach the child to roll into prone as well as into supine lying.

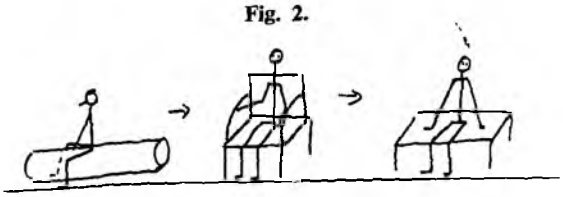
(iii) *Prone lying forearm support*, progressed to straight arm support.

Fig. 1.



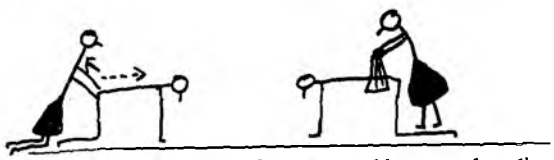
(iv) *Moving into sitting position* from lying or prone lying, at first assisted, later unassisted. As a progression they are taught to sit astride on a small roller and then sitting on a small stool with or without back and/or side supports.

Fig. 2.



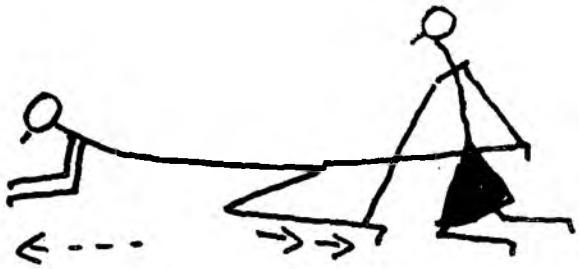
(v) *Prone kneeling, crawling, kneeling:*
PRONE KNEELING: At first the child may be supported by a towel held under the abdomen, or at the hips. Later he has to keep the position on his own. Best done in front of a mirror.

Fig. 3.



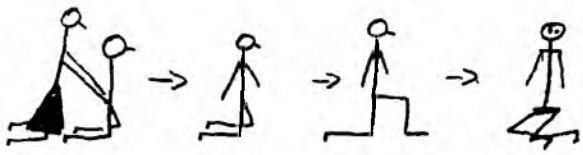
CRAWLING: Is taught from the stable prone kneeling position as above and the child may at first be similarly supported. When teaching crawling to a child with a strong symmetrical tonic neck reflex, it has been found useful to start off by keeping the child in prone lying. The child lifts the head, moves the arms himself (arms in forearm support position). The therapist grasps just above the child's ankles, the hip is flexed and thigh abducted. The child then pushes himself away from the therapist's hand.

Fig. 4.



KNEELING: Is first taught with support of the hips by the physiotherapist, later it is progressed to kneeling alone and half-kneeling as well as side-sitting, changing to left and right hips, with or without support on the hands. It is good to do kneeling training in front of a mirror.

Fig. 5.



(vi) *Moving to standing from sitting or from kneeling positions:* At first the child is supported, either by the physiotherapist or by holding on to a walking aid or wallbars. Later he does this unassisted and with no support.

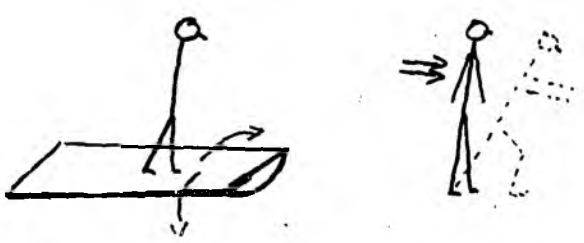
(vii) *Starting walking*, with support (holding on to a table, the wall, the physiotherapist's hands or a walking aid) and later progressed to little or no support if possible.

(viii) Throughout this programme *balance and equilibrium reactions are facilitated.*

BALANCE REACTIONS:

These are the protective reactions to prevent the body from falling. It may consist of body righting reactions only if the body is pushed, e.g. sitting or standing on a balance board that is moved. It may also consist of movement of the arms or legs (e.g. a step taken forward, backward or sideways to prevent falling when the body is pushed while standing).

Fig. 6.



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Combined with teaching balance reactions, the Sprungbereitschaft reflex is also facilitated and developed. It is important that these children are *taught to fall correctly* to reduce their fear of falling as well as prevent or reduce head injuries which occur with incorrect falling. Start to teach falling on a soft mat, from sitting and kneeling positions and later standing positions. Progress to falls on the lawn or the floor.

