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EARLY INTERVENTION FOR CEREBRAL PALSY CHILDREN

Thesis
For fulfillment of Ph.D. Degree in Medical Childhood studies

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List of Abbreviation

NDT	: Neuro Developmental Treatment
CP	: Cerebral Palsy
EMPP	: Early Motor Pattern Profile
GMFCs	: Gross Motor Function Classification system
PCI	: Proportional change indices
PSI	: Parenting stress index
PRD	: Parent Related Domain
CRD	: Child Related Domain
ATNR	: Asymmetric tonic neck response
CPVL	: Cystic periventricular leukomalasia
MR	: Mental Retardation

Abstract

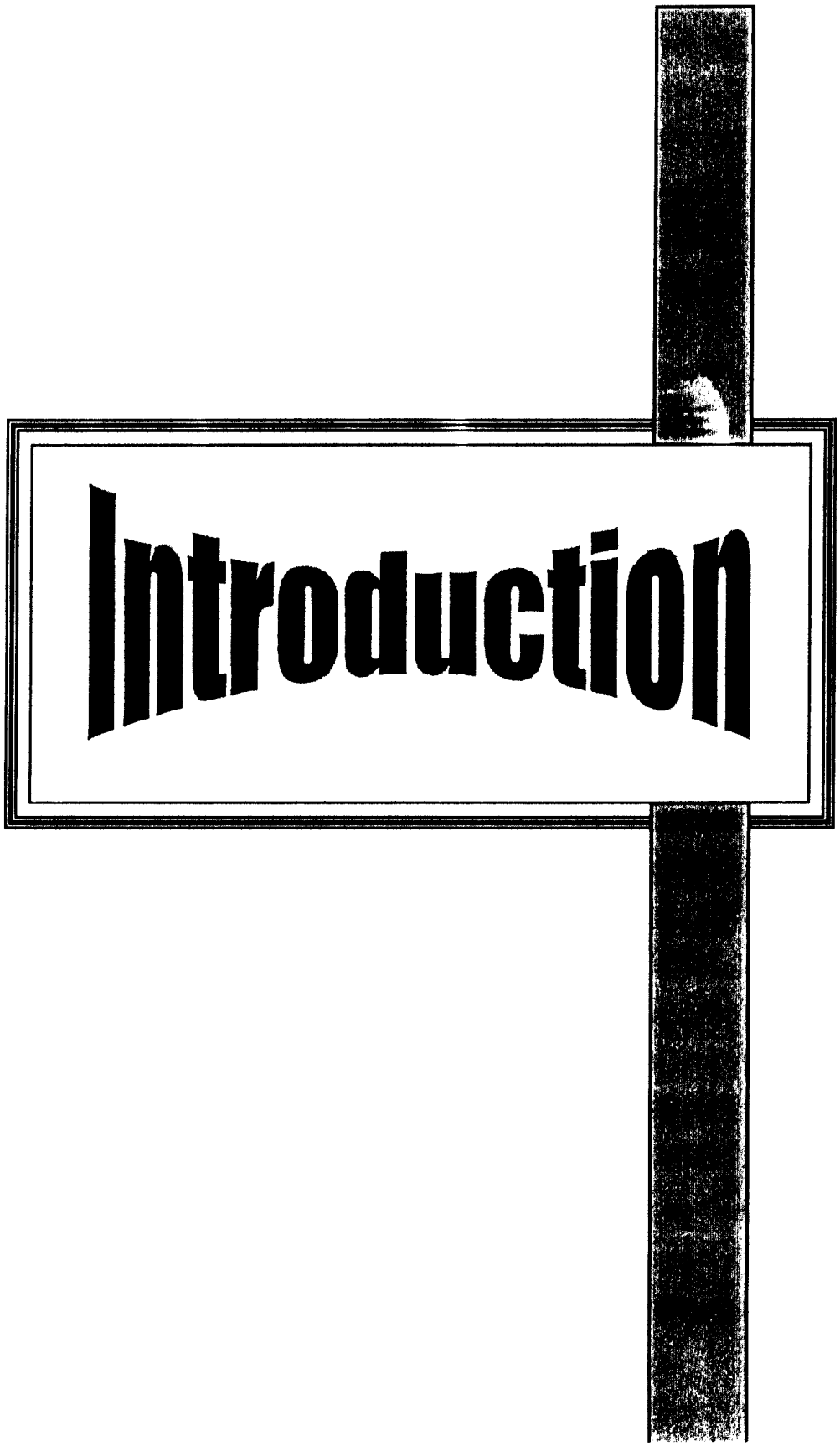
Early intervention program promote the development of young children with disabilities. As well as support the families of young developmentally disabled children to enable them to meet the needs of childhood effectively, and /or promote adaptive family functioning.

The present study aimed at investigating the effectiveness of early intervention program on the development of children with cerebral palsy. As well as assessing the impact of early intervention program on parent stress and parent-child relationship. Thirty eight children fulfilled the inclusion criteria of the study. Only 15 continued the whole intervention training year.

An individual tailored program was designed for every child after assessing the child's abilities and skills. Parents' involvement was encouraged throughout the program.

The results support the effectiveness of early intervention program in facilitating the acquisition of skills measured in the program contexts by children with cerebral palsy. On the other hand, parents who participated in the program showed better adaptation. After intervention, parents had lower level of parental distress. Early intervention not only accelerates child development but can also modify predictor-variables of stress in parents of a disabled child situation. At the end, we need to emphasize on the importance of early intervention programs to enhance the development of children with cerebral palsy. Also, Practitioners should be aware of the critical role of parent involvement for successful early intervention program .

Key words: Cerebral palsy, Early Intervention, Parent stress



Introduction

The human child is the greatest miracle of creation. Every single child is a world of subtle secrets, a personality, and a unique occurrence, never to be repeated on this earth. With child who is born under no matter what circumstances, and no matter what parents, the potentiality of human race is born again ***(Mydral, 1991).***

Normal child development is the attainment of developmental landmarks or milestones within the expected age range and in comparison with children of the same age group. Children with developmental disabilities, have been defined as individuals with impairments in physical or mental abilities that are manifest before 22 years of age and resulting in functional limitations in major life activities. Mental retardation is the prototypic developmental disability; others include cerebral palsy, specific learning disabilities, pervasive developmental disorders, autism, visual or hearing impairments, and disorders of communication ***(Perrin and Shonkoff, 1996).***

Cerebral palsy is the term used to describe a collection of non progressive disordes that manifest as abnormalities of motion and posture and result from CNS injury in the early periods of brain development, usually mainly as the first 3-5 years of life ***((Koman, et al 2004).***

Motor function is the earliest assessable developmental process, thus cerebral palsy is usually the first identifiable

developmental disability. It is often an important marker for other developmental problems that may co-exist but are not yet manifest ***(Eicher and Batachaw, 1993).***

Various methods have been used to manage children with cerebral palsy where a changing balance is struck between the positive factors of normal development and growth and the negative effect of disordered brain function, and where this balance can be favorably influenced by therapeutic intervention, physiotherapy, drug treatment and orthopedic manouvres***(Brett,1997)***

Recent emphasis has been laid on early identification of affected children, so that they can benefit from early intervention programs ***(Majnemer and Shevell, 1995).***

Early intervention programs are deigned to enhance the developmental competence of participants and to prevent or minimize developmental delays. There is a growing consensus based on the best available evidence that early intervention can exert moderate positive effects ***(Majnemer, 1998).***

Palmer and coworkers in 1988 found that infants with cerebral palsy participating in stimulation programs achieved higher motor score than a comparable group of infants receiving only physical therapy

Warfield, et al, (1999), found that there was significant increase in the child related stress among families of children

with disabilities during early childhood period which warrants attention by pediatrician, educators and others professionals who must evaluate the needs of families of children with disabilities for supportive services.

Aim of the work

The study aims at Assessing the impact of Portage program in combination with the WHO manual "stimulation the development of cerebral palsy children" on the development of gross motor, fine motor, and self help skills of children with cerebral palsy after 1 year of intervention program.

It also, aims at assessing the impact of early intervention services on the parent stress and child-related parenting stress.

Cerebral palsy

Definition

Cerebral palsy is a group of non progressive but often changing motor impairment syndromes secondary to lesions or anomalies of brain arising in early stages of its development ***(Koman, et al 2004)***. It is a static encephalopathy and excludes all progressive neurological disorders. Since motor dysfunction evolves over time as the child grows, it may give an erroneous impression of the disorder being progressive. Defining CP in terms of motor deficits should not undermine the fact that other neurological deficits are frequently associated and may in times be more disabling than the motor deficit itself ***(Pratibha and Gorayas, 1998)***

Prevalence and incidence:-

Cerebral palsy (CP) is a common neurodevelopment disorder of childhood with prevalence of 2-2.5 per 1000 live births ***(Stanely et al, 2000).*** The exact incidence and prevalence figures from Egypt are not available. Recent advances in neonatal management and obstetric care have not shown a decline in the incidence of CP ***(Nelson, 2003).*** On the contrary, with a decline in infant mortality rate, there as actually been an increase in the incidence and severity of CP. The incidence in premature babies is much higher than in term babies. For the vast majority of term infants who develop CP, birth asphyxia or obstetric complications cannot be ascribed as the cause ***(Maclennan, 1999).***

Pathology

Cerebral palsy results from a permanent static lesion of the cerebral motor cortex that occurs before, at, or within 2 years of birth ***(Flett, 2003)***. Even though the lesion itself does not change, the clinical manifestations of the lesion change as the child grows and develops. The motor skills of most children with cerebral palsy improve as they grow, but the rate of improvement is slower in children with cerebral palsy than in unaffected children. The motor impairments result from various neurological deficits. CNS pathology associated with cerebral palsy includes: CNS haemorrhage; mechanical spinal-cord or brainstem damage; deep CNS hypoxia; cerebral cortex hypoxia; and transient or irreversible ischemia resulting in cell necrosis secondary to free-radical formation or hypoxia-related metabolic cellular death ***(Schendel, 2001).*** A specific hypoxic event associated with immediate and irreversible cell death explains the etiology of cerebral palsy in less than 50% of cases ***(Nelson and Willoughby, 2000***). Furthermore, some areas of the brain are more susceptible to damage than others. For example, variations in blood supply and unique metabolic requirements in some brain areas increase the sensitivity to hypoxia in the presence of bacterial or viral infection of the fetus, fetal production of cytokines, or maternal infection or chorioamnionitis ***(Gaudet and Smith, 2001).*** "Selective vulnerability" of the periventricular white matter occurs between 26 weeks and 34 weeks of gestation, so fetal insults occurring during this period can produce periventricular

leucomalacia with spastic diplegia. Similarly, the unique metabolic demands of the basal ganglia in the fetus at 38-40 weeks create "selective" vulnerability that can result in dystonia or movement disorders. Fetal production of cytokines can damage neurons, preoligodendrocytes, and vascular endothelial cells and could contribute to intraventricular haemorrhage ***(Foster-Barber et al., 2001).*** Injury to upper motor neurons decreases cortical input to the reticulospinal and corticospinal tracts, which in turn affects motor control, decreases the number of effective motor units, and produces abnormal muscle control and weakness. Simultaneously, the loss of descending inhibitory input through the reticulospinal tract and other systems increases the excitability of gamma and alpha neurons, producing spasticity ***(Goldstein , 2001),*** which has been defined as a velocity-dependent resistance of muscle to stretch ***(Sanger et al.,2003)*** or as excessive, inappropriate involuntary muscle activity associated with upper-motor-neuron paralysis or syndrome ***(Flett, 2003***). The elimination of spasticity allows many patients with cerebral palsy to use what selective motor control they possess more effectively and functionally Spasticity associated with cerebral palsy can lead to musculoskeletal complications such as contractures, pain, and subluxation ***(Flett, 2003)***. Primary or secondary abnormalities within the spinal cord can increase spasticity, and peripheral nociception (pain) can also exacerbate it. Injury to extrapyramidal systems results in movement disorders such as athetosis, chorea, dystonia, or rigidity. Ultimately, the

clinical manifestations of the neurological injuries depend on the extent and type of CNS damage, the location of the irreversible insult, and the ability of the CNS to adapt or reorganise after the insult. Diplegia is associated with periventricular leucomalacia, whereas movement disorders occur after hyperbilirubinaemia and basal-ganglia injury. Hemiplegia is most common in babies born at term and is associated with single hemisphere injury in most cases ***(Fedrizzi, et al, 2003).*** Quadriplegia is associated with diffuse CNS insults. Classifications of cerebral palsy are based on: deformity orabnormality (spastic, dyskinetic, ataxic, mixed); anatomical distribution of the deformity or abnormality (hemiplegia, monoplegia, diplegia, quadriplegia); ***(Bleck, 1987)*** or location of CNS injury (periventricular, brainstem, cortical, pyramidal, or extrapyramidal). Movement disorders--dystonia, athetosis, and chorea are common in cerebral palsy; rigidity is rare. Dynamic deformities and movement disorders can be accentuated during ambulation or other activities.

Etiology and risk factors

The etiology of CP is very diverse and multifactorial. The causes are congenital, genetic (2% of cases), inflammatory, infectious, anoxic, traumatic and metabolic. The injury to the developing brain may be prenatal, natal or postnatal. As much as 75% - 80% of the cases are due to prenatal injury with less than 10% being due to significant birth trauma or asphyxia ***(Maclennan, 1999)***. The most

important risk factor seems to be prematurity and low birth weight with risk of CP increasing with decreasing gestational age and birth weight. Cerebral palsy is seen in 10 - 18 % of babies in 500-999 grams birth weight ***(Michael, 2004).*** CP occurs more commonly in children who are born very prematurely or at term. Although term infants are at relatively low absolute risk, term births constitute the large majority of all births, as well as approximately half of all births of children with cerebral palsy. Prenatal maternal chorioamnionitis is also a significant risk factor accounting for as much as 12% of cerebral palsy in term infants and 28% in premature infants ***(WuYWand Colford, 2000)***. Cystic periventricular leukomalacia (CPVL) is a risk factor with 60%-100% of patients with CPVL developing CP ***(Wu YW et al 2003).***

Prenatal risk factors include intrauterine infections, teratogenic exposures, placental complications, multiple births, and maternal conditions such as mental retardation, seizures, or hyperthyroidism. The incidence of CP is higher among twins nd riplets than singletons.

Perinatal risk factors are infections, intracranial hemorrhage, seizures, hypoglycemia, hyperbilirubinemia, and significant birth asphyxia. Perinatal arterial ischemic stroke has been identified as another probable cause which leads to hemiplegic CP in any infants.

Postnatal causes include toxic, infectious meningitis, encephalitis, traumatic such as drowning. There is also a relation between coagulopathies causing cerebral infarction and particularly hemiplegic type of CP. Postnatal events account for 12% - 21% of CP. But in a large number of cases, the cause of CP remains unknown ***(Sankar and Mundkur, 2005)***

Associated Deficits are Present in a Large Majority of Cases - (75%) Mental retardation (MR) is common in CP in up to 60% of the cases have mental retardation. Cognitive impairment is greater in Children with spastic quadriplegia than in children with spastic hemiplagia. Visual impairments and disorders of ocular motility are common (28%) in children with CP. There is an increased presence of strabismus, amblyopia, nystagmus, optic atrophy, and refractive errors. Children whose CP is due to periventricular leukomalacia are also more prone to have visual perceptual problems.

Speech is affected in CP due to bilateral corticobulbar and oromotor dysfunctions. Both receptive and expressive language deficits are common and go hand-in-hand with mental retardation. Articulation disorders and impaired speech are present in 38% children with CP.

Oromotor problems with feeding difficulties, swallowing dysfunction and drooling are also present ***(Reilly et al, 1996).***

This can result in nutritional problems affecting physical growth ***(Ojturk et al., 2002).*** Behavioral problems are also well documented. Abnormalities of proprioception and tactile sensations are common in children with CP. Psychiatric disorders such as anxiety, depression, conduct disorders and hyperkinesis and inattention were seen in 61% of 6%-10 year-old-children with hemiplegic CP ***(Singhi et al, 2002).*** The associated deficits may be more disastrous for the CP child than the motor problem.

Hearing impairment occurs in approximately 12% of children with CP. This occurs more commonly if the etiology of CP is related to very low birth weight, kernicterus, neonatal meningitis,or severe hypoxic ischemic results. Epilepsy is common in children with CP. And 35% to 62% of children develop epilepsy. Children with spastic quadriplegia (50% to 94%) or hemiplegia (30%) have a higher incidence of epilepsy than patients with diplegia or ataxic CP (16 to 27%).

Deformities of the spine (scoliosis, kyphosis, and lordosis) are associated with cerebral palsy. Although scoliosis can lead to serious outcomes, kyphosis and lordosis are not associated with significant comorbidity ***(Renshaw et al., 1995).*** The overall frequency of scoliosis in cerebral palsy is 25%, with the rate approaching 60-75% in patients with severe involvement and quadriplegia ***(Thomson and Banta, 2001).*** The natural course of scoliosis in cerebral palsy differs from

that of idiopathic scoliosis and is characterized by curve progression after skeletal maturity ***(Thometz and Simon, 1988)***. Progression of scoliosis can lead to pain, interference with sitting, and, less commonly, cardiopulmonary compromise. Progression of curves beyond 50[degrees] is frequent, with curves beyond 100[degrees] a risk factor for complications ***(Sarwahi, et al., 2001).***

Gross motor function classification(GMFCS) severity of the motor impairment or resulting disability

GMFCS has been applied to children with cerebral palsy to measure the severity of motor impairment objectively. Measurement of severity of impairment is important when evaluating intervention strategies.

This is a recently developed system which has been found to be a reliable and valid system that classifies children with cerebral palsy by their age-specific gross motor activity. The GMFCS describes the functional characteristics in five levels, from I to V, level I being the mildest in the following age groups: up to 2 yrs, 2 - 4 yrs, 4 - 6 years and between 6 to 12 years. For each level, separate descriptions are provided. Children in level III usually require orthoses and assisting mobility devices, while children in level II do not require assisting mobility devices after age 4. Children in level III sit independently, have independent floor mobility, and walk with assisting mobility devices. In level IV, affected children

function in supported sitting but independent mobility is very limited. Children in level V lack independence even in basic antigravity postural control and need power mobility ***(Palisano et al.,1997)***.

Clinical pictures of cerebral palsy

CP Classifications based on physiological characteristics can be subdivided into several types based on predominant motor pattern ***(Rosenbloom, 1995)***. Classification based on physiological characteristics (qualititive) and extent of involvement or topography of motor deficits (quantitative). These classifications are of limited benefit from the perspective of early diagnosis because these are based on established rather than evolving syndromes

Spastic CP

It is the most common form and accounts for 70%-75%of cases .it is characterized by upper motor neuron signs, namely, clasp knife hypertonia, exaggerated deep tendon reflexes and extensor planter responses ***(Wollach and Nichter, 1997).***

Spastic quadriplegia

These patients are more disabled. All four limbs are affected with the upper limbs being equally or more affected than lower limbs. The majorities have severe mental handicap, pseudo bulbar palsies, microcephaly, and growth failure and may be associated with visual and hearing difficulties and

epilepsy ***(Menkes and Sarnat, 2000).*** They have hypertonicity leading to arching of the back and scissoring of legs (either spontaneous or when vertically suspended). Hip sublaxation or dislocation may occur because of severe spasticity. Walking is markedly delayed and the child has toe walking due to tendo achillis tightening. Arms are internally rotated, elbows extended or lightly flexed and hands fisted. Later flexion contractures develop at ankles knees and elbows ***(Eicher and Batshaw, 1993).***

Spastic diaplegia

The lower limbs are more affected than the upper limbs. Mild cases may present with toe walking due to impaired dorsiflexion of the feet with increased tone of the ankles. In severe cases, there is flexion of the hips, knees and to a lesser extent elbows. When the child is held vertically, rigidity of lower limbs is most evident and adductor spasm of the lower extremities causes scissoring of the legs. Seizures are common. Fixation difficulties, nystagmus, strabismus, and blindness have been associated with PVL.

The intellectual ability is minimal. It is characteristically seen in preterm babies with periventricular leukomalacia ***(Wollach and Nichter, 1997).***

Spastic hemiplagia

Spastic hemiplegia is a unilateral paresis with upper limbs more severely affected than the lower limbs. It is seen in 56% of term infants and 17% of preterm infants. It involves

one side of the body. The arms is usually more affected than the leg, except in the preterm with periventricular hemorrhagic infarction where the leg may be more affected than the arm .cerebral injury in the region of the middle cerebral artery is the commonest pathology.

It was noticed that that the right side involvement is more common than the left side. Abnormal signs are notice first at the hand as normal development is cephalocaudal. Parents and even doctors may miss the diagnosis of mild cases. But there some early signs of that could help in the diagnoses which are:

1) Fisting of the hands beyond 3 months and minimal movements on the affecting side
2) Hand preference in child less than 12 months age
3) Sitting and crawling are not much delayed; walking is delayed generally by 2-3 months.
4) When the child is supine, the affected lower limb may be externally rotated.

In severe established cases, the arm is held adducted, flexed and internally rotated at the shoulder, with the elbow flexed, forearm pronated, wrist flexed and the thumb adducted. The legs are adducted, semiflexed at knee, and the ankle is planter flexed. In longstanding cases asymmetries of limb growth may occur ***(Pratibha and Goraya, 1998).*** Sterognosis impaired most frequently; 2 point discrimination and position sense is defective. Seizures occur in more than 50%. Visual

field defects, homonymous hemianopia, cranial nerve abnormalities most commonly facial nerve palsies are seen.

Dyskinetic cerebral palsy

It includes the dystonic and choreoathetoid forms. It is cause by damage to the basal ganglia and other extra pyramidal structures, often because of kernictrus and prenatal hypoxic brain damage ***(Rosenbloom, 1994).*** It is characterized by preservation of neonatal reflex patterns, Asymmetric tonic neck response (ATNR), and severe motor disability. Early the child is hypotonic with marked lack of head control, drooling of the saliva and feeding difficulties. After one year age athetosis is manifested and tends to coincide with hypermylination of the basal ganglia, a phenomenon called status marmoratus; Fingers flaying when the child attempts to reach object accompanied by overflow movements and facial grimacing. These are exaggerated with intention emotion and holding a posture. Standing and walking are often delayed. Although intelligence is often preserved, but the presence of severe physical and communicative disabilities give a mistaken diagnosis of mental retardation ***(Singhi, 1997)***

Ataxic cp

This occurs due to predominant involvement of the cerebellum. These infants are hypotonic and inactive. Walking is delayed. The gait is ataxic, wide –based and accompanied by exaggerated balancing movements of arms. Cerebellar

signs are present. Ataxia may occur in the pure form or co-exists with spastisity (ataxic diaplegia). Ataxic CP needs to be differentiated from herido-degenerative ataxias.