(a) *Forward:* bend the knees and stretch out the arms. Fig. 7(i).

(b) *Backward:* bend the knees, hips, trunk and keep the head well forward. Fig. 7(ii).

(c) *Sideways:* turn while falling to fall slightly backward or slightly forward.

Fig. 7.

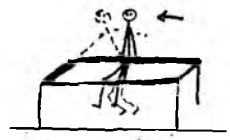
(i)

(ii)

EQUILIBRIUM REACTIONS

Automatic compensatory movements to maintain equilibrium in all positions. It is stimulated in lying, kneeling, sitting, half-kneeling, standing, half-standing, etc. A balance board may be used in stimulating equilibrium reactions, if the spasticity and associated movements are not too severe. Otherwise the child's centre of gravity is changed on a static surface. Further aids are: fibreglass tub for little ones, roller, ball catching and throwing in different positions, etc.

Fig. 8.



(i) Sitting on a table.

(ii)

(iii)

(iv)

(i) Sit on table, change centre of gravity (Notice that the eyes stay in a horizontal line.

(ii) Kneeling, change centre of gravity — eye level stays horizontal.

(iii) Pushed backward in standing (also sitting or kneeling) — eye level stays horizontal.

(iv) Pushed sideways in standing (or sitting or kneeling) — notice eye level stays horizontal.

DISSOCIATION:

Dissociation of movements necessary for normal development is facilitated, e.g. prone-kneeling, extend opposite arm and leg, riding a tricycle to therapy or a static bicycle.

GRASP:

It is important to try and obtain a pincer grip and this must be taught step by step from the primitive pattern of grasping with the whole hand (seen in the small baby), to the fine pincer grip between thumb and forefinger. This is accompanied by *stimulating normal sensation* of the palm of the hand, e.g. brushing the open hand over different types of surfaces, e.g. smooth, cold, hairy, etc.

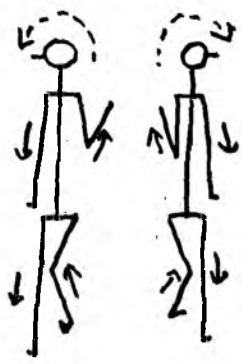
(**Note:** This is necessary for the sole of the foot too, but it is developed in the normal weightbearing of the feet.)

The spastic hand is often held in a fist with the thumb held in the palm. This prevents the child having the opportunity to experience sensation which contributes to the development of stereognosis.

REFLEXES:

(a) It is essential to inhibit in every possible way those reflexes which should have disappeared early in babyhood (many of these between the second and fifth months), e.g. the assymetric tonic neck reflex or the symmetric tonic neck reflex. Fig. 9 (i) + (ii).

Fig. 9.



(i)

(ii) (a) **Head lifted backward: Arms extend, Legs flex.**

(b) **Head bent downward: Arms flex, Legs extend.**

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(b) Simultaneously the normal reflexes which should appear later, like the Sprungbereitschaft reflex (protective extension of the arms) and postural reflexes, are facilitated.

Note: Constantly aim at promoting *full independence* in all facets of life.

II. INHIBITORY TREATMENT

This aims at inhibiting spasticity.

(a) *Ice:*

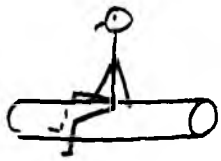
It is used for longer periods, e.g. up to 20 minutes. Ice towels or ice packs can be used.

(b) *Bobath:*

Reflex inhibitory positions, like sitting astride or diamond sitting, are used (Fig. 10) with the aim of preventing a mass pattern, e.g. a full flexion pattern of the leg consists of flexion, adduction and internal rotation of the hips, flexion of the knees, dorsiflexion with adduction, inversion or abduction, eversion of the feet and flexion of the toes. Diamond sitting places the hips in flexion, abduction and external rotation and the feet into plantarflexion.

Fig. 10.

(i) Diamond sitting.



(ii) Sitting astride.

Longsitting with the legs in extension and abduction can also be used, as well as prone-kneeling. Fig. 10(iii) + (iv).

(iii) Long sitting.

(iv) Prone kneeling.

It is important that these positions are *used* as starting positions for other exercises (e.g. arm exercises or balance exercises or to initiate standing). Always encourage *movement out of abnormal patterns into normal patterns.* Do not ever use these positions only, doing nothing further! Of course voluntary co-operation is essential.

(c) *Rood splint:* For the hand.