Hypotonic CP

This is extremely rare type of cerebral palsy. In many cases, it may in fact represent an evolving form of dyskinetic or spastic CP. Others causes of hypotonia should be excluded

Diagnosis of CP:

Problems related to early diagnoses as well as proper management of these children are often because of a lack of understanding not only by the parents but also by medical personnel. As a result the child with CP is frequently subjected to neglect and poor quality of life. The diagnosis of CP is essentially clinical and involves detailed prenatal, natal and postnatal history and careful physical and neurodevelopmental Examination ***(Wollach and Nitcher, 1997).*** In severe cases and long standing cases the diagnosis of CP is not difficult but there is problems related to early diagnosis of mild cases and during evolving cases. So infants screening could be used to identify high-risk neonate. Infant motor screen is found to be highly specific and sensitive screening tool used for early identification of CP in both preterm and term babies ***(Singhi, et al., 1994)***. Table (1) listed certain observations and signs that they are useful for prediction and early identification ***(Singhi et al., 1994).***

Table (1): Signs useful in early diagnosis of CP

1 .Warning signs

- Lack of alertness
- Decreased spontaneous mobility
- Stereotyped abnormal movements
- Constant fisting after 2 months of age
- Poor quality sleep

2. Abnormal signs

- Reduced head circumferences
- Delayed social smile
- Excessive extensor tone, dystonia
- Primitive reflexes persisting beyond 6 months
- Persistent asymmetric tonic neck response (ATNR)
- Delayed appearance of postural reflexes and developmental milestones
- Persistent asymmetry in posture ,movement and reflexes

3. Associated signs

- Oculovisual problems: wandering eye, no visual following, persistent squint
- Lack of auditory response

It should be noted that:

1) Infant particularly preterm babies might have some neuromotor abnormalities so it is important to do repeated assessment before the final diagnosis.

2) Screening tools are not definitive diagnostic tools it must be followed by a comprehensive neurodevelopmental assessment.
3) Periodic examination is important to exclude the slowly progressive neuro-degenerative disease.
4) Neuromuscular, spinal disorders need to be excluded specially in hypotonic, dyskinetic and ataxic forms of CP.
5) Don't give a diagnostic label at first examination, as on subsequent assessment a hypotonic child may get spastic or dyskinetic on follow up.
6) Mental retardation should not be diagnosed based on the use of conventional intelligence test as it will be lower due to associated motor problems and visual, hearing and speech deficits

Early motor pattern profile (EMPP)

The EMPP is a group of common neurological findings that have been organized into a systemic format to provide the clinician with an objective picture of a child's neurological status. Fifteen items were selected for inclusion in the EMPP; these items were selected empirically to reflect multiple aspects of neuromotor function while maintaining a relatively even anatomic distribution ***(Andrew and Jean, 1996)***

The 15 items of the EMPP are:

1. Head Lag-pull to sitting position from supine, and assess alignment of head with trunk.

2. Slip through –support in vertical suspension with hands in axillae, and assess the need for lateral pressure to prevent the child from slipping through.
3. A stasis –place in supported standing and assess weight bearing
4. Hip abduction – with leg extended, flex foot at ankle and assess resistance
5. Ankle dorsiflexion –with leg extended, flex foot at ankle and assess resistance
6. Deep tendon reflexes-assess the response at ankle
7. Asymmetric tonic neck reflex- flex head to one side in supine and observe position of extremities
8. Tonic Labyrinthine Reflex – place hands under shoulders in supine, lift slightly and observe efforts of flex forward
9. Equilibrium in sitting –support in sitting on lap, shift weight to one side, and observe efforts to maintain a neutral position
10. Protective extension –pushes to one side in sitting, and observes efforts to stop falling with lateral propping
11. Fisting – hands remain tightly clenched at rest
12. Shoulder retraction – arms flexed and shoulders retracted posterioly in sitting
13. Tonic Extension -- backward thrusting in sitting or when lifted from supinre.
14. Scissoring –legs adduct in a scissoring motion in vertical suspension or standing
15. Equines –up on toes in supported standing

A three point scale was used for each EMPP item. A score of (2) was given if the abnormality was severe or present all the time, a sore of (0) was given if the abnormality was never present, and a score of (1) was given if the abnormality was inconsistent or partial. The optimal cutoff score at 6 months between 9 and 10 at which the positive predictive value was 89.4, sensitivity was 87.1 and specificity was 97.8. The optimal cutoff score at 12 months was between 3-4 at which the positive predictive value was 91.0, sensitivity was 91.5 and specificity was 97.9*(Andrew and Jean, 1996)*

Prognosis for ambulation in cerebral palsy

The ambulatory potential of children with cerebral palsy is a concern of both parents and health professionals involved in these children's treatment. Cross sectional studies of motor behavior in children with cerebral palsy have demonstrated characteristics patterns of motor development according to the severity of the condition ***(Scrutton and Rosenbaum, 1997).*** Early identification of factors that predict ambulation would assist in the setting of realistic goals and the development of appropriate plan ***(Sala and Grant, 1995).***

Possible predictors of ambulation can be divided into the following three general categories:

(1) Primitive reflexes and postural reactions ***(Watt, 1989)***

(2) Gross motor skills ***(Campos,1994)***

(3) Type of cerebral palsy ***(Badell,1985)***

Primitive reflexes are:
Asymmetrical tonic neck reflex
(ASTNR)
Symmetrical tonic neck reflex
Moro
Neck righting
Tonic labyrinthine
Extensor thrust
Positive supporting

Postural reactions
Foot placement
Parachute reaction

The persistence of primitive reflexes and the absence of postural reactions are associated with a poor prognosis for ambulation. The critical age for examining for these signs to determine ambulatory potential is two years. These been integrated into volitional movements at an earlier age, may interfere with the development of more advanced gross motor skills The ASTNR, Moro reflex and positive supporting reaction were the most consistently associated with inability to ambulate.

Gross Motor skills

There is a relationship between the age of acquisition of various gross motor skills and ultimate ambulatory status. The sitting (defined as the ability to maintain sitting without support when placed by 2 years of age is associated with a good prognosis for ambulation. However, not sitting by 2 years does not preclude achievement of ambulation, but makes it substantially less likely. The maintenance of sitting requires adequate trunk control and balance to sustain the upright posture. As these are motor skills essential for ambulation, children's sitting ability would be a good indicator of their ambulatory potential.

Type of CP

On the basis of the type of CP., children with spastic hemiplegia have the best prognosis for becoming ambulatory (100%). They are followed closely by children with spsatic diplegia, whose outcome as favorable in greater than 85%of the cases. The prognosis is less positive for children with spastic quadriplegia. Since the type of CP serves as a descriptor of the degree of the child's motor involvement.

Investigations

1- Lab investigations

- Serum copper ceruloplasmin determinations in children with unexplained choreoathetosis

- Thyroid function studies
- Serum uric acid is indicated in children who have hypotonia and subsequent athetosis
- Serum quantitative amino acid analysis and metabolic investigations of the urine in children with hypotonia
- Serologic test to identify congenital infection

2 - EEG- if symptoms suggest seizure activity. Certain patterns on EEG may suggest degenerative disorder

3- EMG May help differentiate myopathy from CP

4- Ophthalmic examination: may reveal chorioretenitis suggestive of cytomegalovirus, rubella, or toxoplasmosis infection. In spastic hemiplegia visual field defect can be identified

5- Audiologic investigations

6- Cranial Sonography

7- Color Doppler imaging of intracranial vessels in the neonate

8- Magnetic Resonance Imaging

Management of CP

General principles of management

A comprehensive assessment is needed to identify the motor as well as associated deficits, with the aim to assess the functional capacity of the child in various domains and to plan a comprehensive intervention program.

- CP should not be treated as an illness. The focus of health care should be on children with CP as individuals and should include consideration of all aspects of their

development, their environment, and the needs of their families. The aim is to promote the child's health, improve their functional abilities and support of their carers ***(Bakheit, et al, 2001)***

- It is essential that carers are involved in planning the intervention programme as their active participation helps to explore hidden needs.
- A multidisciplinary team comprise of physiotherapist, a psychologist pediatrician, occupational therapy, a speech and language therapist, a teacher, social worker and an orthopedic surgery. The team should develop a close working relationship. A key worker may be a trained nurse or health worker act as a coordinate with other health professional and communicating information to the parents and child.
- Management options: Treatments should be goal-oriented and produce positive outcomes.

Available treatment options include observation, physiotherapy, device-assisted modalities, oral pharmacological intervention, parenteral medication, and surgery. The treatment options that are used change with the age and developmental stage of the child. However, the consensus is that spasticity associated with cerebral palsy should be treated before children reach the age of 5 or 6 years, so that contractures do not have the chance to develop ***(Graham et al., 2000).*** Children younger than 3 or 4 years

rarely develop fixed deformities, joint contractures, or bony deformities; therefore, many respond to physiotherapy, oral pharmacological agents, neuromuscular blocking agents, and orthotics. As patients grow older, the frequency of fixed contractures, joint subluxation, dislocation, or deformity, and bony deformity increases, and the need for surgical intervention increases. The best response to heelcord lengthening of the Achilles tendon is seen in patients older than 6 years, and derotation osteotomy procedures have in the best outcomes in children of 8 years old (Koman, et al, 2003). For children who undergo osseous or soft-tissue procedures before skeletal maturity, chemomodulation of spasticity, casting, or both might be necessary during rapid periods of growth to maintain the benefits of the surgical procedure. Skeletally mature children and adults can benefit from chemodenervation (alcohol/phenol) or neuromuscular blockade (botulinum toxin) to manage painful spasticity or to achieve specific functional or positional needs.

The severity and distribution of spasticity is crucial to identification of appropriate management options. Most patients with mild involvement receive fewer types of treatments, and those with severe involvement need more extensive interventions. For successful management, the least invasive and most cost-effective treatment should be chosen and the effect of the intervention monitored by use of outcome instruments. Furthermore, the interventions should be adjusted on the basis of efficacy in achieving

preintervention goals and the carers' adherence to the prescribed therapeutic interventions. ***(Goldstein, 2001)***

Physiotherapy and occupational therapy techniques

Non-pharmacological approaches include occupational therapy, physiotherapy, and speech therapy, device-assisted modalities (e.g., electrical stimulation), orthotics, casting, or any combination of these methods. These treatments are used to maintain or improve joint range of motion, facilitate or strengthen weak muscles, inhibit or weaken spastic agonist muscles, provide support, improve muscle strength, and improve or normalize motor development. In addition, patients' daily activities can be facilitated by their use of adaptive devices (e.g., standers, seating systems) ***(Goldstein, 2001).***

Pharmacological options

Various orally, intramuscularly, and intrathecally administered pharmacological options are available to manage spasticity.

Orally administered medications:

They are used to treat spasticity include: *GABA agonists, a2-adrenergic agonists, muscle relaxants, and seizure medications.* Baclofen, Tizanidine, and Diazepam are examples of the most frequently prescribed medications.

Parenterally administered agents:

They are used to manage spasticity in children with cerebral palsy include baclofen, botulinum toxins, alcohol, and phenol. ***Intrathecal infusion of baclofen*** is effective in reducing tone; however, the short half-life of the drug means that it has to be infused continuously for optimum spasticity management ***(Albright, 1996).***

Indications for intrathecal baclofen include: impaired gait and leg movement in patients without significant weakness; arm and leg spasticity interfering with function; painful or function-limiting dystonia; spastic quadriparesis in non-ambulatory patients that interferes with function, activities of daily living, comfort, and endurance; and spasticity interfering with carers' support activities in non-functional children. To test whether intrathecal Baclofen is suitable, in each patient an intrathecaltrial with either a single bolus or short-term infusion of baclofen should be done. The participation of parents, therapists, and other care providers is essential during the trial process to ensure that everyone sets realistic goals for the treatment. A successful trial supporting implantation of a baclofen pump is defined as a reduction of at least 1 point on the Ashworth spasticity scale. Decreased tone interfering with function during the trial of intrathecal baclofen is not a contraindication to pump implantation. In fact, documented spasticity reduction during a trial shows the patient's responsiveness to the drug. Once a pump is

implanted, delivery of the drug can be modulated according to the degree of spasticity and weakness best suited for each individual patient to avoid interference with functioning; the pumps are programmed with input from the therapist, physician, patient, and family to meet each individual patient's needs ***(Flett, 2003).***

The computer software used with the pump can be programmed to deliver different amounts of drug during the day depending on the degree of spasticity reduction that is required for different activities. For example, the pump can be adjusted to deliver one dose of drug during sleep and to lower the dose during the day to facilitate function. Replacement of pumps is required every 5-7 years, and pumps must be refilled with drug at a minimum of every 3 months. The frequency of pump refills is mandated by the fluid capacity of the pump and the limited stability of baclofen in solution. Complications associated with Iintrathecal Baclofen can be caused by the pump placement (seroma, haematoma, wound breakdown, decubitus, and infection) or the catheter (migration, erosion, rupture, dislodgement, blockage, and dural leakage***) (Albright, 1996).***

Intrathecal baclofen is an effective treatment for management of severe, generalised spasticity in appropriately selected patients with spasticity and movement disorders. In addition, intrathecal baclofen has produced variable beneficial

effects on arm spasticity ***(Albright et al., 1995)*** and, anecdotally, is reported to improve speech. ***(Mason et al., 1998)***. The level of catheter placement within the spinal cord can be adjusted to modulate the effects on arm versus leg control of tone.

Injectable neuromuscular blocking agents

Neuromuscular blockade/chemodenervation (*Botulinum toxins, Phenol, Alcohol)* balance muscle power across joints by producing selective denervation of muscles and nerves. These agents include botulinum toxins, phenol (3-7%), (107-109) and alcohol (45-100%) ***(Carpenter and Seitz, 1980).***

Phenol and alcohol are non-selective proteolytic agents and produce selective denervation when injected into motor nerves or muscles. Because diffusion of both is limited, the area of effective denervation extends just a few millimeters from the injection site. The duration of denervation associated with alcohol injection is 3-6 months, whereas phenol denervation lasts 4-8 months.

Indications for alcohol and phenol injections include: spasticity, joint imbalance secondary to spasticity, and decreased function. Alcohol and phenol injections also are used to assess the effect of spasticity reduction in potential candidates for surgery. Side-effects of alcohol and phenol injections include pain on injection, non-selective protein

denaturation, and possible permanent muscle fibrosis ***(Carpenter and Seitz, 1980).***

Botulinum toxin A can be injected intramuscularly to produce selective and reversible chemodenervation at the neuromuscular junction. Compared with phenol injections, injections of botulinum toxin are associated with fewer complications, greater reversibility of effects, and ease of drug administration ***(O'Brien, 2002)***. Botulinum toxin A has been used clinically in the management of spasticity associated with cerebral palsy since 1988. The toxin is injected into spastic muscles to balance muscle forces across joints. Injections of botulinum toxin A are used in the management of focal spasticity; intrathecal baclofen and selective dorsal rhizotomy are used to manage more widespread spasticity ***(Graham, et al., 2000)***. The amount of toxin injected into individual muscles depends on the formulation of the toxin, the size of the muscle, the number of neuromuscular junctions in the muscle, and the size and weight of the patient. Two formulations of botulinum toxin A are available for intramuscular injection: Botox (Allergan, Irvine, CA, USA) and Dysport (Ipsen Limited,Maidenhead, Berkshire, UK). Botox is used most commonly in concentrations of 50 U/mL or 100 U/mL. Doses of 2-6 U/kg bodyweight per muscle with a maximum total dose of 29 U/kg have been reported. One U Botox is equivalent to about 3-5 U Dysport. The recommended dose of Dysport for children is 30 U/kg bodyweight up to a

maximum of 1000 U.116 ***(Gormley, et al, 2001).*** The dose that has been used for children with cerebral palsy has increased over time. The current practice is to inject several muscles at each injection session, with smaller patients receiving higher doses than reported in the past.

Type B toxin is a different serotype from type A toxin and is commercially available as Myobloc (USA) or Neurobloc(Europe). Although type B toxin has been used for spasticity management in cerebral palsy, there are no peer-reviewed publications describing its use, the optimum dose is unknown, and the duration of its effect is speculative ***(Koman, et al, 2003).***

Baker, et al., 2002 assessed the effect of toxin injections on leg spasticity in ambulatory patients with cerebral palsy. Patients who received toxin injections responded with improved ambulatory status. One study investigated the effect on arm range of motion and function. Patients receiving toxin showed increased range of motion and decreased tone, although functional changes were negligible ***(Corry, et al, 1997).***

Studies have examined the effects of various doses of Botox or Dysport on gait measures in patients with cerebral palsy. In these studies, the higher doses of the preparations

were more effective in improving gait measures than the lower doses ***(Polak, et al, 2002).***

The combination of toxin injections and use of a hip orthotic improved gait compared with physiotherapy and "best practice" in a randomized prospective trial. (Botulinum toxin A has an excellent safety profile with a low frequency of side-effects ***(Goldstein, 2001).***

Indications for intramuscular botulinum toxin A injections in patients with cerebral palsy include: dynamic deformity interfering with function, producing pain, or contributing to progressive deformity; painful spasticity with or without fixed muscle contracture; postoperative or post-treatment pain control; symptomatic focal dystonia; muscle imbalance producing or contributing to skeletal deformity; as a diagnostic trial; and drooling reduction ***(Koman ,et al, 2004).*** A contraindication for these injections is: the presence of a fixed contracture, since they are ineffective in this case.

Surgical reduction of spasticity

The use of selective dorsal rhizotomy decreases spasticity by balancing spinal-cord-mediated facilitory and inhibitory control. This procedure involves stimulation and transection of selective posterior rootlets or arbitrary transection of a specific proportion of rootlets. The procedure requires a laminectomy at L2-L5; the facet joints are excluded,

if possible, to prevent spinal-column instability and secondary deformity. Subsequent selective dorsal rhizotomy approaches have used two-level laminectomies ***(Park, et al., 1994).*** Because transient muscle weakness is observed after the procedure, many patients require orthotics and long-term physiotherapy to achieve the best outcome. Patients with normal intelligence, pure spasticity, diplegia, no fixed contractures, good strength, and postural stability have been identified as the best candidates for selective dorsal rhizotomy, The ideal age and best technique for selective dorsal rhizotomy are unknown. Some surgeons undertake the procedure in children aged 2-4 years; others prefer to operate on children older than 6-8 years. In 1995, Renshaw and colleagues stated that "rhizotomy is not indicated in the presence of athetosis, ataxia, rigidity, dystonia, muscle weakness, overlengthened tendons, or severe fixed joint contracture". The irreversibility of the procedure dictates caution when this therapeutic modality is chosen.) A meta-analysis of three randomised, controlled trials concluded that selective dorsal rhizotomy and physiotherapy provided a small but significant increase in scores on the gross motor function measure compared with physiotherapy alone ***(Steinbok,et al .,1997)***

Orthopedic surgery

Long-established orthopaedic surgical procedures are designed to lengthen contracted myotendinous units, balance joint forces, transfer motor power, fuse unstable joints by

arthrodesis, correct bony deformity to improve biomechanical alignment, reduce joint subluxation and dislocation to improve joint congruency, diminish painful spasticity, and maintain, restore, or stabilise spinal deformity.

Orthopaedic surgical techniques include neurectomy, tenotomy, arthrodesis, osteotomy, ostectomy, tendon transfer, tendon lengthening, fractional myotendinous lengthening, multisegmental spinal fusion, or a combination of these procedures.

Indications for surgery include progressive deformity producing pain or interfering with function, fixed contractures, joint subluxation or dislocation, refractory spinal deformity, and deformity preventing adequate administration of care.
The surgical procedures should be individually adjusted according to the patient's age, disease severity, underlying pathology (spastic, dystonic, or mixed), comorbidities, and overall well-being. For example, adductor tenotomy and iliopsoas recession in a child with 50% subluxation of the femoral head will prevent dislocation and will improve hip stability and coverage in over 80% of children. Therefore, early and prompt treatment of hip subluxation at an earlier age is appropriate. A progressive spinal curve deformity between 40[degrees] and 50[degrees] in a growing child and documented progression of a curve beyond 50[degrees] after skeletal maturity are indications for surgery in patients with

favorable Risk/benefit ratios. The use of segmental spinal instrumentation improves correction, decreases the period of postoperative immobilization and the rate of non-union, and improves outcome in selected patients ***(Thomson and Banta, 2001)***

Surgical management of the arms in patients with cerebral palsy is designed to correct muscle contracture, decrease spasticity, reduces deformity, improve function, and improve health-related quality of life. Soft-tissue procedures are rarely successful in patients with movement disorders ***(Van Heest, et al., 1999)***. However, arthrodesis can improve outcomes in these patients; reduced sensitivity is common in patients with spastic arms as shown by deficits in stereognosis (97%), two-point discrimination (90%), and proprioception (46%). Furthermore, the extent of sensory loss does not correlate directly with the severity of the motor deficit ***(Cooper, et al, 1995)***. The role of surgery is not as prominent for arm deformities as for the legs because of sensory impairments associated with spasticity of the arms and the limited functional gains after surgery ***(Flett, 2003).***

Shoulder internal rotation can be managed by: lengthening of the pectoralis major or subscapularis tendons, or both, transfer of the latissimus dorsi and teres major tendons to the lateral humerus, humeral osteotomy, or shoulder fusion.. Shoulder fusion is rarely indicated.

Significant elbow flexion contracture can be decreased by any combination of the following: brachialis fractional lengthening; Z plasty of the biceps brachii; flexor pronator slide; release of the elbow capsule; and humeral osteotomy. Osseous procedures are rarely indicated to manage elbow flexion. Weakening biceps function may exacerbate pronation deformities and must be factored into any surgical decision. Patients with elbow flexion contractures of greater than 60[degrees] are candidates for surgery if the goals of patient and physician are reasonable. A deformity of less than 30[degrees] rarely justifies surgery, although contractures of 30-60[degrees] might benefit from surgical intervention. ***(Koman, 1990).***

Early intervention for Developmentally disabled child

Early intervention applies to children of school age or younger who are discovered to have or to be at risk of developing a handicapping condition or other special need that may affect their development. Early intervention can be remediable or preventive in nature, remediating exciting developmental problems or preventing their occurrence.

Early intervention may be center-based, home-based, hospital based, or a combination. Services range from identification-that is, hospital or school screening and referral services-to diagnostic and direct intervention programs.

The world has been paying attention even more on the importance of early intervention to enhance the development of infants, toddlers, and young children. The period from conception through early childhood is the most important in human development for maximizing the potential for living fully.

The benefits of early intervention have been summarized in the following:

- Promote the social, emotional, intellectual and physical development of young children with developmental disabilities and to enhance their potential for learning

- To prevent the development of secondary disabilities in young children with developmental problems
- To support the families of young developmentally disabled children so as to enable them to meet the needs of the children as effectively as possible. ***(Parry,, 1992)***

Biological rationale for Early Intervention

The brain has achieved four fifths of its adult weight and size by the end of the second year of life. Noticeably, the brain grows at a remarkable pace from conception through the first several years of life. This begins with five critical phases of prenatal brain development. The first phase is ***neural proliferation***. By the fifth prenatal month, all of the neurons that the brain will ever have –approximately 100 billion- are created. In the second phase, ***neural migration***, neurons begins to migrate to the outer cortex of the brain. This delicate process is completed by the end of the sixth prenatal month. These events create the basic "hardware and wiring" necessary for sensory input, information processing, and motor output. The third involves a process called synaptogenesis, by which the neurons develop interconnections that allows them to communicate with another. More synapses are created than are really necessary. Fourth phase is ***pruning***, in which, reducing of the number of connections occurs so that only those that are used and needed survive. In the fifth phase, the nerves are coated with ***myelin*** especially along the nerves that run from the brain down the spinal cord. The result is that commands

are executed rapidly. Primitive and survival related cognitive structure is myelinated first during early postnatal life. Executives functioning structures are myelinted as late as adolescence and early adulthood.

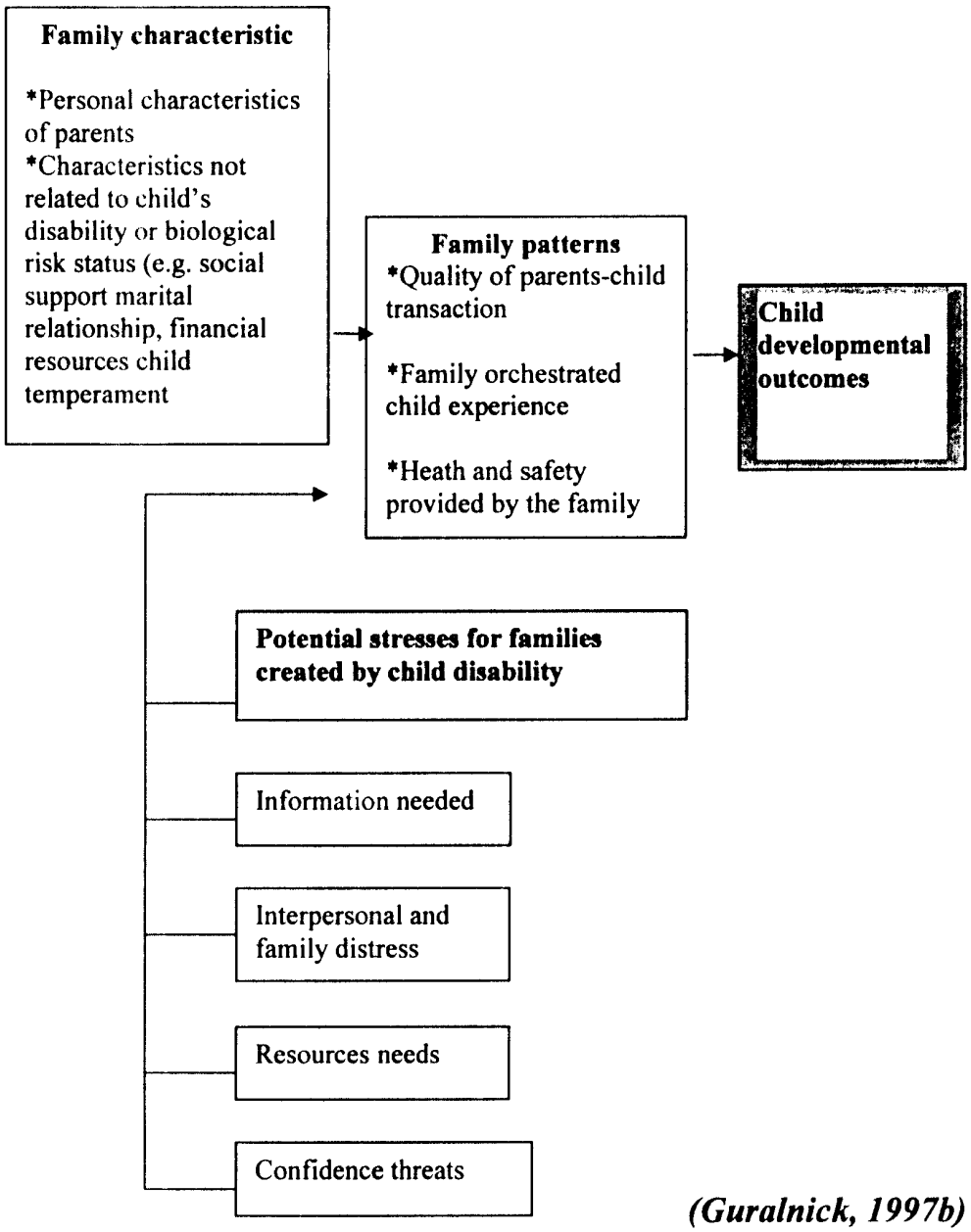
This information alone could justify early intervention. Also, finding the best way to facilitate typical brain development during critical periods (the optimal times for certain types of learning that is during this particular stage of development some experiences are of critical importance for the development of neural structure), minimize the impact of injury, and take advantage of the brain plasticity (the brain's attempts to self -repair) ***(Skonkoff, and Phillips, 2000)***

Conceptual model of early development and risk factors

These models are useful not only in understanding how development proceeds for diverse populations of children and families, but also provide a conceptual framework to guide the complex process of early intervention. This model also incorporates the additional construct of stress in connection with a child's disability or child and family risk status ***(Thompson et al., 1994).***

Fig (1) illustrates factors influencing child outcome. The central portion (family pattern) of fig(1) represents three essential family interactions patterns governing the course of child developmental outcomes **(Guralnick, 1997b)**.

Fig. (1) : The possible potentiating effects of risk factors on family interaction patterns and child developmental outcomes



(Guralnick, 1997b)

A) The quality of parents-child interactions: It includes responding contingently, establishing reciprocity, providing effectively warm non intrusive interactions, appropriately structuring the environment, and ensuring developmentally sensitive patterns of sensitive caregiver-child interaction ***(Hart and Riseley, 1995)***

B) family- orchestrated child experiences: It includes the variety and developmental appropriateness of toys and materials provided, the general stimulation value of the environment, and sets of measure related to parental arrangement of the child experiences ***(Ladd et al 1992)***

C) Health and safety provided by the family: It includes immunizations, adequate nutrition, protecting the child from violence

These three patterns of family interaction, which jointly or independently influence the child development outcomes, are themselves product of an array of family characteristics which, includes parental attitudes, beliefs, maternal mental health status, coping styles, and existing support, stressful marital relationships ***(Emery and Kitzmann, 1995)*** and limited financial resources ***(Duncan et al, 1994).***

Moreover, children born with established disabilities create potential additional stresses. It includes four categories which are:

a) Information needs: Information as regards the child's current and anticipated health and development as well

as, Information needed to support them in their parenting role ***(Donahue and Pearl, 1995).***

B) Interpersonal and family distress

C) Resource needs: It includes time needed for locating and coordinating services for the child. Also, financial responsibilities for their child's health care, respite care and therapeutic services mount rapidly.

D) Confidence threat in their ability to solve current and future child-related problems

The actual impact of a child's biological risk or disability on family patterns of interaction in the context of the larger ecology of family characteristics is likely to be of considerable significance in the design of a cost effective and efficient early intervention system.

Stressors created by disability conditions operate through family interaction patterns to produce decline in the child developmental outcome. It has been argued by ***Guralnick, 1999*** that early intervention programs are capable of altering either those non optimal family interaction patterns directly or by moderating the impact of stressors that influence those patterns (i.e., family characteristic). In order for the early intervention, the components of the system must be designed in a manner that is responsive to the stressors that have been

identified. The system is comprised of three major characteristics:

(a) ***Resource supports*:** Becoming aware of, accessing, and coordinating appropriate educational, health and social services is fundamental.

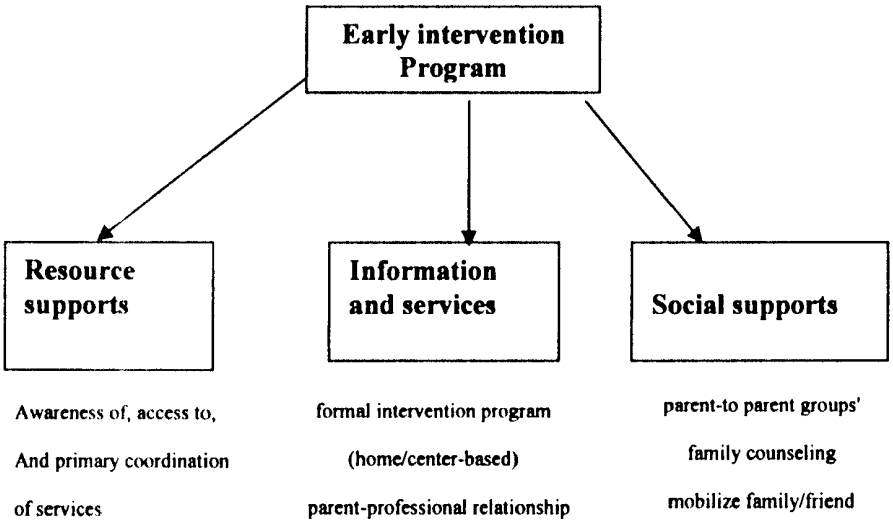
(b) ***Social supports*:** parent to parents groups are a unique source of support and can be of enormous value in alleviating any interpersonal or family distress that may have been arisen ***(Dunst et al, 1997)***. These same groups are able to assist families to involve friends, extended family and other community-based supports to establish a network that minimize stressors and shows the strongest relationship to both family and child outcomes***(Dunst , 1999b).*** If interpersonal and family distress becomes extreme, intensive family counseling must be considered ***(Cooley, 1994)***

(c) ***The provision of information and services*:** Child receives specific developmental or therapeutic interventions, and the parents are provided with information and techniques to enhance parent child interaction. Formation of relationships with professionals provides another vital and supportive component of the early intervention system. These parents-professional "partnership" provide an

opportunity to discuss the child's developmental outcomes, and anticipatory guidance.

Finally, if the components of these early intervention systems are carefully coordinated and integrated, the cumulative impact may well minimize any threats to the family's confidence in their ability to address the ongoing needs of their child ***(Guralnick.M, 1998).***

Fig (2): Components of Early Intervention Programs as a response to stressors (Guralnick, 1997)



On the other hand, ***Simeonsson, 1991*** proposed a conceptual framework for the provision of early intervention services, applying the concept of primary, secondary, or

tertiary levels of prevention (table 2). This framework has implications for direct intervention with children and linked intervention for families. The premise is a coherent approach that can address the goal of early intervention, namely the manifestation, severity, or extended impact of developmental delay is to be prevented. The application of this prevention perspective is based on the following assumptions: (a) the family is seen as a system ; (b) the condition of developmental delay, or its potential, identifies the child and makes the family unit eligible for linked interventions; (c) family maladaptation or dysfunction is not an inevitable correlate of actual potential developmental delay in the child; (d) interventions can therefore take the form of services to promote as well as restore family adaptation.

The framework serves as an integrating framework in which different levels of prevention are addressed cross-sectionally within a single family unit. In such a situation, secondary prevention could be represented by interventions to promote functional skill acquisition by a developmentally disabled child. Efforts to reduce sequelae, such as elevated demand and stress on family functioning, could comprise a tertiary prevention focus. Finally, intervention activities to prevent the manifestation of developmental disability in a high-risk younger sibling within the same family unit could represent primary prevention.

Table (2): levels of Prevention: Early Intervention Implication

Level of prevention	General goal of Prevention	Intervention implications for children	Linked intervention implications for families
Primary prevention	Prevent condition by reducing number of new cases	Reduce new cases through enrichment and stimulation of major developmental domains	Anticipatory guidance to enhance parenting and promote esteem and differentiation in family
Secondary prevention	Prevent condition by reducing number of existing cases	Reduce duration and/or severity of developmental delay /disability through interventions to maintain and restore, or develop new skills	Facilitate adaptation of family to reality demands through promotion of coping and fostering skills
Tertiary prevention	Prevent condition by reducing direct and indirect effects	Reduce direct and indirect effects through interventions to augment or compensate behaviors or functions	Facilitate adaptive, structural, and integrative change for affected family structures, relationships, and/or values

(Simeonsson, 1991)

In the context of early intervention, primary prevention addresses populations at risk for developmental delay based on biological or environmental factors or combinations of the two. Biological factors are characteristics intrinsic to the child and include prematurity, low birth weight, and others markers of complications of pregnancy or delivery. Environmental risk factors are extrinsic to the child and include family characteristics such as low socio economic status and parental substance abuse. The goal of primary prevention is to prevent, or reduce the potential of, developmental delay in the child. The interventions implications for the infants are to promote conditions for normal development and remove and reduce conditions impeding normal development. Given the fact that primary prevention is provided prior to a documented diagnosis of developmental delay in the child, the involvement of the family is geared to interventions that (a) promote development and adaptation and (b) prevent potential delay and dysfunction. The nature of services provided is likely to take the form of parents support and parent training in individualized interventions.

In a secondary prevention approach to early intervention, the objective is to reduce the number of developmentally disabled children who will need special education or related services. Services in a secondary prevention context may include the parent support and training activities and child rehabilitation (physical, occupational, and

speech therapy) or remediation (e.g., cognitive and language skills buildings). In the light of the goals of secondary prevention of developmental disability, two major issues are likely to constitute intervention need to the families one has to do with the initial shock of the child's diagnosis and the others is concerned with the ongoing demands of meeting the additional needs of a special child ***(Menolascino and Egger,1978).***

The goal of tertiary prevention is to prevent sequelae of developmental delay in the child and family such as atypical, maladaptive characteristics in the child concomitant with developmental delay, family maladaptation and dysfunction. Tertiary prevention is less readily identified in early intervention than primary and secondary applications. Broadening the focus in services from direct effects on the child to indirect effects on the family however makes tertiary prevention a relevant concept in a comprehensive view of early intervention.

The levels of prevention also have specific implications on the issues pertaining to eligibility criteria, epidemiology, screening and assessment, outcome evaluation, and intervention personnel. A summary of these implications is presented in table (3)

Table (3): Levels of prevention: implications for early intervention policy

Dimension	*Implications*
Eligibility criteria	A) primary prevention: risk status confirmed b) Secondary prevention: developmental delay manifested c) tertiary prevention: Sequelae of developmental delay manifested
Epidemiology	In order to plan an effective prevention program ,there is a need for an epidemiology of developmental delay /disability in terms of : a) Incidence b) Prevalence c) Relative risk
Screening and assessment	The nature and form of assessment are specific to each level of prevention
Evaluation of outcome	Primary prevention: reduction of the manifestation of developmental delay Secondary prevention: reduction of duration or severity Tertiary prevention: reduction of sequelae
Professional roles and skills	Professional roles and skills would be differentiated by the level of prevention and associated child and family interventions.

(Simeonsson, 1991)

Effectiveness of Early Intervention

From a scientific perspective, however the existence of numerous methodological problems has posed significant challenges to establish clear statements regarding the efficacy of early intervention ***(Guralnick, 1997)***. Yet despite the concerns, the results of two meta-analyses as well as more traditional review of effectiveness support the opinion that early intervention programs definitely effective, producing average effect sizes falling within the range of one half to three quarters of a standard deviation.

Effectiveness of early intervention for disabled infants and their families

Severity of the disability is one of the features that are related to effectiveness of early intervention. Programs oriented toward developmentally delayed appeared to report greater cognitive gains than those serving children with mental retardation, whereas the smallest impact was associated with programs for children with orthopedics handicaps. So, work is needed to understand how severity influences child outcomes and to obtain a better grasp of this construct in terms of its influence on an absolute as well as relative basis.

Another feature that appears to be related to intervention effectiveness is the relation between severity of disability and age at program entry. For mildly impaired infants, enrollment before the age of 6 months is associated with a significantly

better outcome than beginning services at a later age. More severely handicapped children, appear to have a constant rate of improvement regardless of their age at program entry.

Family characteristics are an equally important factor, because family risks and biological risks interact to moderate the effectiveness of early intervention programs. ***Bendersky and Lewis, 1994*** found that a family risk measure composed of assessments of social support, stressful events, parent-child interactions, and organization of the environment.

Programs characteristics related to effectiveness (Skonkoff and Hauser, 1987)

- A program with well defined curriculum shows significant greater child effects than those that used less structured approach.
- Locus of service delivery is another dimension. Home-based program are more effective in the young preschool children than centre-based program alone.
- Programs that aim for high levels of parent involvement appear to be more effective than those that minimize or disregard the parental role.

Long term effectiveness of Early Intervention

It is expected that the early intervention system would produce long term effects that worth the extensive resources put into place during the early years. The developmental model presented earlier can provide a framework that guides

our understanding for expected reasonable for both short terms and long terms outcomes ***(Zigler and Styfco, 1994).*** Intensity of early intervention and specificity are critical elements attributable to long term gains to early intervention in the light of the developmental framework.

Intensity are defined as the level of intervention occurred within a specified time interval (density), occurring across a longer period of time (duration), containing more early intervention components (comprehensiveness).

In the light of the developmental framework, the intensity of early intervention would not be the only factor as intensive therapy would not be needed under all risk and disabilities circumstances. So, the notion of specificity is central to an understanding of contemporary early intervention programs and has important policy implications for providing cost- effective services. As the interactive nature of developmental framework, suggests that the effects of any one stressor are likely to be moderated by the array of existing stressors associated with family characteristics and with a child's biological risk and disability status.

Designing early intervention based on stressors has important has important implications for policy and practices. A system can be put into place through matching the specifics of early intervention program components (intensity, type of

curriculum)with child (e.g., type and severity of disability), goals or outcomes of early intervention (including long term effects) and family characteristics (e.g., social supports, financial resources) and family interactions patterns (parents child transactions). In this system, some families and children will require only surveillance or minimal supports, even children with established disabilities; others will require highly intensive, long-term programs to produce important outcomes that are sustained beyond the early years. As a consequence, eligibility for early intervention programs should not mean that the child and family have available the entire array of services but an individual was put in place to match the need and services. This includes developing sensitive assessments of needs for services and supports as perceived by families, as well as developing better risk indices and clinical instruments that are consistent with the framework ***(Guralnick, 1998).***

Early intervention for cerebral palsy children

Early intervention has been defined as a systematic and planned effort to promote development through a series of manipulations of environmental or experimental factors initiated during the first five years of life ***(Paramleen, 2006).***

Characteristics of early childhood intervention

Early Intervention is based on a ***Family- centered orientation*** which encompasses three key elements: parents have final control over decision making, parents are treating respectfully

and supportively, the parents are provided with all information needed***(king et a.l,1999).*** The rational behind family –centered approach are: the family context and the experiences provided within this context are extremely critical to a child's development ***(Dunst, 1999b; Guralnick, 1999)***. Beside this fact the care -giving family is the constant over the child's life span, and families spend the most time with their child .because most children in early intervention receive far fewer service hours ***(Bruder and Staff,1998)***, it is obvious that families (or other caregivers) have the opportunity to provide the greatest influence on the child developing competence. So, it is recommended that early intervention should provide families with a sense of confidence and competence about their children's current and future learning and development ***(Bailey et al 1998)***. In particular, parents should be given information in a way that supports their ability to parent their child and facilitate learning without threatening self confidence and cultural, religious or familiar traditions.

The key to the intervention program was to improve the mother's ability to recognize and support her own infant's abilities in different domains; establishing care taking routines; building synchrony and reciprocity between parent and child, and generally improving the competence of the mothers were essential goal of the program. Analysis of the role of parents in early intervention program that planned extensive parent involvement showed significant greater effect than those with little or no planned parent participation. Criteria for extensive

involvement (parents volunteered in the classroom, participated in planning and evaluating activities, and implemented carry over activities at home. Programs targeted their efforts on parents and infants together ,linking parents 'role to the services given to the child appears to be more successful than those that work with either parent or child in isolation ***(Shonkoff and Hause-Gram,1987)***

Despite the growing acceptance of a family –oriented approach to early intervention services, measures of family functioning have been abandoned in nearly all outcomes studies. Few studies have included measures of parent-child interaction. ***Brinkers and Lewis1982*** speculated that the behavior of infants with motor disabilities might lead parents to adopt specific patterns of interaction that eventually could hinder the child's learning. More research is needed to explore how specific interventions can influence the parent-child relationship to facilitate adaptive development.

The effectiveness of early childhood intervention for cerebral palsy children

In the absence of early intervention, infants and young children with cerebral palsy use their abnormal tone and retained primitive reflexes to develop atypical movements patterns ***(Bobath, 1984)*** such as W –sitting (sitting with hip internally rotated), walking on tip toes ***(Bly,1991)***. Persistent use of atypical patterns of movement and tone lead to muscle

tightness, joint contractures, and musclo-skeletal deformities (e.g., hip dislocation, scoliosis ***(Fetters, 1984).***

Children with spastic diplegia walked earlier and more steadily if placed in an early intervention (before 9 months of age) compared with those for whom treatments was initiated after 9 months ***(Kanda et al., 1984).***

The effects on children with spastic diplegia who received 12 months of neurodevelopmental therapy, a significant advantage on both motor and cognitive measures for the group receiving infant stimulation. The study shows that a systematic and comprehensive programme parent mediated infant stimulation benefited both motor and cognitive development ***(Palmer et al., 1988)***

Wright and Nicholson 1973 posited that the families of the children who received therapy were more confident in handling their children, whereas families of children of control group require support.