A forearm plaster splint with a cone fitting into the hand, the base at the radial side of the hand so that the fingers and thumb grasp over the cone. Pressure on the flexor tendons reduces flexor spasticity.

Note: Inhibitory plasters were found to be of temporary value only and are no longer used.

III. FACILITATORY TREATMENT

This forms an important facet of the treatment programme.

(a) *Balance and equilibrium reactions* are facilitated as discussed above.

(b) *Rood technique* with the brush, vibrator or ice.

(i) THE BRUSH is used to stimulate the nervefibres in a dermatome to facilitate the muscle with the corresponding nerve segment. It must be applied three to five minutes.

(ii) THE VIBRATOR is used to cause a repetitive stretch reflex that facilitates the muscle and is also applied about five minutes.

(iii) ICE can also be used in short stimulating strokes.

(c) *Modified Proprioceptive Neuromuscular Facilitation Patterns* (P.N.F.) is used to break the typical pattern of spasticity (e.g. flexion, adduction, internal rotation). Resistance must be used with care when strong association reactions are present. Often an orthopaedic operation is required before the antagonists can overcome the mechanical disadvantages caused by overaction of the spastic muscles, e.g. extension of the hand is only mechanically possible after a flexor release (e.g. a flexor slide of the short finger flexors, or a flexor carpi ulnaris transplant to the dorsum of the hand).

Experimental electromyography has already shown normal reaction in the wrist extensors where *no* movement was possible due to strong flexor spasticity.

(d) *Facilitatory tapping* on the musclegroup with the fingers. This must be light and reasonably short raps on the musclegroup.

(e) *Approximation* or joint pressure which facilitates the antagonists, e.g. in side sitting, pressing or leaning on the extended arm. See that the hand is kept open. Here we find approximation of the shoulder and elbow joints (Fig. 11).

Fig. 11.

Side sitting — support on hemi-arm.

(f) *Repetition* lowers the threshold for nerve impulses.

IV. IT IS ESSENTIAL TO PREVENT CONTRACTURES AND DEFORMITIES

This is an important reason why treatment should start as early as possible, i.e. as soon as the abnormality has been noticed, even at three or four months of age. These abnormal movement patterns can then be discouraged before they become a fixed pattern. Early treatment prevents atrophy and passive stretching is aimed at preventing shortening from leading to contracture. Parents are advised how to handle the child (e.g. to carry the child, who has strong adductor spasticity, so that the legs are kept abducted — astride over their hips or piggy-back style —"abba"). A child with severe hipflexor spasticity could be treated in prone lying.

V. ORTHOPAEDIC APPLIANCES

(1) Adaptations to shoes or boots, e.g. Thomas Heels, weighted heels — with lead — for athetoids, medial or lateral wedges to the heel and sole, raised heels for hyperextension of the knees, calipers (full length or below knee, single or double irons and many more may be made.

(2) Crutches and walking aids of various kinds may be used.

(3) Nightsplints may be made of leather (like Dennis Brown Nightsplints or abduction nightsplints) or of plaster of Paris. They are used for conservative treatment or post operatively.

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The orthopaedic surgeon, physiotherapist and often the occupational therapist must decide together what type of orthopaedic appliances each child needs.

VI. PRE- AND POST OPERATIVE TREATMENT AND OPERATIVE TREATMENT

Together with the usual strengthening exercises and preparation of pre- and postoperative treatment, is the very important task of making films and photos to record exactly what the patient's condition was before the operation and how he reacted to the operation. Follow-up films must be made regularly. Operative treatment of Cerebral Palsy is still a very new field and every success, but also every failure should be recorded.

(a) *Lower limbs:*

Operations on the lower limbs have been done for quite a while now, but have been modified according to results of operations. An adductor tenotomy does not necessarily involve only a tenotomy of Adductor Longus and Brevis, but sometimes of Gracilis too, as well as a neurectomy of the anterior branch of the Obturator Nerve. It is advisable to do Tendon Achilles lengthenings rather than a Gastrocnemius recessions, as the latter usually have bad results for spastic muscles. Other leg operations include a modified Egger's operation, muscle transplants, Soutter slide, Grice's operation, osteotomy and seldom a triple arthrodesis, or an operation in which the patellar tendon is fixated lower down on the tibia so that the patella is once more over the knee-joint and not above it. (This condition develops because of the gait with the knees in flexion.) With the Tendon Achilles lengthening, it is necessary to put the plaster of paris on with the foot in 90% dorsiflexion with extension of the toes and knee (not the knee in flexion as in the case of polio patients). The plaster must reach well over the toes, but not include them completely. After two weeks a below-knee walking plaster is put on for three to four weeks.