Forms of Early Intervention for children with motor disabilities

Many therapy systems have been devised. The therapists aim to draw on the most appropriate techniques and methods for each child, rather fitting the child into a single favorite system.

A) Therapeutic exercise

It aims at promoting normal movement patterns and inhibiting the abnormal ones in order to maximize functional motor independence. When started early it helps in preventing contractures and deformities ***(Rosenbloom ,1995).*** The most widely used is the neurodevelopmental treatment (NDT) ***(Bly, 1991***: ***Bobath &Bobath, 1984).*** According to Bobaths, the motor problems of CP arise basically from CNS dysfunction "lack of higher level –motor control over movement and release of primitive and abnormal reflexes at lower levels" ***(Horak, 1991),*** which interferes with the development of normal postural control against gravity and impedes normal motor development. The goal of treatment is to inhibit abnormal muscle tone and primitive reflexes and to facilitate normal motor patterns and function and to prevent contractures and deformities ***(Horak, 1991)***. The therapist uses handling techniques that controlled various stimuli that inhibit spasticity, abnormal reflexes, and abnormal movement patterns, and used to facilitate normal muscle tone, equilibrium responses, and movement's patterns. The child was a relatively passive recipient to NDT treatment. NDT had not automatically carried over into activities of daily life, as expected to be, so leaders in physical therapist have suggested that a task oriented model of neurological rehabilitation may be preferable to be more traditional neurofacilitation approaches ***(Harok, 1991) (Bultler and Darrah, 20001)***. A task –oriented model involves more problems solving on the

part of the client and less "hands-on" facilitation on the part of the therapist. Emphasis is on specific skill acquisition rather than on enhancing quality of movement. Using the World Health Organization 1980) According to the International classification of impairments, disabilities, and handicaps categories, the NDT models are directed at trying to modify the child's impairment (facilitating typical muscle tone or inhibiting primitive reflexes. Whereas a task oriented model is directed at minimizing the effect of the child's disability by making modifications in the environment –for example, providing ankle –foot orthoses to increase independence in standing. Increased emphasis on addressing the functional outcomes of early therapy interventions ,rather the outcomes aimed at modifying the client 's impairment (e.g., muscle tone or range of motion) has been suggested by a number of researchers in the field ***(Haley et al .,1993; Harris,1990a)***.

B) <u>Neurobehavioral motor intervention</u>

Is an approach developed by ***Horn,et al 1995*** which consist of 3 specific procedures:

1) Identification of the movements components absent from he child's motor behavior repertoire
2) Identification of functional activities or milestone skills requiring the execution of these movements components.
3) Development of intervention protocols consisting of both behavioral programming and neurodevelopmental programming. The neurobehavioral motor intervention

assesses both the acquisition and generalization of specific movement patterns in an effort to examine the attainment of functional outcomes across different settings in which the child lives and plays.

C) <u>Conductive education</u>

developed in Budapest, Hungary, in the 1950s by Dr. Andras Peto, the goal of conductive education is to stimulate a developmental process which would not come about spontaneously, and which will continue subsequently , even when the child have been discharged ***(Harris and Tillemans,1984).*** It aimed at improving posture and movement in functional motor activities within highly structured institutional setting. The child is an active participant in conductive education, such as the conductor role is to facilitate the child's learning rather than to treat the child. The daily program includes self- care activities and sensorimotor as well as preacademic skills. Goals are functional and comprehensive and frequently involve a task analytic approach.

Children work in groups involving children of similar abilities. All children in the group work on the same series of tasks but will attain different level of accomplishment and use different methods to attain goals ***(Hari and Tillemans,1984)***

The conductor sets the stage for each physical/motor task by encouraging the child to mentally prepare for the task first, a technique known as *rhythmic intention.* The child will

announce what he or she is going to do before attempting the movement. The child lives at the center and take part of the program throughout the entire school day. In this way learning strategies are integrated into each aspect of daily living

D) Specific environmental adaptations

It adopts specific environmental adaptation, such as the use of powered mobility, augmentative communication systems, adaptive positioning devices and orthrosos. With increasing importance on modifying the environments in an effort to minimize the child disability rather than trying to alter the child's impairments, it is reasonable that the major forms of early therapy intervention are moving away from the more traditional hands-on neurofacilitation approaches and toward providing more specific, functional, client –centered adaptations. Harris 1988 stated that beyond the first 2 years, it is time to let go the notion of "normalization" with respect to muscle tone, reflexes, and movement patterns, and work instead toward achievement of functional skills such as independence in mobility and communication.

E) Portage program

Portage is an educational program which can be adapted for use for children with CP children.

In late 1960s in rural Wisconsin, the portage guide to early intervention was developed to mange developmental delay in preschool children. A parent, usually the mother, teaches the

child each day and keeps a record. A home visitor monitors progress weekly and teaches the parent by modeling the program with the child. Portage services exist throughout the UK.

Portage program was amongst the first to explore, study, and involve parents directly in rehabilitation and management of their young children. It is an example of early developmental intervention programs. It is widely available package, which is frequently used for children with developmental disabilities ***(Marlows and Avon, 1998).***

This program can be applied to all children from 0-5 years with problems in acquiring skills due to mental or motor disability as Down syndrome, Cerebral palsy or developmental disability. Its application starts by assessing the child in 4 fields:

- Motor skills
- Cognitive skills
- Social and language skills
- Self help skills

The primary focus of Portage is the developmental progress of the child where parental support is provided as a part of delivery ***(Marlows and Avon, 1998).*** The Portage services are usually provided in the child's home, in a center – based facility, or in a combination of both settings.

The Portage program is based on 450 behaviors sequenced developmentally and classified into self help, cognition, socialization, language, and motor skills ***(Sheater and Shearer, 1972)***.

A program's special educator normally visits the home one day each week to do some tasks, or parents receive the same service in the center's weekly session;

- To review the child's progress during he previous week
- To describe the activities for the upcoming week
- To demonstrate to the parents how to carry out the activities with the child
- To observe the parents and the child interacting
- To offer suggestion as the portage program and advice as needed
- To summarize where the program stands and indicate what records parents should keep during the next week

A review of the outcome studies on the portage project states that there is evidence of developmental acceleration in mildly delayed children ***(Sturmey and Crisp, 1986).***

A consistent approach to the child's management throughout the day is essential so that intervention enhances other activities. The therapists' roles in management are mainly advisory and cover all aspects of daily life ***(Jone, 1992)***. The following areas should be considered:

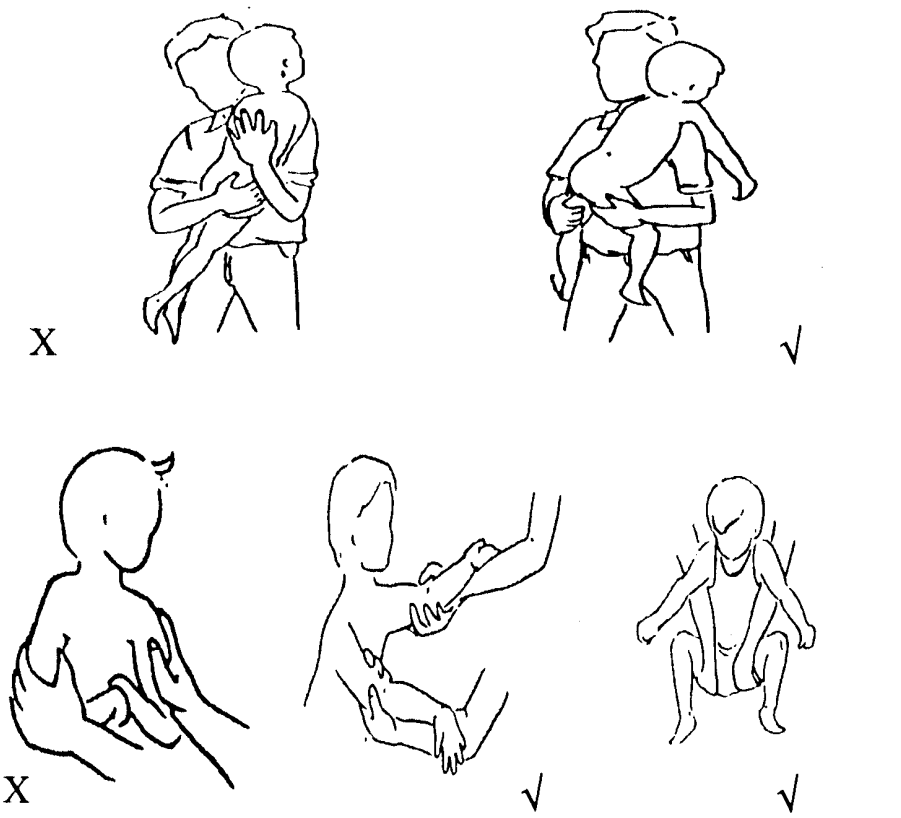
1. lifting
2. positioning

3. movement between position
4. personal care
5. dressing
6. sleeping
7. communication and language intervention
8. skills required for augmentative communication systems
9. Eating and drinking skills
10. Accessing switches
11. mobility
12. education
13. transport
14. pay and leisure

lifting and carrying

Good lifting and carrying techniques encourage the child's ability and interaction and communication with the environment, discourage deformity, and should be relatively easy and safe for the carrier (fig 3). The child should be given enough support so that he is safe but not so much that he is passive.

Fig (3): Different correct ways for lifting and carrying a CP child



(Fennie, 1990)

X Incorrect handling

√ Correct handling

Positioning

For many children and adults with cerebral palsy, correct positioning is fundamental to any functional activity as well as to comfort and ease of handling. It is also vital in

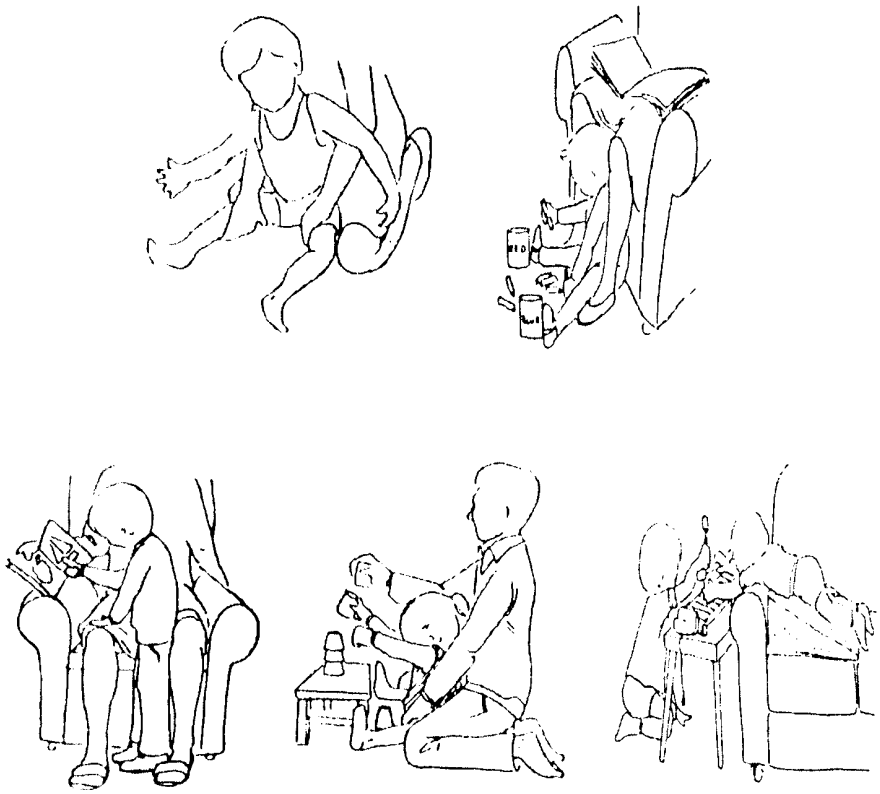
combating deformity where this is a potential or existing concern

In defining positions to be used one may consider various positions relative to various activities and choose those which most nearly fulfill certain criteria which are :

1. Function 2. correction and management of deformity
3. Ease of use 4. Ease of obtaining necessary equipment
5. Comfort 6. Feasibility in specified setting

The weighting of criteria will vary according to the child, the activity, the setting and the carers involved. For children unable to support themselves in certain positions (seating, standing, mobility, deformity management) and those at risk of developing deformity, there are specific fundamental appositional needs for which recommendation and, where necessary, equipment must be provided and monitored as efficiently as possible ***(Bergan and Colangelo,1985)*** fig (4).

Fig (4): Different correct positions for CP children

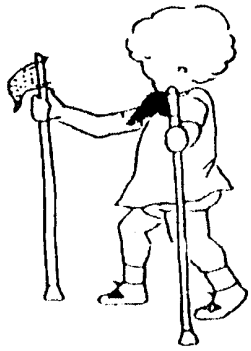


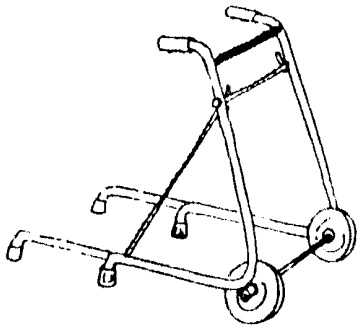
(Fennie, 1990)

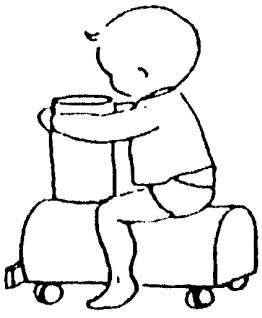
Movement between positions

Movement between positions includes: Rolling, lying to sitting, creeping and crawling, sitting to standing, standing to walking, assisted walking (fig 5). Throughout the day a child will frequently be moved or will need assistance to move between positions, and these are appropriate times to reinforce and encourage ability. Also, there are specific activities involving movement between positions, which are useful during individual and group treatments.

Fig(5): Aids to mobility of CP children





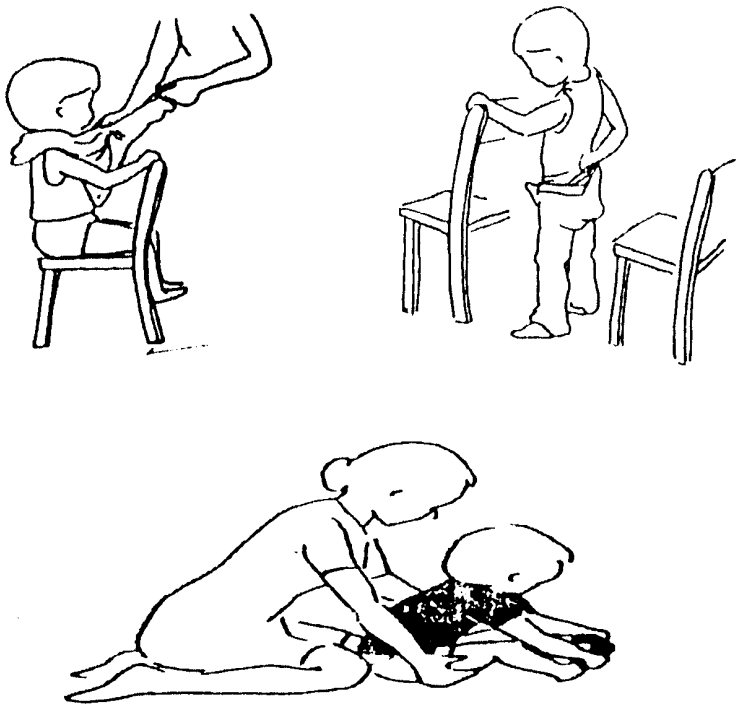


(Fennie, 1990)

Personal care

The way the child participates in his personal care can be used to improve his motor development. The important principle is the child feels secure, i.e. able to maintain a symmetrical posture balanced enough to move and participate in the required task using simple problem solving, such as support using the carer's body or a standard item of furniture (Fig 6). In all aspects of personal care the child should take increasing responsibility for himself which, are appropriate to the child's level of ability.

Fig (6): Different supports used to maintain balance during personal care



(Fennie, 1997)

Sleeping

There are two main considerations when the child is sleeping :

The posture of the child in the bed, maintaining a good position throughout the night will assist in prevention of deformity and will afford an opportunity for a long period of correct posture and stretch. For the young child, using towels, sheets, or nappies may be sufficient to maintain the child in abduction or side lying ***(Finnie 1968, Millard 1984).*** Splints, personalized night boards and wedges can be used for older children and children with severe involvement ***(Fearn and Tutt 1989).***

The child need to be put in a position that provide adequate stimulation to the more affected side ***(Finnie,1990)***

Eating and drinking

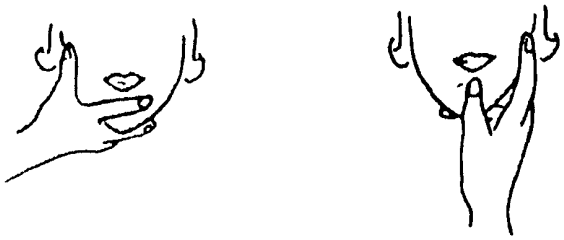
Meal times provide opportunities for the development of postures, head control, hand /eye coordination. Considerable language interaction occurs at mealtimes allowing vocabulary building, concept development and rules of social behavior to be learnt. Giving the child choices and control at mealtimes allows him to develop self –esteem and independence

Advice on adequate and healthy food is necessary to allow the child to receive adequate, varied diet, and appetizing nutrition content with minimum food bulk for health, growth and digestion.

The patterns of movement of lips, tongue, jaw, ect., practiced whilst eating, as well as hypersensitivity problems strongly influence feeding and the development of precise movements necessary for speech and control of saliva

Advice to parents is necessary about lips jaws and tongue control, swallowing stimulation techniques as well as good posture head position and oral desensitization techniques, oral stimulation that improved motor competence for handling the food and liquid. (Fig 7).

Fig 7: Oral control techniques



Communication and language intervention

Early intervention is essential to establish the child preverbal skills and to ensure communicative competence whether the child ultimately acquires speech or requires an augmentative system for communications. The child with cerebral palsy may demonstrate all the prerequisites for verbal development, e.g. eye contact, listening, attentiveness, turn

taking and verbal comprehension, even though non-verbal interaction may be impaired, i.e. facial expression, eye movements, gesture. The child attempts at communication, whether verbal or non-verbal, need to be continuously reinforced by parents and carers by encouragement to build vocabulary and develop expressive language through reinforcement and expansion of his own initiated attempt.

Accessing

Use of switches can improve the range of opportunities for the child (play, powered mobility, communication aids...) A training program should be planned for each child, with the opportunity to practice progressing from play situations to use for mobility.

Play and leisure

Early intervention is essential to develop the child's awareness of his surrounding and to achieve "normal" auditory, visual and tactile experience. Experiential play is important developmentally and the child should have opportunity to play with all the normal play media. Opportunities for peer group interaction, and for observation and initiation of play and participation in sequential play, should be encouraged. Specialized lay play equipment may be necessary to encourage learning such as cause- effect, scanning, and spatial awareness.

Methods of applying Early Intervention programs

Home based programs

Center based programs

Combined home center programs

(Heward and Orlansky,1992

I- Home based programs

Home-based early intervention program can have positive long –term effects on the mental state of adolescents ***(Aroenen, 1996).***

These programs depend heavily on parental training and cooperation. The parents assume the responsibility of primary caregivers and teachers for their handicapped child. Parent training is usually provided by a teacher or a trainer who visits home regularly to guide the parents, act as consultant, and evaluate the success of intervention. They may visits as frequently as several times a week. They sometimes carry the results of their in-home evaluations back to other professionals, who may recommend changes in the program.

An early intervention program based in the home has several advantages, especially if the home is the handicapped child's own. First, the home is the child natural environment, and parents have been the child first teachers. There is opportunity to interact with the child for both instruction and for social contact which can play an important role in the child's growth and development. Also, home learning activities and materials

are more likely to be natural and appropriate. In addition, parents who are actively involved in helping their child have an advantage over parents who feel guilt, frustration, or defeat of the seeming inability to help their handicapped child. Home- based programs can also be less costly to operate without the expense of maintaining a facility and equipment and transporting children to and from the center ***(Baily and Brikers,1985)***

On the other side, home-based program place so much responsibility on parents, so they may be not effective with all families. Not all parents are able or willing to spend the time required teaching their children. Children in home-based program may not receive a wide range of services as they would in a center based program. In addition, the child may not receive sufficient opportunity for social interaction with peers.

II. Center- based programs

These programs provide early intervention services in a special educational setting outside the home. The setting may be part of a hospital complex, a special day-care center, or a preschool. Some children may attend a specially designed developmental center or training center that offers a wide range of services for children with varying types and degrees of disabilities.

Most center-based programs encourage social interaction, and some try to integrate handicapped children with non handicapped in day care or preschool classes. Parents are sometimes given roles as classroom aids. One important benefit of these programs is the opportunity for a team of specialist from different fields (education, physical and occupational therapy, speech and language, ect.) to observe each child and cooperate in intervention and continued assessment. Many centers hold regular meeting at which all those involved with the child sit down to discuss the program and do some modification to the program. Parents involved in center programs feel some relief at the support they get from the professionals who work with their child and other parents with children at the same center.

Disadvantages of the center-based program include the expense of transportation, the cost and maintenance of the center itself, and the probability of less parent involvement than in home-based program.

III.Combined home-center programs

Many early interventions combine center –based activity and home visitation. Because young children with handicap require more intervention than few hours a day, many programs combine the intensive help of a variety of professionals in a center with the continuous attention and sensitive care pf parents at home. Intervention that carries

over from center to home clearly offers many advantages of the two types of programs and negates some of their disadvantages ***(Heward, and Orlansky, 1992).***

Evaluation of the results of Early intervention for cerebral palsy

Bulter and Darrah, 2001, classified the results of early intervention for cerebral palsy children on the basis of the dimensions of disability which is a concept and a classification system that facilitates the measurements, and research of rehabilitation outcomes.

Impairment

Motoric responses:

Physiological motor function, qualitative movement; tone; spasticity; reflexes ;weight shift; posture ;postural alignment; trunk rotation ;displacement, movement time ;step length; velocity; ;foot angle, cadence; base of support; gait stride length

***Contractures and deformity*:**

Range of motion or joint limitation of hip, knee, ankle

Motoric development:

Motor age, gross motor age, fine motor age

Other domains of development and function:

Social age; mental age; language age; temperament (compliance, responsiveness, activity, adaptability, mood, distractibility

Functional limitation /activity

Motoric activities:

Gross motor milestones and activities, walking, turning, rising from sitting; hand activities, independent play

Social activities

Societal limitation /context factors (Disability/ participation)

Participation in family, school, or community roles

Maternal behaviors:

Home management; maternal responsiveness, overprotection, acceptance, overindulgence, rejection, involvement, restrictions, directiveness, positive initiations, holding face to face and physical contact with infant .

Environment

Arrangement; play materials; variety of stimulation; adaptive seating use

Parent's satisfaction

Parental stress among parents of disabled children

It has been well documented that the parents of children with disabilities experience chronic stress. It is noted that having a child with disabilities affects not only the parents, but also siblings and the relationships among the family members ***(Harris, 1994)***. The nature of stress has been shown to span over several aspects of family life such as daily care demands, emotional distress (e.g., maternal depression), Interpersonal difficulties (e.g., parental discord), financial problems and adverse social consequences (e.g., social isolation). Stress experienced by the families is influenced by child specific variables like age, sex and severity of the problems; socio-demographic variables such as social class, family income and perception of stigma associated with the disorder ***(Beresford, 1994)***. Additional stress is also created due to marital conflicts associated with rearing the handicapped child, extra financial burdens to obtain the necessary services, and fatigue and loss of leisure time due to care taking responsibilities ***(Andrew, 1976)***. Added to this stress is the behavior problems exhibited by children and adults with disabilities. Not only do child characteristics influence parental stress levels, but negative reactions from others can also serve as a source of stress for the families ***(Singer and Powers, 1993)***. ***Seifer et al., in 1992*** found that the families attitude contribute to the prognosis. Family stresses associated with limited financial resources, lack of appropriate services, and insufficient support systems

are examples of family risk factors that can contribute to poor prognosis. Environmental risk factors such as lack of services and negative attitudes can also have an adverse influence on the prognosis of the child with disability. ***Thompson and Gustafson, 1996*** found that mothers of children with chronic illness/disability are at psychosocial risk

Predictors of stress

Sloper et al (1988) detected the following variables as predictors of stress in parents of a disabled child which are High behavior problems in the child, high excitability in the child, low child functioning, high levels of strain from current life events, marital dissatisfaction, lack of family cohesion, lack of active recreational involvement in the family, lack of strong moral –religious on the family, socio economic factors of unemployment, lack of car, inadequate housing, and parental coping strategies –low use of practical coping /high use of passive acceptance in dealing with child-related problems

The following issues in relation to well being of mothers of children with disabilities will be discussed in this section:

- Child characteristics
- Parental gender
- Marital relationship
- Socio-economic factors
- Developing country model
- Culturally perceived causes of disability
- Early intervention
- Adaptation to child and social support

1) Child characteristics

Upshur 1989 found significantly more stress in parents of developmentally delayed children compared to groups of parents of children at various risks. The characteristics of a child greatly influence the degree of occurrence of stress in parents. Disabled child in particular exhibits different characteristics compared to that of a healthy child, which could attribute to parental stress

A disabled child's problem behavior, care giving demands and levels of communication –skills has repeatedly been found to be linked to parental stress ***(Frey et al., 1998)***

2) Behavior

A child's behavioral problem may be defined as any behavior, which makes life difficult for the child and those who care for him ***(Kirenan et al., 1978)***. It disturbs parents; interfere with peace of their mind or relationship with the child. Both, a child with physical disability and that with learning difficulty, exhibit a variety of behavioral problems: sleeping problem, inability to learn task, attention deficit, inability to perform task e.g. feed and dress, rudimentary play e.g. Mouthing a toy, breaking a toy or valuable thing, incontinence, careless running in the main street, socially improper behavior.

3) Care giving demand of a disabled child

Bristol, 1988 have found that the increased level of stress in parents of a disabled child may not be linked to overall disability or severity of disability of the child per se but rather to extra care – giving demand of the child. The care giving demand of a disabled child is further more linked to the functional independence of the disable child ***(Blasher, 1984).***

4) Communication

Sloper and turner (1993) identified that physical disability and communication problems in a child tend to be risk factors for stress in mothers.

5) Age

Walker (1981) pointed out that at certain points there is an increase in stress especially when there is discrepancy between normative expectation and actual event e.g. time of first diagnosis, when the child starts school, and when the child reaches adolescence.

6) Marital relationship of parents of disabled children

A child disability can affect the marital relationship of parents, which can cause added stress in them. Marital harmony plays a significant role for parental adjustment to the child's disability ***(MCKminney and Pterson, 1987).***

Incompatibility of support from the father and mother of a disabled child may lead to higher parenting stress ***(Bristol et al 1988)***

7) <u>Adaptation and social support</u>

Barakat & Linney, 1992 have reported that the Social support moderated the relationship between child functioning and maternal depression. In a study conducted by ***Manuel, 2003***, they found that neither the child's disability severity, nor functional status, predicted maternal depression. In addition, only perceived social support was a significant moderator of the relationship between the child's functional status and maternal depression. Moreover, other factors such appraisal or family income examined didn't buffered the relationship between disability parameters and maternal depression. Mothers of high functioning children experienced more distress than mothers of low functioning children when they perceived low levels of social support.

8) <u>Socio economic factors</u>

Social factors such as household income had a negative relationship with maternal stress. Having to care for a child with serious physical disability erode the limited resources of the family resources. It costs money for the family to access services for the child, especially travel cost and money for medicine, aids, and so forth. Economic empowerment of such

families may, thus, be an essential factor for such successful intervention ***(Mubarak et al, 2000)***

9) Developing country context

Social stigmatization creates stress in parents. Many disabled children in some country context are abused in their schools and neighborhood as well as in their extended families which creates tremendous stress in parents. The socio economic factors and the socio-political context have their constant influence on the occurrence of stress in the families of disabled children in the developing countries.

10) Early intervention

Although satisfaction with support received from the families' members and others is an important predictor of well being in mothers ***(Frey et al, 1989)***, an effective early intervention by professionals is essential to change the skills and functioning of a disabled child, stress in his/her mother. Early intervention also changes alongside the child's speed of development ***(Davis and Rushton, 1991)***. ***Meisles and Sknoff, 1990*** outlined the goals of early intervention in the context of a disabled child and his/her family as:

To accelerate child development, minimize potential delays in development of a disabled child, resolve existing problems related to the child's family and community, limit acquirement of additional disabling conditions, and /or

promote adaptive family functioning. The adaptation of mother (as well as other members of the family) to her child's disability depends largely on the level of stress she experiences as well as the success of early intervention. The parent should be helped to adapt to the child's disability, to cope with the general circumstances and to provide an optimal home environment for the child progress, otherwise they would be unlikely to facilitate the child's own adaptation and positive child outcomes may not be sustained ***(Davis and Rushton,1991) (Barid and McConachie1995)***. Contextually appropriate early intervention can make a lot of difference in functioning, controlling behavior problems, socialization in future, inclusion in the school and ultimately inclusion in the society of the disabled child

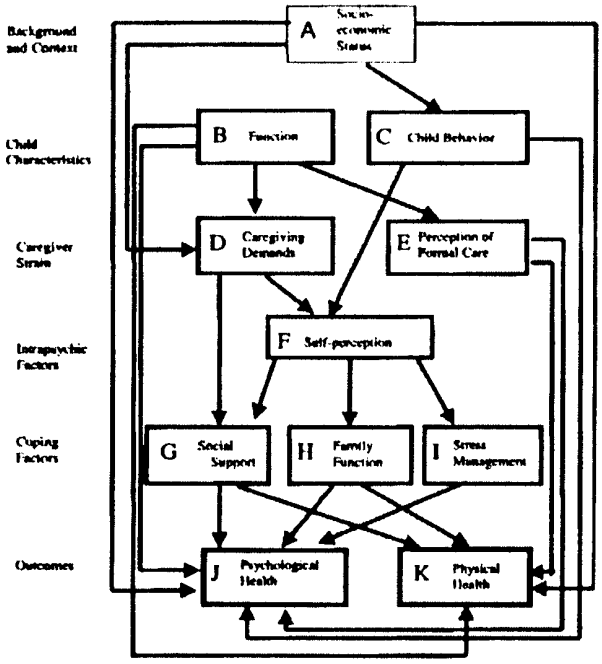
Intervention can also improve parental knowledge and skills in handling their disabled child as well as confronting difficulties. Early intervention not only accelerate child development but can also modify predictor-variables of stress in parents of a disabled child e.g. variables related to the disabled child's characteristics, his or her family and social characteristics ***(Thorburn, 1990)***.

Rania et al, 2004 have developed a conceptual multi dimensional model (fig8), which includes a comprehensive set of factors that are relevant to the caregiving situation. The 5 constructs in the proposed model include:

(1) Background and context,
(2) Child characteristics,
(3) Caregiver strain,
(4) Intrapsychic factors, and
(5) Coping/ supportive factors.

Rania and colleagues, 2004 examine the direct and indirect associations between caregiver characteristics, sources of caregiver stressors, family functioning, and informal social support on the wellbeing of the caregivers of children with CP.

Fig (8): Conceptual model of the caregiving process among caregivers of a pediatric population



(Rania et al ., 2004)

The most important predictors of caregivers' well-being were child behavior, caregiving demands, and family function. A higher level of behavior problems was associated with lower levels of both psychological ***(Mittelman et al., 1995)*** and physical health ***(Palisano et al., 1997)*** of the caregivers, whereas fewer child behavior problems were associated with higher self-perception ***(Krause, 1990)*** and a greater ability to manage stress ***(Palisano et al., 1997)***. Less caregiving demands were associated with better physical ***(Beckman, 1983)*** and psychological ***(Sloper and Turner., 1993)*** well-being of caregivers, respectively. Similarly, higher reported family functioning was associated with better psychological health and physical health ***(Musil, 1998).*** Self-perception and stress management were significant direct predictors of caregivers' psychological health but did not directly influence their physical well-being.

Caregivers' higher self-esteem and sense of mastery over the caregiving situation predicted better psychological health ***(Beckman, 1983)***. The use of more stress management strategies was also associated with better psychological health

of caregivers ***(McCubbin and Patterson, 1983).*** Gross income ***(Dumas et al., 1992)*** and social support ***(Shillitoe and Christie, 1990)*** had indirect overall effects only on psychological health outcome, whereas self-perception ***(Mittelman et al.,1995),*** stress management ***(Eicher and Batshaw, 1993)***, gross income ***(King et al 1999),*** and social support ***(Shillitoe and Christie, 1990)*** had indirect total effects only on physical health outcomes. In families of children with CP, strategies for optimizing caregiver physical and psychological health include supports for behavioral management and daily functional activities as well as stress management and self-efficacy techniques. Services frameworks that are family centered not simply technical and short-term rehabilitation interventions that are focused primarily on the child. In terms of prevention, providing parents with cognitive and behavioral strategies to manage their child's behaviors may have the potential to change caregiver health outcomes.

Although impaired motor function is the hallmark of the CP syndromes, many children also experience sensory,

communicative, and intellectual impairments and may have complex limitations in self-care functions such as feeding, dressing, bathing, and mobility. These limitations can result in requirements for long-term care that far exceed the usual needs of children as they develop. We chose CP as a prototype condition to study the issues that parents who care for a child with a disability face. Family caregivers often shoulder the principal, multifaceted responsibilities of long-term disability management. Although caregiving is a normal part of being the parent of a young child; this role takes on an entirely different significance when a child experiences functional limitations and possible long term dependence. One of the main challenges for parents is to manage their child's chronic health problems effectively while maintaining the requirements of everyday living. In some cases, the provision of such care can prove detrimental to both the physical health and the psychological well-being of parents of children with chronic disabilities and have an impact on family income, family functioning, and sibling adjustment.

It is not fully understood why some caregivers cope well and others do not. Stress has been conceived as the balance between external environmental demands and the perceived internal ability to respond and may occur when the demands prevent the pursuit of other life objectives

Modifying factors of caregiver stress include:

(1) The characteristics of the caregiver (e.g., age, marital status, coping ability) ***(Sloper and turner, 1993)***

(2) Characteristics of the recipient (e.g., the degree of disability)

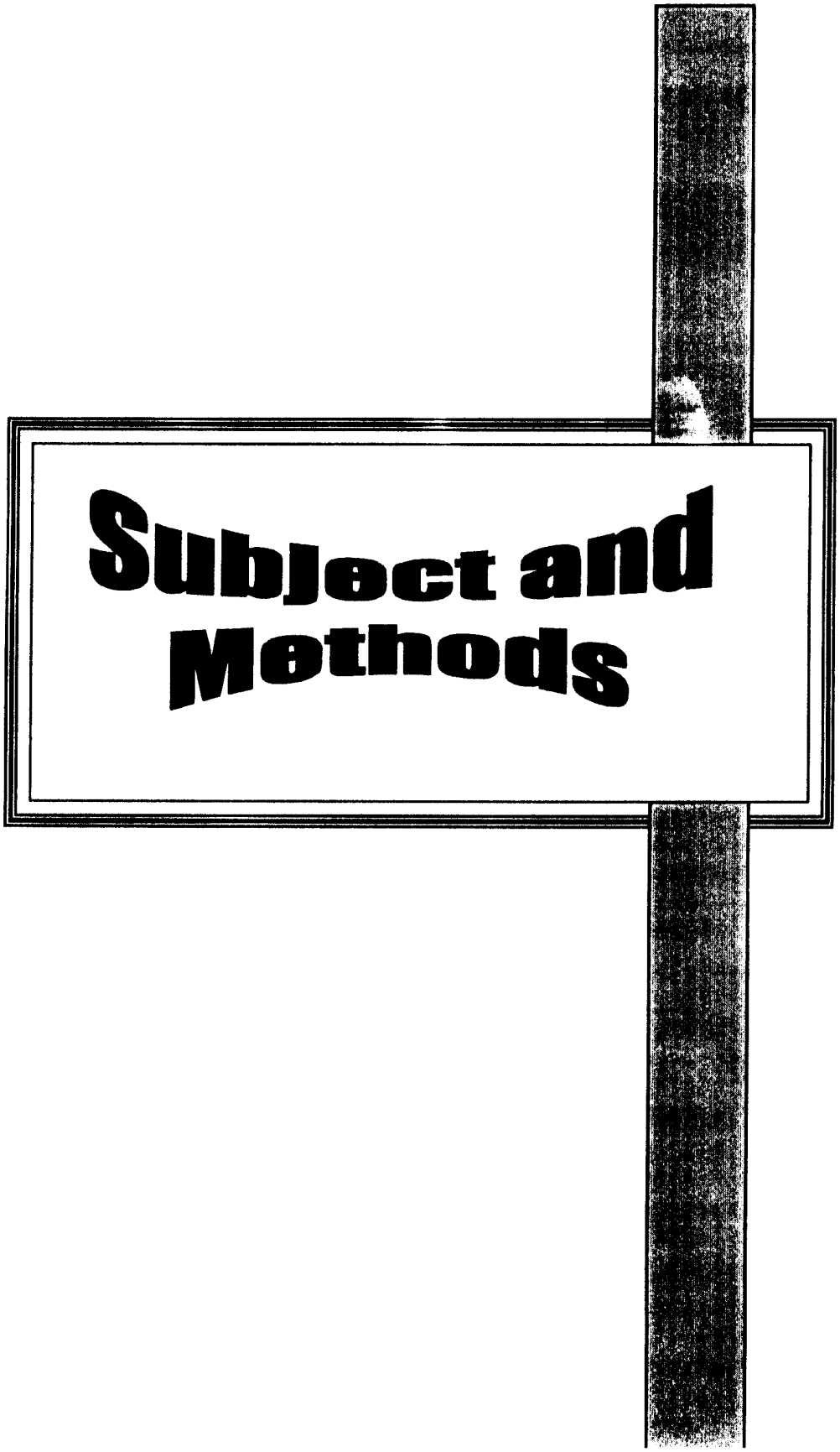
(3) The shared history between the caregiver and the person being cared for

(4) Social factors (e.g., access to social networks and social support)

(5) Economic factors (e.g. socioeconomic status, ability to access formal care, employment),

(6) Cultural context.

Each of these factors may influence the outcome of the caregiving situation; together they suggest that stress occurs in a broader context than simply the provision of care for a child with a physical disability. Our primary objective was to examine, within a single multidimensional model, a comprehensive set of factors that are relevant to the caregiving situation.



Subject and Methods

Subjects

Cerebral palsy children attending early intervention unit at SETI Center-Caritas Egypt and Ahmed Maher Teaching hospital during the period between the first of September 2005 and the end of august 2006 were 62. Selected Children were 38 according to the inclusion criteria. Children whose parents agreed to join the intervention program and had completed the one year period of intervention were 15 children.

Inclusion criteria were:
- Children less than 6 years
- Mild to moderate mental retardation
- Both genders
- attended one year of early intervention program with a minimum 32 sessions
- Written consent was a must before joining the study

Exclusion criteria were:
- Above 6 years
- Severe mental retardation
- Presence of sensory disability (auditory, visual)

All the children were receiving physiotherapy.

Study design: Intervention study

Ethical issues:

Parent signed a written consent before starting the program. No control could be taken as all potential children were identified and non could be denied the accessibility to available service or placed on a "Waiting list" on other tactic to establish a control group.

Design and procedure

I- Diagnostic procedures

Children were subjected to the following

1. I Q was assessed using Bailey Mental scale for children 3.5years and below, and non- verbal Stamford-Binet IV for children above 3.5 years.
2. Thorough history taking
3. Clinical examination to exclude visual or hearing problems and to determine type of cerebral palsy (Hemiplegia, Diplegia, and Quadriplegia)
4. Physical observation

The aim of physical observation was to discover any delay in the motor development and to identify abnormal postural patterns and reflex activity. The physical observation of the infants was carried out in the presence of their parents to obtain better response. Initially mother was asked to put the child in the position required to perform the testing activity. The child was observed in different positions (The posture of the child while at rest, as well as when he moved to change the position, or to do an activity).The main test positions were

supine, prone, supported sitting, sitting, supported standing, and standing positions.

5. Physical examination

The following aspects of motor behavior of the child were noted:

A. the ability or inability to conform to the test position

B. postural analysis : the following factors were noted :

- resistance to movements such as flexion, extension or abduction
- persistent asymmetry : this was due to poor control and alignment of head ,trunk, and limbs
- type of tone : abnormal tone hypo tonicity or hyper tonicity
- consistent elevation ,protraction or retraction of shoulder
- pronounced retraction of the pelvis

C. dynamic analysis

- the infant's ability to assume, get out of and function in the test positions
- primitive movement patterns
- alternation of tone during movement

D. reflex reaction analysis: persistence of primitive reflexes or presence of abnormal or pathological reflexes

E. predominating tone, postural pattern and asymmetries

5. Developmental assessment of children using the Portage checklist for gross motor, fine motor and self help domains at 2 time points, one at the start of the program and the second at the end of one year early intervention sessions. Each item passed independently without physical prompts or assistance is equivalent to one point and the raw score is the sum.
6. The gross motor, fine motor, and self help developmental age were calculated using the following equation

$$\frac{\textit{Number of items passed independently by the child } x \textit{ actual age in month}}{\textit{Number of items should be done at the age of the child}}$$

7. The rate of development for each domain (gross motor, fine motor, self help were calculated by dividing the developmental age /chronological age for each domain at the time of entry into the program and the second at the end of the program.
8. Proportional change indices (PCI) were calculated as follows:

   Rate of development during intervention / Rate of development before intervention

   To determine if the rate of development was affected by intervention, Proportional Change Indices, PCI, ***(Rosenberg et al., 1987)*** were calculated). PCI above 1.00, indicating a gain in developmental rate during intervention, while PCI below 1.00, indicating a decline in Developmental rate over the 12-month study.
9. The severity of the cerebral palsy was assessed using Gross Motor Functional Classification system level

(GMFCs) level as well as to evaluate the change in gross motor level after intervention.

GMFCs has been applied to children with cerebral palsy to assess the severity of motor impairment objectively. Assessment of the severity of impairment is important when evaluating intervention strategies. GMFCs is a recently developed system which has been found to be a reliable and valid system that classifies children with cerebral palsy by their age-specific gross motor activity. The GMFCs classifies the functional characteristics in five levels, from I to V, level I being the mildest. Each level is assessed in the following age groups: up to 2 yrs, 2 - 4 yrs, 4 - 6 years and between 6 to 12 years. For each level, separate descriptions are provided. Children in level III usually require orthoses and assisting mobility devices, while children in level II do not require assisting mobility devices after age 4. Children in level III sit independently, have independent floor mobility, and walk with assisting mobility devices. In level IV, affected children function in supported sitting but independent mobility is very limited. Children in level V lack independence even in basic antigravity postural control and need power mobility ***(Palisano, et al,1997).*** Annex (1).

10. Parenting stress index was completed by the 15 mothers of children with cerebral palsy at 2 time point. One at the entry of the program and the second at the end of one year early intervention.

The parenting stress index (PSI) was developed by Abidin in 1983 and translated to Arabic on the Egyptian context by Beblawi in 1988. The PSI yield sub-scales scores related to the child domain stress (CDS) and parent-domain stress (PDS), together with a total parenting stress index score. The CDS measured six dimensions related to parental perception of child temperament (adaptability, acceptability, demandingness, mood, distractibility, and 'child reinforces parent') that could act as stressors. The PDS measured seven dimensions that were related more to parental personality /pathology and situational stress (depression, attachment to the child, restriction of role, parental confidence, social isolation, relationship with spouse and physical health). The PSI also yield a life stress score, which is a cumulative score of life events that had occurred in the past year that could independently contribute to stress (e.g. changes in marital or work status, death or birth in the family , financial problems or problems with law, new home or school environment

II. Therapeutic procedures

The program

Portage program was used in combination with the WHO manual "stimulation the development of cerebral palsy children, 1993. The Portage Project was originally created 28 years ago in Portage, Wisconsin, USA, in response to the need to provide services in a rural community to young children with disabilities. Portage is known for early intervention and development of intervention systems in the community. Its appreciation and success relies heavily on parental

involvement in enhancing the development of young children with disabilities. The parents must first understand that development of the child is sequential in nature. Secondly, they must believe that the child's development can be influenced by their efforts. A final assumption that needs to be met if family involvement is to be implemented is parental acceptance of their role inactively facilitating their child's development. (Simeonsson, 1991).The specific components of the original Portage Model included child assessment using formal standardized tools and informal curriculum assessment. Using this assessment information, the home teacher and parent target skills and behaviors to be taught. Typically three to five specific skills are selected during each weekly home visit.