(b) *Arm operations*

Arm operations are in the experimental stage, yet very good results have been obtained by the school's honorary orthopaedic surgeons. In the case of severe flexor spasticity and associated reactions (of the elbow — especially seen in hemiplegias) a partial tenotomy of Brachialis with Biceps tendon lengenthening and severing of the flexor fascia has been proved successful cosmetically and functionally. For the hand a flexor slide of the Flexor Sublimus or a Flexor Carpi Ulnaris transplant to the dorsum of the hand (into Extensor Radialis Longus or Extensor Pollicis Longus has been proved successful.

2. **Diplegia**

This is treated very much the same as for quadriplegia, concentrating on the legs and trunk. Dissociation, balance and equilibrium reactions require special attention. They often learn to walk with elbow crutches, and may discard these later.

3. **Double hemiplegia**

These cases are treated on the same principles as for quadriplegia, but concentrating on the arms and intensive strengthening of the weak trunk muscles.

4. **Hemiplegia**

Hemiplegics are treated on the same principles as an adult hemiplegia and quadriplegias. A strange fact that was noticed at the Pretoria School for Cerebral Palsy, is that most of the congenital hemiplegias (lesions before or during birth) are right-sided hemiplegias while more of the acquired hemiplegias (post natal lesions) are left-sided. (Comment from other schools would be welcome!) It is essential to inhibit the association flexion pattern of the arm on the affected side while standing, jumping, running or while doing activities with the other hand (e.g. writing, building with blocks, etc.). In the classroom the teacher should be shown how the child must sit, and how he must use his hemi-hand as an assisting hand, e.g. the forearm with open hand resting on his desk, to hold the book while he is writing. *Dissociation* of arm from leg movements in the affected side, as well as the two hands and arms during exercise of either, is essential. Even in normal people strong action in one hand (e.g. clenching a fist against strong resistance) might cause a slight co-contraction in the other hand. This is exaggerated in the hemiplegic during activities such as writing or building with blocks.

The *Rood splint* has been proved very successful in releasing the flexion spasticity of the wrist and finger flexors. It also allows the wrist and finger extensors to be strengthened as the mechanical disadvantage caused by the spastic flexors has been overcome to some degree. A valuable aspect of the Rood technique of brushing and vibrating, is the correction of a squint by brushing and vibrating the Sterno-cleido Mastoid Muscle on the affected side. This causes stimulation of the Medial Rectus muscle of the eye and thus draws the eye to a position from where it can focus normally. It is best done before bed time. Later on the child can maintain the results even during activities. This is a process which may take six months before it shows lasting results, but it has been proved effective.

B. ATHETOID

Athetoids are treated similarly to quadriplegia, but attention is concentrated on teaching the child static positions, i.e. to control various basic postures. Simultaneously intensive balance and equilibrium reaction exercises are given, as well as dissociation and co-ordination exercises, especially for the bigger rather than finer movements. Boots are weighted down with lead heels to facilitate walking.

C. ATAXIA

Balance and equilibrium reaction exercises, as well as fine co-ordination exercises are especially important for the ataxics. If they show any pyramidal signs, they are treated as spastics too.

D. HYPOTONIC SPASTICS

These are also treated as quadriplegias. In addition to intensive strengthening of the antagonists of the spastic muscles, as well as all the the postural muscles, they need a lot of stimulation — *mental* stimulation as well! They seldom "want" to do anything and would prefer to lie in any position and listen to a favourite story or record — and have everything done for them.

E. HYPERKINETIC

These children often have very little physical disability and seldom need physiotherapy. Treatment for balance and equilibrium reactions and co-ordination is occasionally necessary. Try to improve their concentration span — and test *your own patience*!

It is a good idea to arrange classes for hemiplegias, ataxics and for breathing exercises. (Breathing in the spastic quadriplegias and athetoids especially is often very shallow and inefficient. Brushing and icing — short quick stimulating strokes over the diaphragm — facilitate breathing. The children must learn to cough properly. They often suffer from chronic bronchitis and even pneumonia.)