Portage kit is an Activity Card File that consists of 580 developmentally sequenced behaviors from birth to age six in five areas: Socialization, Self-Help, Language, Cognition, & Motor Annex (2).

The Portage Program is a system of well structured learning procedures and individualized curriculum developed to train family members in the home (and community) of a disabled child and adults with some modifications to the Portage curriculum). Portage learning activities stimulate the acquisition of developmental milestones that will lead to greater independence and continued parental involvement. The Portage model postulates: Parent/primary caretaker involvement is critical to successful early intervention; the

home or other least restrictive environments are natural and significant learning environments; intervention objectives and strategies must be tailored for each child needs and based on familial concerns, priorities and resources. Data collection is important to reinforce positive change and to make ongoing Intervention decisions (***Sampon and Wollenburg 1998).***

Portage program can be applied on minimal and mild CP cases. It needs more modification on motor skills and self help and fine motor in moderate CP cases ***(Abdel Salam, 2004)*** that is why the WHO manual "stimulation the development of cerebral Palsy children" 1993 was used. WHO manual includes training suggestions to promote gross, fine motor, and self help skills. Also, it provides ideas about low cost adaptive equipment that could be used.

Program procedures:

First stage: Pre- assessment of children

Second stage: Application of the program

The program applied was a mixed center and home based program. The mother comes with her child to the center where a full assessment of the child on the portage program, by a professional trainer in the five domains. The aim of the assessment is to identify the child present performance, define problems and types of activity performance required in the different domains. Program objectives, goals and activities are developed to meet the needs of the child in collaboration with the families. In this study the researcher was more concerned

with 3 fields of child development, namely: Gross motor, fine motor, and self help skills.

Children enrolled attended weekly early intervention sessions that lasted one - two hours. The session included:

-. Setting of short term goals for the coming week after revision of previous week's goals.
- Mothers received guidelines, explanation, and encouragement for carry the different activities at home
- Activities were practiced with child as a guide for the mother in the session that enhance gross, fine motor skills, and self help were set and explained to the mothers.
- A mother's home work was given to apply during the rest of the week till the following session. The homework sheet includes:

  Goals and activities that enhance attainment of goals,

A form for the mother to record frequency of achievement of goals throughout the week. Annex (3).

- Observations of the activities done in the session and comparing it with the activities that should be done in the Portage program according to previous assessment had been done to the child, The ability of the child to do each activity (alone, or with help), and the behavior of the child in the session as well as the behavior of the carer.
- Correct handling techniques were used to inhibit spasticity, abnormal reflex, and abnormal movement pattern and to facilitate normal muscle tone, movement pattern. The

families received advices on correct handling technique that could lead to greater independence at home.

- Families received information about their child's disability in a simple and honest way with emphasis on the positive aspects of the child as well as support from other parents. Any difficulties encountered by the families were discussed and the activities were adapted according to the child needs
- Low cost adapted chairs and other adapted equipment were suggested to the parents.

Third stage: Post assessment after the end of a full year training.

Statistical analysis

The Microsoft Office Excel program was used for the figures. SPSS was used to assess any statistical difference before and after intervention .

Limitation of the Study:

first, a control group was not possible for ethical reasons , as all potential children were identified and none could be denied the accessibility to available service or placed on a 'waiting list' or other tactic to establish a control group. Second, sample sizes decreased are small due to number of drop out during the application of the intervention program that extended for one year intervention.

Results

This study aimed to evaluate the effects of early intervention program on children with cerebral palsy (CP). Thirty eight children fulfilled the inclusion criteria of the study. Only 15 continued the whole intervention training year and the remaining 23 were drop-outs. The fifteen children were (5 males, 10 females; mean age 33.2 months, age range15 months-58 months) table (4)

Table (4): Children's mean age, gender, and type of CP

	Mean age (Mon)	Spastic quadriplegia	Spastic Diplegia	Hemiplegia	Hypotonia	total
Male	24.2		2	2	1	5
Female	34.2	4	4	2	-	10
Total	33.2	4	6	4	1	15

Types of motor disorder were as follows: Spastic Quadriplegia (n=4); Spastic Diplegia (n=6); Hemiplegia (n=4), and Hypotonia (n=1). The children received a mean of 43 Sessions, in individual format. Most of the sessions addressed gross motor, fine motor, and self care.

Table(5): children's age in month at time of entry to the program and at the end of the program, type of Cerebral palsy and their level of mental disability

children's number	Age at the start of program (month)	Age at the end of program (month)	N=0 of session received	Type of CP	Level of mental disability
1	34	46	32	Rt Hemiplegic CP	Mild
2	15	27	40	Spastic Quadriplegic	Moderate
3	21	33	48	Spastic Diplegia	Mild
4	46	58	36	Rt Hemiplegic CP	Mild
5	58	70	48	Spastic Diplegia	Mild
6	12	24	48	Hypotonic CP	Moderate
7	45	57	48	Spastic Quadriplegic	Mild
8	51	63	40	Rt Hemiplegia CP	Moderate
9	35	47	36	LT Hemiplegia CP	Mild
10	22	34	42	Spastic Quadriplegic	Mild
11	20	32	48	Spastic Diplegia	Moderate
12	36	48	48	Spastic Quadriplegic	moderate
13	48	60	42	Spastic Diplegia	mild
14	20	32	48	Spastic Diplegia	moderate
15	36	48	42	Spastic Quadriplegic	moderate

Effect of early intervention on gross motor development

Effect on GMFCs

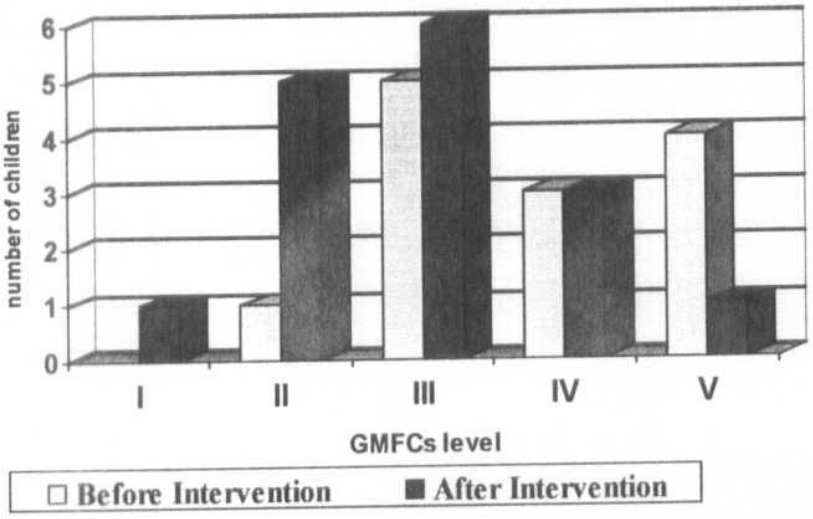
Participants were distributed across the following Gross Motor Function Classification levels at the time of enrollment in the program. 6.6% of children were in level II, 26.6% were in level III, 26.6% were in level IV, and 40% were in level V. At the end of intervention,

It was found that the GMFCs was as follow: 6.6% were in level I, 33.3% were in level II, 40% are in level III, 20% were in level IV, and 6.6% were in level V. It was found that the GMFCs have moved from the least independent motor function (level V) to the most Independent motor function (level I) denoting child function improvements by the end of intervention year (able 6) (fig 9). Only one child was in level V compared to 6 children before intervention.

Table (6): The distribution of children by type of CP on the GMCFs before and after intervention

Level of GMFCs	I		II		III		IV		V	
	Before	After	Before	After	Before	after	Before	After	Before	After
Spastic quadriplegia				1	1	1	1	1	2	1
Spastic Hemiplegia		1	1	1	1	3	2			
Spastic Diplegia				2	2	2		2	4	
Hypotonic				1			1			
Total n=15 (100%)	0 (0%)	1 (6.6%)	1 (6.6%)	5 (33.3%)	4 (26.6%)	6 (40%)	4 (26.6%)	3 (20%)	6 (40%)	1 (6.6%)

Fig 9: GMFCs level for children before and after intervention



Effect on gross motor development rate

All the children made gains in gross motor score (range +3 to +19). The gross motor developmental rate (Gross motor developmental age / chronological age) increased in about 80 % of cases after intervention, this means that the gross motor developmental age increased parallel with the chronological age regardless of the process of maturation as shown in (Fig 10, 11).

Only one child in this group gained less. The effect of early intervention is indicated by a significant difference between pre-post test means of the raw score (df 14 t –7.68, $p>0.001$). All the 15 children attending early program

intervention program gained skills and their raw score increased. To determine if the rate of development was affected by early intervention, Proportional Change Indices, PCI, were calculated. 80% of children showed a PCI above 1.00, indicating a gain in developmental rate during the early intervention program, while 20% of the children PCI were below 1.00, indicating a decline in developmental rate over the 12-months study (Table 6).

Fig(10) Gross motor developmental age before and after intervention

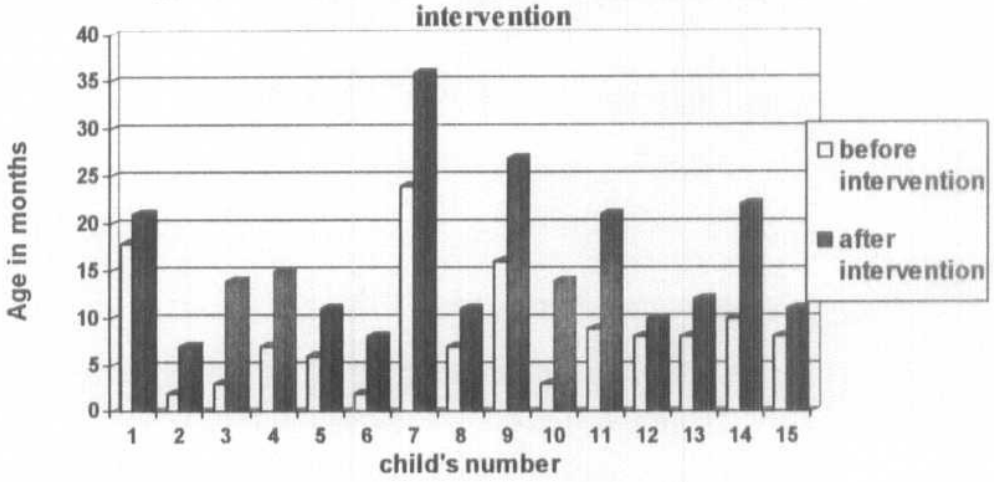


Fig (10): shows increases in the developmental age in gross motor area after intervention as compared to developmental age before intervention

Table (7): Gross Motor pre intervention and post intervention raw score, developmental age, developmental rate, and change index

PATIENT'S NUMBER	1 HEMI	2 QUAD	3 DIP	4 HEMI	5 DIPL	6 HYPO	7 QUAD	8 HEMI	9 HEMI	10 DIPL	11 DIPL	12 QUAD	13 DIPL	14 DIPL	15 QUAD
Chronological age - Pre –intervention	34	15	21	46	58	12	45	51	35	22	20	36	48	20	36
- Post- intervention	46	27	33	58	70	24	57	63	47	34	32	48	60	32	48
Raw score - Pre-intervention	33	5	8	16	15	5	38	16	31	9	21	19	19	22	19
- Post- intervention	39	16	29	30	24	18	43	24	39	28	35	22	26	36	24
- Gain	6	11	11	14	9	13	5	8	8	19	14	3	7	14	5
Developmental age - pre-intervention	18	2	3	7	6	2	24	7	16	3	9	8	8	10	8
- post- intervention	23	7	14	16	11	8	36	11	25	14	21	10	12	22	11
Age differential - pre- intervention	- 16	- 13	- 18	- 39	- 2	- 10	- 21	- 44	- 19	- 19	- 11	- 28	- 40	- 10	- 25
-post intervention	- 23	- 20	- 19	- 42	- 59	- 16	-21	- 52	- 22	- 20	- 11	- 38	- 48	-10	- 37
Developmental rate - pre-intervention	0.52	0.13	0.14	0.15	0.1	0.16	0.53	0.13	0.45	0.13	0.45	0.22	0.16	0.5	0.22
- post-intervention	0.52	0.28	0.42	0.27	0.16	0.33	0.6	0.18	0.53	0.41	0.65	0.2	0.2	0.6	0.22
PCI**	1	2.15	3	1.8	1.6	2	1.1	1.3	1.1	3	1.4	0.9	1.2	1.2	1

**Proportional change indices rate of development during intervention / rate of development before intervention

Pre-post test means of the raw score (df 14 t –7.68, p>0.001).

Fig(11): Gross motor developmental rate before and after intervention

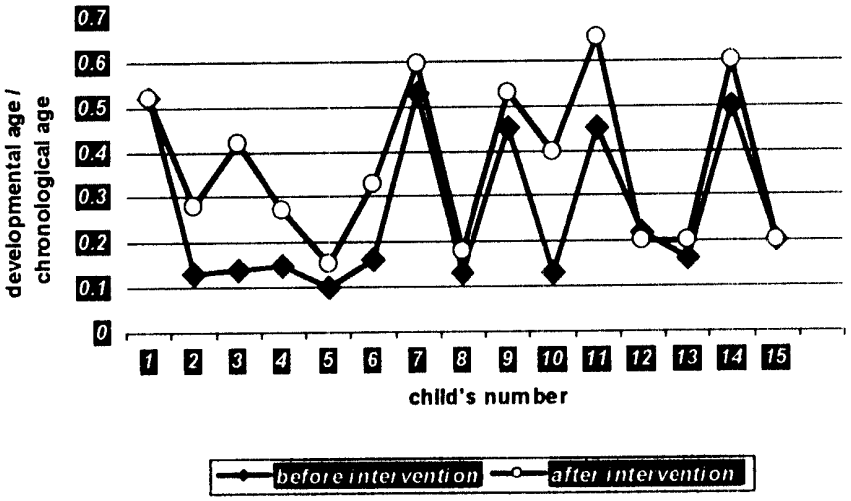


Fig (11) shows increases in the developmental rate in gross motor area after intervention as
compared to before intervention especially in children numbers 2, 3, 4,10, 11

Effect of early intervention on fine motor development

All the children made gains in fine motor (range +6 to +19). The fine motor developmental rate (Fine motor Developmental age / Chronological age) increased in 100 % of cases after intervention which means, that the fine motor developmental age increased Parallel to the chronological age regardless the process of maturation as shown in fig (12,13).

There is a significant difference between pre-post test means of the raw score. All the 15 children attending early

program intervention program gained skills and their score increased. (Table7). All children showed a PCI above 1.00, indicating a gain in developmental rate over the 12-months early intervention sessions. The developmental rate in the domain of fine motor increased in 100 % of the children enrolled in the intervention.

Table (8): Fine motor pre intervention and post intervention raw score, developmental age, Developmental rate, and change index

CHILD 'S NUMBER	1 HEMI	2 QUAD	3 DIPL	4 HEMI	5 DIPL	6 HYPO	7 QUAD	8 HEMI	9 HEMI	10 DIPL	11 DIPL	12 QUAD	13 DIPL	14 DIPL	15 QUDR
Chronological age															
- pre- intervention	34	15	21	46	58	12	45	51	35	22	20	36	48	20	36
- post- intervention	46	27	33	58	70	24	57	63	47	34	32	48	60	32	48
Raw score															
- Pre-intervention	18	6	16	15	21	2	26	17	15	16	18	13	15	18	15
- Pos-intervention	24	18	28	24	32	14	38	34	34	28	25	23	32	25	25
- Gain	6	12	12	9	11	12	12	17	19	12	7	10	17	7	10
Developmental age month															
- pre-intervention	15	4	11	11	18	1	23	14	17	11	12	8	17	12	9
- post-intervention	24	11	29	24	31	10	39	34	34	29	24	22	32	24	24
Age differential															
- pre- intervention	- 19	- 11	- 10	- 22	- 27	- 11	- 22	- 37	- 18	- 11	- 8	- 28	-31	-8	-27
- post- intervention	- 22	- 16	- 4	- 34	- 39	- 14	- 18	- 29	- 13	- 5	- 8	- 26	- 28	- 8	- 24
Developmental rate															
pre-intervention	0.4	0.2	0.5	0.2	0..3	0.1	0..5	0..3	0..5	0..5	0.6	0..2	0.4	0.6	0..3
post-intervention	0.5	0.4	0.9	0.4	0.4	0.4	0.7	0.6	0.7	0..9	0.8	0..5	0..5	0.8	0..5
PCI**	1. 25	2	1. 8	2	1..3	4	1.4	3	1.4	1. 8	1..3	2..5	1. 25	1..3	1. 6

**Proportional change indices rate of development during intervention / rate of development before intervention

Pre-post test means of the raw score (df 14, t –11.8, p>0.001).

Fig(12): Fine motor developmental age before and after intervention

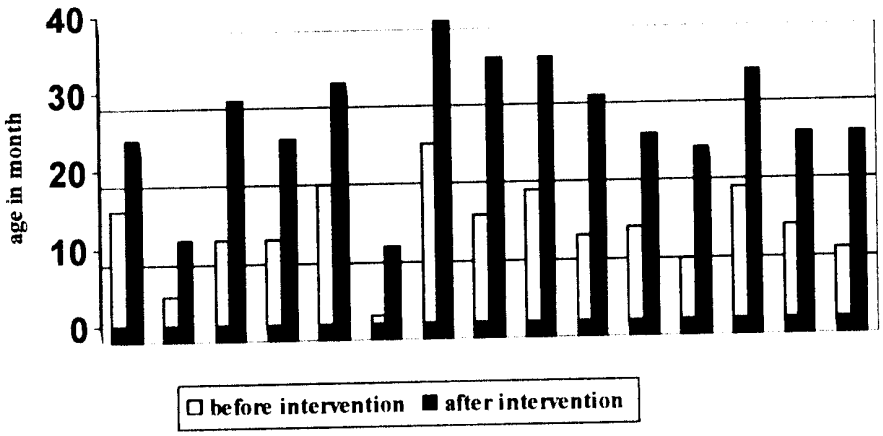


Fig (12) shows increases in the developmental age in fine motor domain after intervention compared to before intervention in all children

Fig(13): Fine motor developmental rate before and after intervention

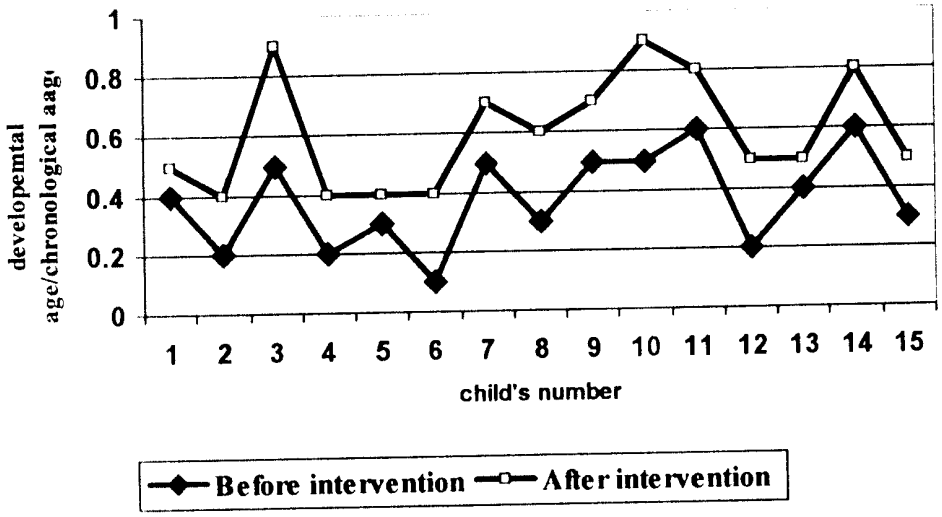


Fig (13) shows increases in the developmental rate in fine motor domain after intervention compared to before intervention in all children

Effect of early intervention on the self help development of children with cerebral palsy

All the15 children made gains in self help skills and their raw score increased (range +7 to +28). The self help developmental rate (self help Developmental age / Chronological age) increased in about 93.3 % of cases after intervention which means, that the fine motor developmental age increased Parallel to the chronological age regardless the process of maturation as shown in fig (14,15). Only one child in this group gained less

The effect of early intervention is indicated by a significant difference between pre-post test means of the raw score (df 14, t –10.14, p>0.001). (Table 8), 53.3% of children showed a PCI above 1.00, indicating a gain in developmental rate over the 12-month early intervention treatment. One child (6.6%) showed a PCI less than one, and 6 children (40%) showed a PCI 1.00.

Fig 14: Self help developmental age before and after intervention

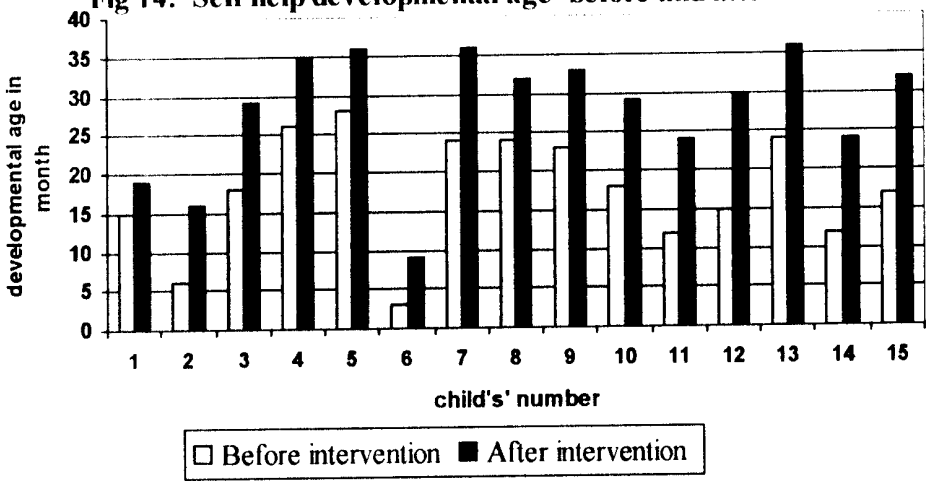


Fig (14) shows increased in the developmental age in self help domain after intervention

Table (9): Self Help pre intervention and post intervention raw score, developmental age, developmental rate, and change index

CHILD'S NUMBER	1 HEMI	2 QUAD	3 DIPL	4 HEMI	5 DIPL	6 HYPO	7 QUAD	8 HEMI	9 HEMI	10 DIPL	11 DIPL	12 QUAD	13 DIPL	14 DIPL	15 QAUD
Chronological age															
- pre- intervention	34	15	21	46	58	12	45	51	35	22	20	36	48	20	36
- post intervention	46	27	33	58	70	24	57	63	47	34	32	48	60	32	48
Raw score															
Pre- intervention	14	6	19	27	33	3	25	25	24	20	13	16	25	13	18
Post- intervention	21	17	35	49	51	10	52	39	41	35	25	37	52	25	39
Gain	7	11	16	22	18	7	27	14	17	15	12	21	27	12	21
Developmental age (month)															
- pre-intervention	15	6	18	26	28	3	24	24	23	18	12	15	24	12	17
- post- intervention	19	16	29	35	36	9	36	32	33	29	24	30	36	24	32
Age differential															
- pre- intervention	- 9	- 9	- 3	- 20	- 30	- 9	- 21	- 27	- 13	- 4	- 8	- 21	- 24	- 8	-19
- post- intervention	- 27	- 11	- 4	- 23	- 34	- 15	- 21	- 31	- 14	- 5	- 8	- 18	- 24	- 8	- 16
Developmental rate															
- pre-intervention	0.44	0.4	0. 85	0. 6	0. 48	0. 3	0. 5	0 .47	0. 65	0. 8	0. 6	0.4	0. 5	0. 6	0.47
- post- intervention	0. 43	0. 6	0.9	0. 6	0.5	0.4	0. 6	0. 5	0.7	0. 85	0.75	0. 6	0. 6	0.75	0. 66
PCI**	0.9	1.5	1	1	1	1. 3	1. 2	1	1	1	1. 25	1..5	1. 2	1. 25	1. 4

**Proportional change indices rate of development during intervention / rate of development before intervention

Pre-post test means of the raw score (df 14, t –10.14, p>0.001)

Fig(15): Self help developmental rate before and after intervention

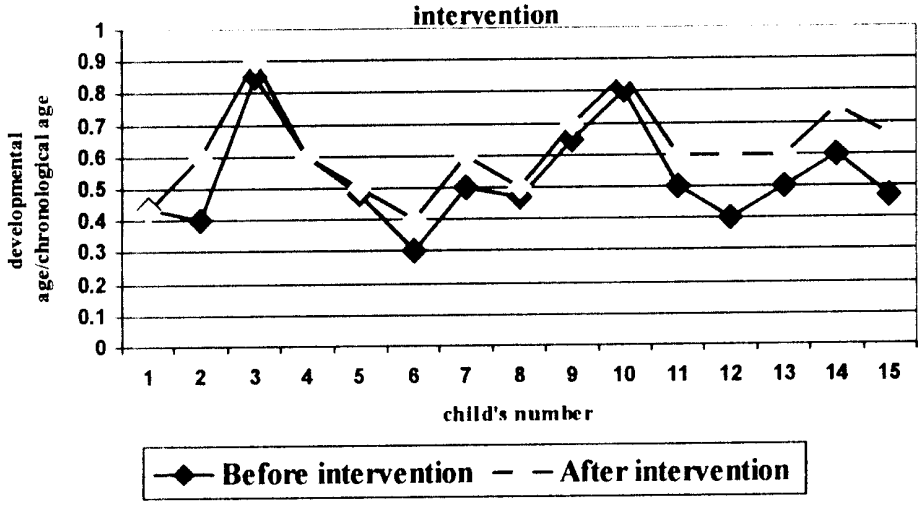


Table (10) Relationship between number of sessions and skills gained in gross motor, fine motor, self help skills.

Skills Gain in different domains	40 sessions and less n= 5	More than 40 session n= 10
Gross motor		
=< 10 skills	3 (60%)	5 (50%)
> 10 skills	2(40%)	5 (50%)
Fine motor		
=< 10 skills	2 (40%)	4 (40%)
> 10 skills	3 (60%)	6 (60%)
Self help		
=< 15 skills	3 (60%)	4 (40%)
> 15 skills	2(40%)	6 (60%)

There was no significant relationship between the number of sessions given and skills acquisition in gross motor (p=0.714), fine motor (p=1), and self help skills (p=0.460).

Relationship between skills gained in different domains and type of CP

Gross motor gain was least in children with spastic quadriplegia and highest in children with hypotonic and diplegic CP. Fine motor gain was high in children with hemiplegic CP followed by children with hypotonic and diplegic CP. Self help skills gain was more in children with diplegic and hemiplegic CP and less in children with quadriplegic CP(Table 9) .

Table (11): relationship between type of CP and skills gained in the 3 domains

	Hypotonic Mean (SD)	Hemiplegia Mean (SD)	Diplegia Mean (SD)	Quadriplegia Mean (SD)
Gross motor	13	9(3.4)	12(4.27)	6(3.4)
Fine motor	12	12(6.2)	11(3.7)	11(1.1)
Self help	7	16(6.2)	20(6.6)	15(5.57)

NB: no SD in column 1 as only one case have hypotonia

Relationship between age of the children at the start of the program and skills gained in the targeted domains (gross motor, fine motor, and self help)

A relationship was found between the younger the age at which intervention begin and gross motor gains. A significant difference in gross motor gains was found in children who started intervention below 2 years and those who started above 2 years in favor for children who started intervention before 2years (table 10).

On the other hand, a significant difference in self help skills in children who started intervention above 2 years and those who started below 2 years in favor for the children who stared after 2 years(Table 10)

Table (12): relationship between the age of the children at the start of the program and skills gained

	<=2 years n=(6)	> 2 years n= (9)	P value
Gross motor **			
Mean gains (SD)	13.6 (2.94)	7.2 (3.1)	0.002**
=<10 skills	-	8 (89.9)	0.001**
> 10 skills	6 (100%)	1 (11.1)	
Fine motor			
Mean gains (SD)	10.33 (2.5)	12.3 (4.3)	0.3
=<10 skills	2 (33.3%)	4 (44.4%)	0.6
> 10 skills	4 (66.7%)	5 (55.6%)	
Self help **			
Mean gains (SD)	12.1 (2.94)	19.3(6.3)	.000**
=< 15 skills	5 (83.3%)	2 (22.2%)	0.02*
>15 skills	1 (16.7%)	7 (77.8%)	

* Significant ** highly significant

Parenting stress index (PSI) and its 2 subscales

Table (13): Parent stress total score, child domain total score and parent domain total score by type of CP and the GMFCs

Type of CP	GMFCs level		parent stress total score		child domain total score		parent domain total score	
	Before	After	Before	After	Before	After	Before	After
Rt hemiplegic CP	II	I	243	213	107	93	136	120
Spastic Quadriplegia	IV	III	337**	307**	156**	137**	181**	170**
diplegic CP	V	III	193	185	103	100	90	85
Rt hemiplegic CP	IV	III	210	191	108	101	102	90
spastic diplegia	V	IV	262**	240	107	103	155**	137
hypotonic CP	III	II	285**	256	113	101	172**	155**
spastic quadriplegia	III	II	254	227	102	93	152	134
Rt hemiplegia CP	IV	III	211	193	107	101	104	92
LT hemiplagia CP	III	II	243	213	107	93	136	120
spastic diplegia	V	III	196	185	103	100	93	85
spastic diplegia	III	II	193	185	103	100	90	85
spastic quadriplegia	V	V	360**	349**	155**	139**	205**	210**
spastic diplegia	V	IV	261	231	107	94	154	137
spastic diplegia	III	II	193	185	103	100	90	85
spastic quadriplegia	V	IV	309**	297**	145**	135**	164**	162**

** Significant score

Effect of early intervention on parenting stress index and its subscales

Table (14): Percentages of parents recorded significant score on the parents stress index and its Subscale before and after intervention

Items	Before intervention (total n=15)	After intervention (total n=15)
Total parental stress score	6 (40%)	3 (20%)
Child domain total score	3 (20%)	3 (20%)
Parent domain total score	6 (40%)	4 (26.7%)
Child domain total score		
- Adaptability	2 (13.3%)	2 (13.3%)
- Acceptability	15 (100%)	7 (46.7%)
- Demandingness	4 (26.7%)	4 (26.7%0
- Child mood	2 (13.3%)	2(13.3%)
- Distractibility	0	0
- Reinforcement of parents	6 (40%)	6 (40%)
Parent domain total score		
- Depression	4 (26.7%)	3 (20%)
- Attachment	7 (46.7%)	4 (26.7%)
- Restriction of role	7 (46.6%)	7 (46.6%)
- Sense of competence	4 (26.7%)	3(20%)
- Social isolation	7 (46.7%)	4 (26.7%)
- Relation with spouse	2 (13.3%)	2 (13.3%)
- Parent's health	3(20%)	3(20%)

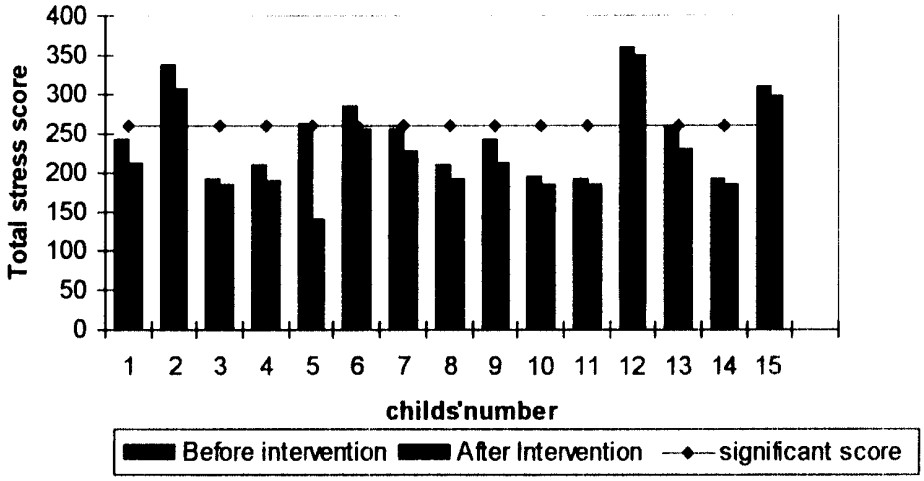
Total PSI score and PRD score and CRD score

It was found that 40% (6) of parents had a significant total stress score before intervention, half of whom (3) have children who are spastic quadriplegia, and their GMFCs were IV and V. After intervention only 20% (3) recorded significant score (all had spastic quadriplegic children) (fig 16).

Child related domain stress score were above the clinical cut off in 20% of parents (all the parent had children who had spastic quadriplegia and remained the same after intervention (fig 17).

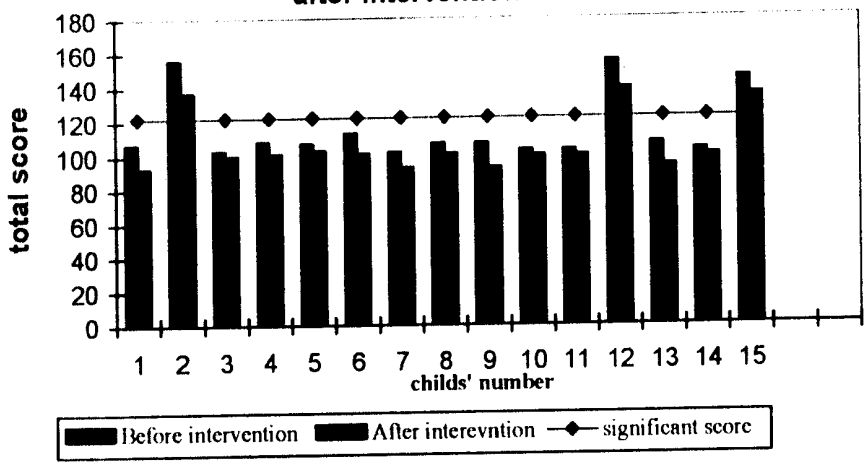
27% of parents (4) recorded significant score in the parents' related domains compared to 13% after intervention (all are parents of spastic quadriplegic child) (fig 18).

Fig (16) Total parenting stress score before and after intervention



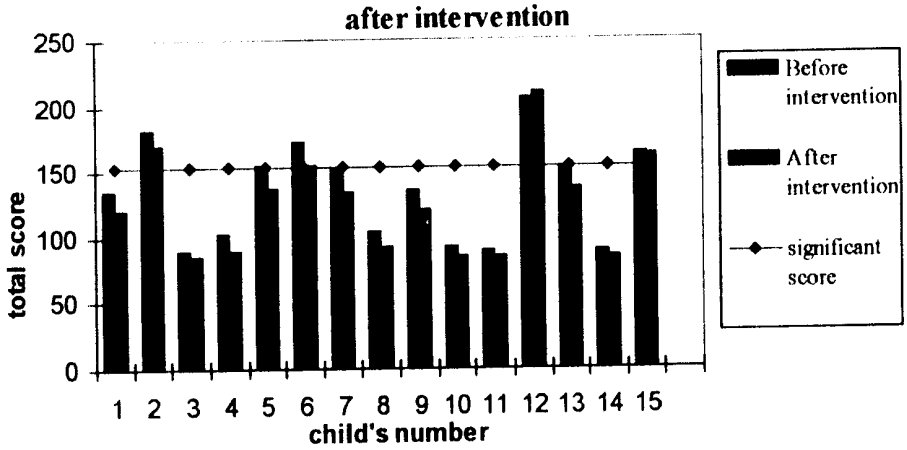
The graph shows a decrease in the total stress score after intervention compared to before intervention, although it remained above the clinical cutoff point in 3 cases.

Fig(17) : Total child domain stress score before and after intervention



The graph shows a decrease in the total child domain stress score after intervention compared to before intervention, although it remained above the clinical cutoff point in 3 cases

Fig (18): Parent domain total stress score before and after intervention



The graph shows a decrease in the parent related domain total stress score after intervention compared to before intervention. Although the score remained above the significant cut point in 4 cases, but it decreased in all cases.

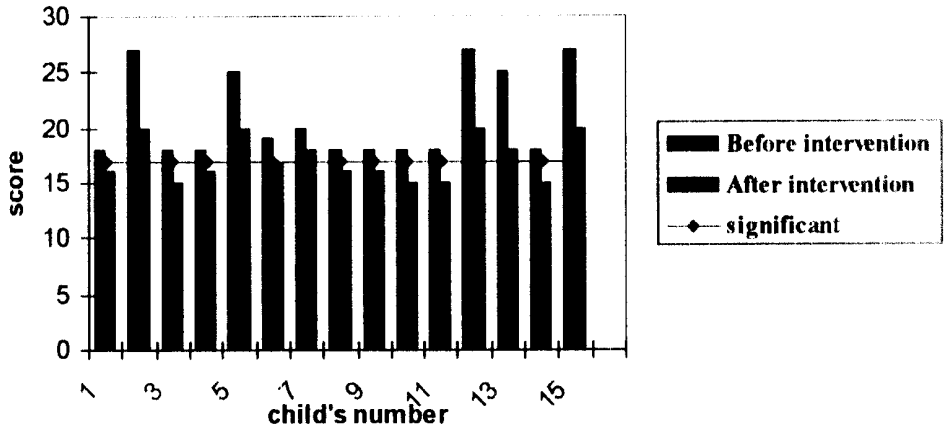
As regards child related domain (CRD) subscales

All of parents reported significantly high scores on the sub-scale of *"acceptability" (which addressed the impact of the child mental and physical and emotional features on the parent's acceptance)* compared to 46% of parents after intervention (fig 19).

Four (27%) of parents reported a significant score above the clinical cutoff in the subscale "demandingness" these were parents of a spastic quadriplegic child and remain the same after intervention (fig 20).

Only 2 cases (13%) reported significant score on the subscale of *"child mood"* and remained the same after intervention. No one reported significant score on the subscale *"distractibility"*.

Fig(19): Parental acceptibility for the child before and after intervention



The graph shows a decrease in the subscale of acceptability of the child by the parent after intervention compared to before intervention. Although the score decreased in all cases, but still 6 cases were above the significant cut point.

Fig (20): Child demandigness before and after intervention

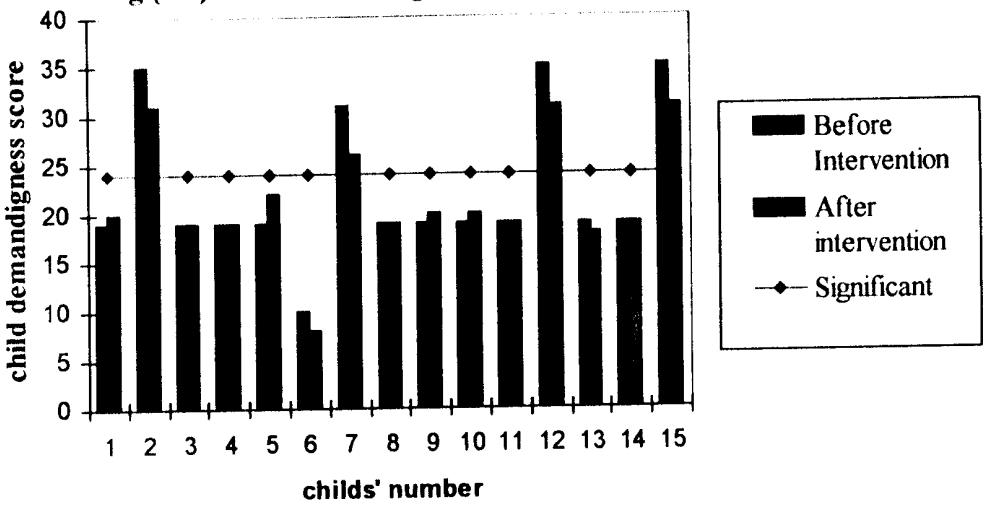


Fig (20) shows a decrease in the score of "child demandigness" after intervention compared to before intervention, but still above the significant score for 4 cases.

Fig (21): Child reinforcement of parent before and after intervention

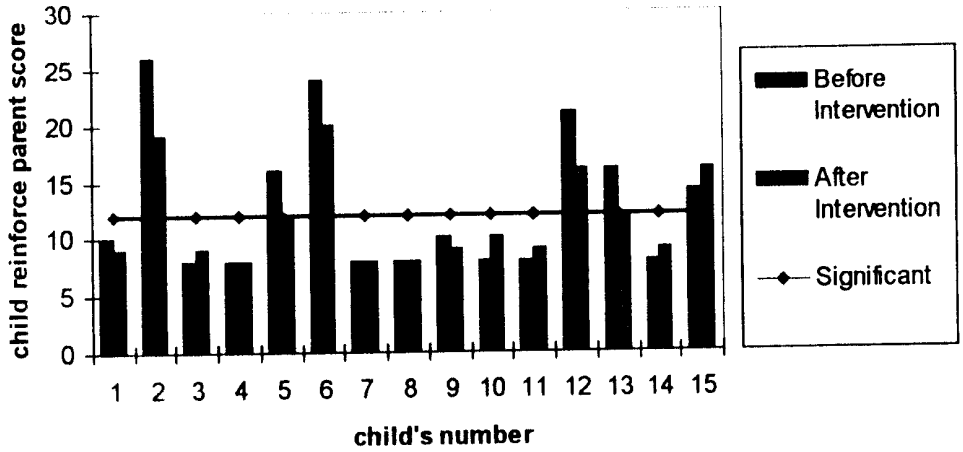


Fig (21) shows a decrease in the score of "child reinforce parent" after intervention compared to before intervention in 6 cases and remained constant in 3 cases. Six cases still

remained above the significant score after intervention, five of whom had a slight increase in the score after intervention and one case remained above the significant score.

As regards Parent Related Domain (PRD) subscales

Forty seven (47%) of parents (7) had a significant score above the clinical cutoff in the subscale of "attachment" compared to 27% (4) after the intervention (fig 22).

About *27% of parents (4) reported a significant score in the subscale of "depression"* compared to 20 %(3) after the intervention (fig 23).

About 47% of parents (7) reported significant score on the subscale of "restriction of role "before intervention and remained the same after intervention (fig 24).

As regards the subscale of "social isolation", 27% of parents (4) reported significant score after intervention compared to 47% (7) before intervention (fig 25).

About 27% of parents (4) reported significant score above the clinical cut off point in the subscale of "sense of competence "before intervention compared to 20 %(3) reporting significant score after intervention (fig 26).

Parent health and relationship with spouse did not change before and after intervention.