A short note on the work of the rest of the team

The occupational therapist:

The occupational therapist tests the child for any perceptual problems (e.g. body concept, colour concept, figure background, etc.) and then follows up with perception training. She teaches the child balance and equilibrium reactions, as well as fine co-ordination, using different kinds

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of motivation (e.g. games or working an electric train while rocking a small balance bench — if the child stops rocking, the train also stops, etc.). She teaches the child all activities of daily living (e.g. dressing and undressing, putting on and fastening shoes, getting in and out of bath, etc.) as well as personal care (e.g. make-up, care of the hair, etc.). Work orientation is most important as the capability of the child is tested, and he can be taught useful activities, preparing him for life after leaving school. Among these activities are typing, welding, batik, matmaking, making plastic articles, office work, e.g. working a telephone switchboard, etc.

The speech therapist:

She deals with any communication problem the child may have. Hearing tests are done and they arrange the fitting of hearing apparatus when necessary and do hearing training. Any speech problem, e.g. stuttering, is also treated, as well as the mandibular thrust (reflex opening of mouth with any intention of movement) or tongue thrust (the tongue thrusts forward and out at any attempt to speak or to eat). They teach the child to move the tongue, close the lips, to swallow and to suck. They treat children suffering from expressive or receptive aphasia or dysarthria due to brain lesions. They help children with reading or spelling problems which often develop due to hearing loss or incapability to vocalise certain sounds.

The teaching staff:

Very intensive, specialized teaching to children in small classes (8-10 preferably) allows individual attention. These teachers must have a knowledge of the physiology and anatomy as well as the basic pathology of the brain and nervous system. They must have some knowledge of epileptic fits and be able to help a child who has an epileptic fit.

Specialized teaching methods are used, e.g. the Glendoman method for reading, Montessori's method, etc. Each child progresses as fast as he can and in one class one may find a child doing Grade II reading and Standard 1 arithmetic. The teachers must have great patience and can be admired for it.

The psychologist:

The psychologist is invaluable in helping to determine the approximate intelligence of the child (by various verbal and non-verbal tests). They help children suffering from learning, behaviour or other problems.

The social worker:

Valuable information about the home, social and family background may be obtained by the social worker. Furthermore information about the financial problems of the parents and the parent-child relations may be collected by the social worker.

The medical staff:

The neurologist, orthopaedic surgeon, paediatrician, urologist, internist, ear-nose-and-throat specialist and the dentist give invaluable services to these children for which we are all very grateful.

Teamwork:

It is essential that the parents, teaching staff, all therapists, the psychologist and all medical staff should co-operate and endeavour to understand each other in all aspects of treatment for the child. Every member of the team also benefits from co-operation with the other members of the team. Teamwork is the only way that positive and lasting results can be achieved for the cerebral palsied child.

OBITUARY

MISS MARJORIE DOUGLAS, M.C.S.P.,

Member of the South African Society of Physiotherapy

Miss Marjorie Douglas died in Johannesburg, on 8th August, 1971, after an illness lasting several months.

Marjorie Douglas trained at Guy's Hospital, London, and was in private practice in Johannesburg for many years. During this time she was closely associated with the Hope Convalescent Home in a part-time capacity.

During these comparatively early days of the South African Society of Physiotherapy Miss Douglas served on various committees, both in the Central administration and in the Southern Transvaal Branch. It was at this time, too, that she assisted with the examination and teaching of the first Physiotherapy training in South Africa.

When war broke out in 1939 Marjorie, in company with a woman friend, drove by car to Kenya to join the British Women's Transport Services, with whom she served in Kenya and Somaliland, before transferring to the South African Medical and Nursing Services as a Physiotherapist again. She eventually returned Up North and took charge of physiotherapy in the South African Hospital in Florence.

After the war she returned to Johannesburg and private practice and later took over the newly-formed Physiotherapy Department at the Hope Convalescent Home in a full-time capacity, building it up into an efficient rehabilitation unit including an Occupational Therapy Department and indoor Therapy Pool.

In 1964 Marjorie left Johannesburg to live in Durban until early 1971 when illhealth sent her back to her family in Johannesburg. During this latter period of semi-retirement Marjorie retained her life-long interest in Physiotherapy by helping the Cheshire Homes in Natal in all manner of ways, and doing occasional locums at local hospitals in Durban, and became a member of the Natal Coastal Branch of the S.A.S.P.

In 1964 she was made an Honorary Member of the S.A.S.P. in recognition of her services to Physiotherapy in South Africa.

Early in her adult life, nearly 40 years ago, Marjorie made a name for herself by being one of the first two women in South Africa to gain pilot's wings.

She will be sadly missed and ever remembered by her large family and friends and all the countless people of various races and creeds whom she helped during her long and fully active life. E.M.B.

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