Fig (22) Parent attachment before and after Intervention

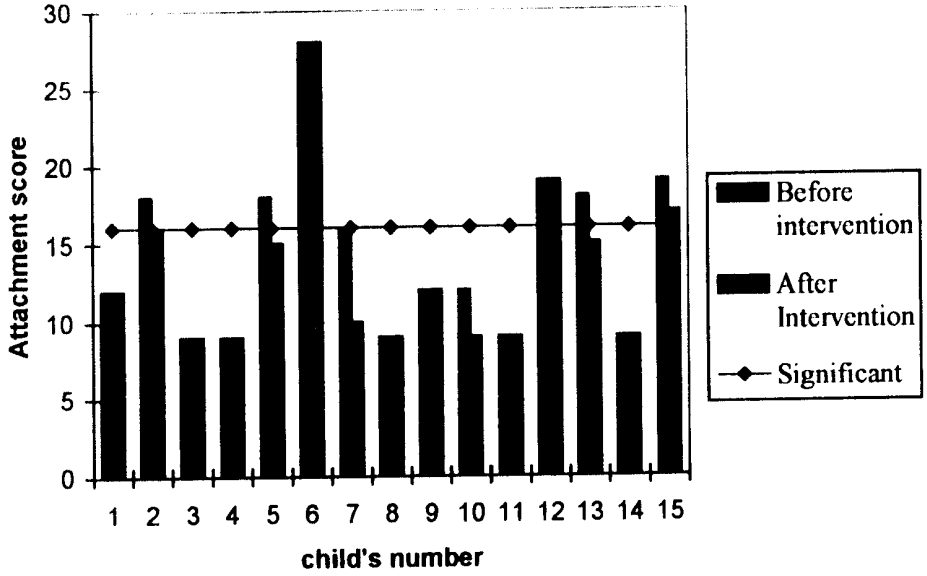


Fig (22) shows a decrease in the score of parental attachment after intervention compared to before intervention in 5 cases and the score remained constant in 9 cases. Only 4 cases still remained above the significant score after intervention

Fig(23): Parent depression before and after ntervention

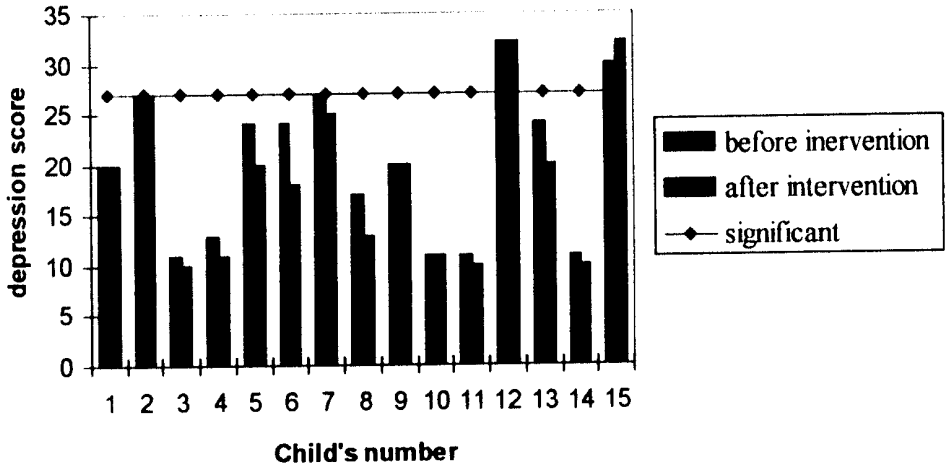


Fig (23) show a decrease in the score of parent depression after intervention compared to before intervention in 9 cases and remained constant in 5 cases. Three cases still remained above the significant score after intervention. One case had increase in the score after intervention.

Fig (24)Restrictions of parental role before and after intervention

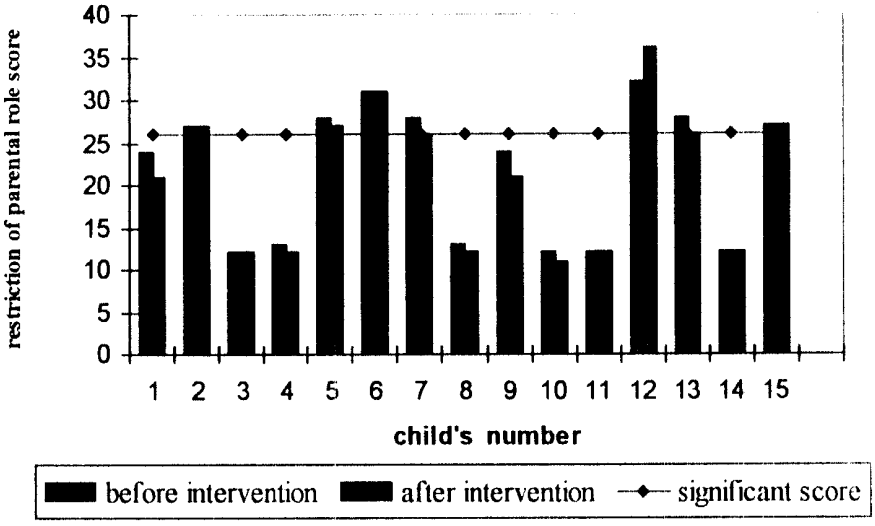


Fig (24) shows a decrease in the score of restriction of parental role after intervention compared to before intervention in 7 cases and remained constant in 6 cases. Seven cases still remained above the significant score after intervention. One case showed an increase in the score after intervention.

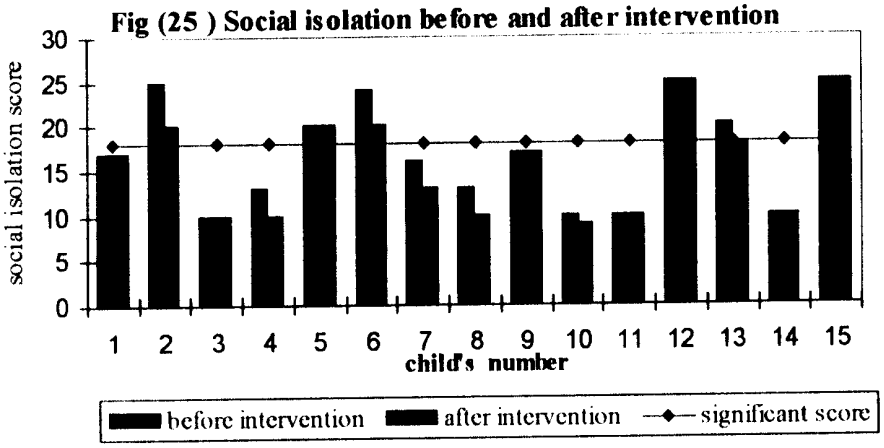


Fig (25) shows a decrease in the score of social isolation after intervention compared to before intervention in 7 cases and remained constant in 8 cases. Six cases still remained above the significant score after intervention.

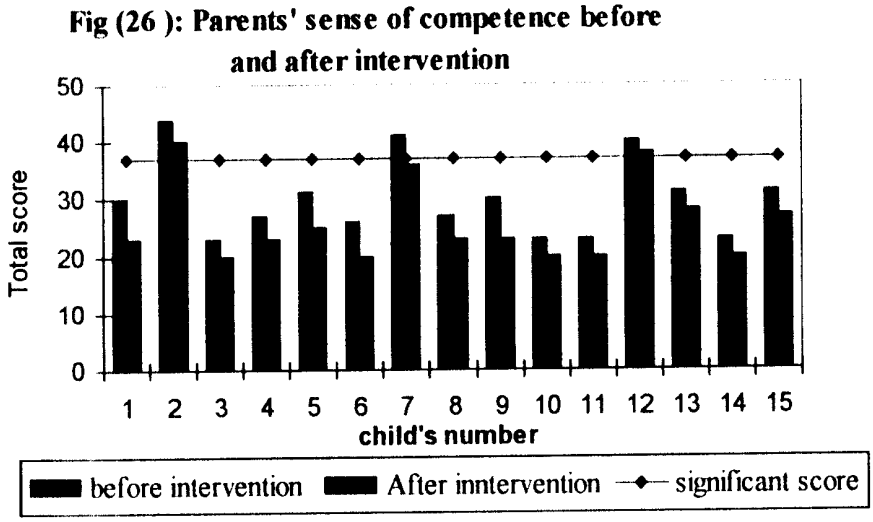


Fig (26) shows a decrease in the score of parent's sense of competence after intervention compared to before intervention in all cases. Two cases still remained above the significant score after intervention.

Relationship between degree of disability and parenting stress score and its subscales (table13)

Using X2 showed a significant (X2=0.02) relationship between severity of disability and total parental score before intervention but it was insignificant after intervention.

There was no significant relationship between severity of disability and the child domain total score and remained insignificant after intervention

There was a significant relationship(X2=0.02) between severity of disability and parent domain total score and it was insignificant after intervention.

There was a significant relationship(X2=0.02) between severity of disability and child reinforces parents which it became highly significant(X2=0.004 after intervention.

There was a significant relationship(X2= 0.02) between severity of disability and parents reported social isolation. Then it became highly significant(X2=0.004) after intervention.

A significant relationship after intervention between severity of disability and "restriction of role" was found although it was insignificant before intervention.

Table (15): Relationship between degree of disability and parenting stress score and its subscales

Items	Before intervention		P	after intervention		P
	Mild – moderate Disability (I,II,III) n= (%)	Severe disability (IV,V) Total n=o (%)		Mild – moderate Disability (I,II,III) n=o (%)	Severe disability (IV,V) n=o (%)	
total parental stress score	0 (0%)	6 (60%)	0.02*	1 (9.1%)	2(50%)	0.08
Child domain total score	0 (%)	3 (30%)	0.171	1 (9.1%)	2(50%)	0.08
Parent domain total score	0 (%)	6 (60%)	0.02*	2 (50%)	2(50%)	0.2
child domain total score						
- Adaptability	0(0%)	2(20%)	0.28	0 (0%)	2(50%)	0.012*
- Acceptability	15(100%	10(100%)		3(27.3%)	4(100%)	0.013*
-Demandingness	1(20%)	3(30%)	0.68	2(50%)	2(50%)	0.21
- Child mood	0(0%)	2(20%)	0.283	2(18.2%)	0(0%)	0.36
- Distractibility	0(0%)	0(0%)		0(0%)	0(0%)	
- Reinforcement of parents	0(0%)	6(60%)	0.02*	2(18.2%)	4(100%)	0.004*
Parent domain total score						
- Depression	1(20%)	3(30%)	0.68	1(9.1%)	2(50%)	0.08
- Attachment	1(20%)	6(60%)	0.14	2(50%)	2(50%)	0.2
- Restriction of	1(20%)	6(60%)	0.14	3(27.3%)	4(100%)	0.013*
- Sense of competence	1(20%)	2(20%)	1	1(9.1%)	1(25%)	0.423
- Social isolation	0(0%)	6(60%)	0.02*	2(18.2%)	4(100%)	0.004*
- Relation with spouse	0(0%)	1(10%)	0.4	0(0%)	1(25%)	0.08
- Parent's health	0(0%)	3(30%)	0.17	2 (18.2%)	1 (25%)	0.77
Total n=0	5(33.3%)	10(66.7%)		11(73.3%)	4(26.7%)	

Relationship between total parenting stress score, parent domain total score and child domain total score between

A highy significant relationship(X2=0.000) between parental total score and child domain total score was found after intervention, and it was significant as well (X2=0.01) before intervention.

A highly significant relationship(X2=0.000) between parental total score and parents related domain before intervention and became highly significant (X2=0.001)

Relationship between parent attachment and child reinforce parents

A significant relationship was found between parent attachment and "children reinforce parents" (x2=0.001) and remained significant after intervention.

Discussion

Cerebral palsy is a group of non progressive but often changing motor impairment syndromes secondary to lesions or anomalies of brain arising in early stages of its development ***(Koman et al., 2004)***. It is a common neurodevelopmental disorder of childhood with prevalence of 2-2.5 per 1000 live births ***(Stanely et al., 2000)***.

Clinical patterns of involvement described in cerebral palsy include: diplegia (significant leg involvement with little effect on the arms); hemiplegia (involvement of the ipsilateral arm and leg); and quadriplegia (involvement of all four limbs). Movement disorders can coexist with the clinical patterns of involvement, and there can be spasticity, hypotonia, ataxic, athetosis, or a mixture of these disorders ***(Dabney et al., 1997)***.

Early intervention has been defined as a systematic and planned effort to promote development through a series of manipulations of environmental or experimental factors initiated during the first five years of life ***(Paramleen,et al.,2006)***. It is a service designed to meet the developmental needs of children, from birth to 5 years of age, who have a delay in physical, cognitive, communicative, social, emotional or adaptive development or have a diagnosed condition that has a high probability of resulting in developmental delay. The

aim of the service is to enhance the child's development, and to provide support and assistance to the family.

As the rate of human learning and development is most rapid in the preschool years, timing of intervention becomes particularly important when a child runs the risk of missing an opportunity to learn during a state of maximum readiness ***(Bailey, et al., 2004)***.

Disability in a child affects not only the child's life but also the family's life. The parents, other members of the family of the child with disabilities may experience stress.

Although impaired motor function is the hallmark of the CP syndromes, many children also experience sensory, communicative, and intellectual impairments and may have complex limitations in self-care functions such as feeding, dressing, bathing, and mobility. These limitations can result in requirements for long-term care. The family of a young child with disability often feels disappointment, social isolation, added stress, frustration, and helplessness. The compound stress of the presence of a young child with disability may affect the family's well being and interfere with the child development.

The present study investigates the effectiveness of early intervention program on the development of children with

Cerebral Palsy in gross motor, fine motor, and self help skills, as well as assessing the impact of early intervention program on parent stress and parent-child relationship. Children who fulfilled the inclusion criteria were 38. Children whose parents agreed to join the intervention program and had completed the one year period of intervention were 15 in number. Parent signed a written consent before starting the program. (9 males, 6 females; mean age 33 months, age range 15 months to 58 months).

Developmental age and developmental rate before and after intervention were calculated for 3 domains (gross motor, fine motor, self help) using the Portage checklist. Children were classified according to the severity of motor impairment using the Gross Motor Function Classication system (GMFCs). The parenting stress index (PSI) was completed by the 15 mothers of cerebral palsy children at 2 time point, one at the start of the program and the second at the end of one year early intervention.

An individual tailored program was designed for every child following fixed steps: assessment of the child's abilities and skills- needs assessment – putting objectives, long term and short term goals of program- application of the program for at least one year – reassessment- needs assessments …etc. that is to say, the program is an ongoing process .It is designed to be a continuum of services for both child and

parents. It aims at enhancing the child's abilities and making full use of his/her potential, and on the other hand it empowers parents to play a leading role in the live of their children leading to their progress and improvement thus to an independent life on the long run as much as possible.

Children were attending weekly early intervention sessions. Each session was divided into 2 parts: the first was informative and the second was practical. Examples of information were: information about their child's disability, impact of disability on skills acquisition and health, the child present abilities, importance of correct handling and guidelines for carrying out similar routines in their home, referral services available nearby their place of residence, child development, and basic information about different domain of child development and how to stimulate each domain. Examples of practical work carried on: Setting of short term goals for the coming week, activities that stimulate the acquisition of developmental milestones in the targeted domains using the Portage Program and the WHO manual "Stimulation the Development of Cerebral Palsy Children" were practiced with child as a guide for the mother activities, observations of the activities done in the session and comparing it with the activities that should be done in the Portage program according to previous assessment, application of correct handling techniques, and a mother's home work was given to apply during the rest of the week.

Parents' involvement was encouraged throughout the program by participating in planning and evaluating activities and implementing carry over activities at home.

The results support the effectiveness of early intervention program in facilitating the acquisition of skills measured in program contexts by children with cerebral palsy. At the end of the early intervention year a significant difference was found in gross motor, fine motor, and self help skills, thus implying the positive impact of the program.

In gross motor domain, it was found that the GMFCs have moved from the least independent motor function (level V) to the most independent motor function (level I). It meant that the child function improved. Also, 80% of children showed a Proportional Change Indices (PCI) above 1.00, indicating a gain in developmental rate of gross motor function during the early intervention program.

In fine motor domain, all the 15 children attending early program intervention program gained skills and their score increased. Proportional Change Indices (PCI) was above 1.00 in 100% of children, indicating a gain in developmental rate over the 12-months early intervention program.

In self help skills, 60% of children showed a Proportional Change Indices (PCI) above 1.00, indicating a

gain in developmental rate over the 12-month early intervention program.

In the present study, PCI indicate that early intervention program did have a positive impact on developmental rate. The individual results indicate that every child gained skills during early intervention, and means and effect sizes support this interpretation. Also, the gain of early intervention is more obvious in spastic diplegia children. Children with spastic diplegia benefit most from early intervention than spastic quadriplegia according to ***Trahan and Mclaim (1999) and (Adam et al., 2000).***

However, there is an additional component that may have resulted in the gains. Studies have shown that parent training can improve parent–child interaction and relationships, and it is particularly changes in relationships that can affect child development ***(Mahoney et al., 1998)***. In this present early intervention program, parents learned new ways of interacting with them under the supervision of the trainer, and these are very likely to have been transferred to the home setting. It is hypothesized that changed parent–child relationships affected the gains reported in this study. These results agreed with ***(Liberty, 2004)*** who suggested that changes in the parent–child relationship may have interacted with other variables, such as intensity, age, and severity of disability to produce such gains.

Also,*(Bulter and Darrah, 2001)* stated that Parental involvement was the most important aspect in any intervention program because without parental involvement any intervention program was unlikely to be successful.

It had been suggested that program intensity might affect impact ***(Darrah et al., 2003)***. However, in the present study, the number of sessions attended did not appear to have a significant impact on gains. In the light of the developmental framework discussed earlier, the intensity of early intervention would not be the only factor determining early intervention. In the light of the developmental framework, the intensity of early intervention would not be the only factor as intensive therapy would not be needed under all risk and disabilities circumstances. So, the notion of specificity is central to an understanding of contemporary early intervention programs and has important policy implications for providing cost-effective services. As the interactive nature of developmental framework, suggests that the effects of any one stressor are likely to be moderated by the array of existing stressors associated with family characteristics and with a child's biological risk and disability status.

It has been suggested that the younger the age at which intervention has begun, the greater its impact ***(Kozma and Balough, 1995).*** In this study, a significant relationship was found between gains in gross motor skills and the earlier age at

which the program started to start the program before and after 2 years of age. There was a relationship between intervention effectiveness, severity of disability, and age at program entry. For mildly impaired infants, enrollment before the age of 6 months was associated with a significantly better outcome than beginning services at a later age. More severely handicapped children appeared to have a constant rate of improvement regardless of their age at program entry. Children with spastic diplegia walked earlier and more steadily if placed in an early intervention training program (before 9 months of age) compared with those for whom intervention was initiated after 9 months (Kanda et al 1984). As well as, in the absence of early intervention, infants and young children with cerebral palsy used their abnormal tone and retained primitive reflexes to develop atypical movements' patterns that hindered their gross motor development ***(Bobath, 1984).***

A significant relationship was found between skills gain in self help (more than 10 skills) domain and the age of entry in favor of the children enrolled in the program after 2 years. This could be explained that self help skills expanded after 1.5 years and before that, only few self help skills were attained. This was the same case in the normal child development.

Further research should seek to identify characteristics of effective early intervention program for children with cerebral palsy. As regards child and family characteristics , we

would not ,of course ,expect specific program features of an early intervention program to operate with equal effectiveness for children differing in developmental characteristics or children from families varying in terms of resources, family interactions patterns, existing supports, or related factors. Work is needed to understand how severity of disability influences child outcomes and to obtain a better grasp of this construct in terms of its influence on an absolute as well as a relative basis. On the other hand, further research should study the role of parent– child relationships in developmental gains in early intervention.

Early childhood intervention is a dynamic field focused on the enhancement of a child's abilities and development, and the support of a child's family to enable them to adapt to their child's ongoing needs.

It was found that 40% (6) of parents had a significant total stress score before intervention, half of them had children who are spastic quadriplegia, and their GMFCs were IV and V. After intervention only 20 % (3) recorded significant score (all of them had spastic quadriplegic children). The results showed better adaptation among parents who participated in the program. After intervention, these parents had lower level of parental distress as they got more positive perceptions and attitudes concerning their child's disability and their parental situation. They are more confident in their own capabilities,

the surrounding resources and the support they could receive from others.

Maternal depression, sense of incompetence, physical health problems, social isolation, and marital dissatisfaction have been described among families of disabled children ***(Dyson, 1991)***

The Parent Stress Index (PSI) is subdivided into 2 subscales: child related stress scale and parent related stress scale.

Child related stress score were above the clinical cut off in 20% of parents. Those were the parents who had children with spastic quadriplegia and remained the same after intervention. This finding was similar to those found by ***Hanson and Hanline, 1990 and Vijesh and Sukumaran, 2007.*** They stated that parents who had children with severe physical incapabilities experienced more stress. Also, the gain of early intervention was more obvious in spastic diplegia children. Children with spastic diplegia benefit most from early intervention than spastic quadriplegia according to ***Trahan and Mclaim (1999) and (Adam,et al 2000).***

It was found that the score for parenting stress index and its subscales decreased after intervention although it remained significantly above the clinical cut off point in some cases.

This denoted that early intervention could result in improving parents' attitudes as regards themselves and their children. Early intervention not only accelerated child development but also modified predictor-variables of stress in parents of the disabled child e.g. variables related to the disabled child's characteristics, his or her family and social characteristics ***(Thorburn, 1990)***

It was found that 100% of parents recorded significant score on the child related subscales of "acceptability " which addressed the negative impact of the child's mental, physical and emotional features on the parent's acceptance of their child compared to 46% of parents after intervention. These result agreed with ***Hanson, Hanline, 1990*** who found that mothers of children with neurological impairments reported the most stress. Maternal stress for mothers of children with neurological impairments was associated with their children's demamndigness and acceptability. As the parents perception is not directed towards to a medical or clinical condition but towards the ability of their child to perform the daily activities ***(Prashad et al, 1993).*** This finding coincided with ***Bailey et al. in 1998*** who stated that intervention improved parents' understanding about their children's present abilities and future learning and development. Parents saw their children gaining skills during the intervention program. These led parents which in turn lead parents to have more positive attitudes

towards their children and consequently increased parent satisfaction.

About 20% of parents reported significant score in the subscale of "depression" after intervention compared to 27% before intervention. This finding was similar to the finding of a study conducted by ***Küçüker, 2006*** that aimed to assess the parental outcomes of an early intervention program, designed to enhance the development of children from birth to four years old with developmental disabilities through parental training. He found that the depression levels of both parents decreased after the implementation of the program.

One of the advantages of parents' involvement in the intervention program was the change in the parents' sense of competence. They felt more confident about caring for their children. Intervention might improve the parents understanding of how to rearrange the environment and modify the surroundings to stimulate the children and maximize their ability. Also, it provided them with information and skills for training and tutoring their child ***(Garland et al, 1981).***

Parent social isolation decreased after intervention. 26.7 % reported significant score after intervention compared to 46.6% before intervention. As parents had access to help from early intervention program, support from professionals and

others parents having the same condition with similar experience and feelings. They felt more confident in the aid they could receive from others, which made them feel less isolated. However, a significant relationship was found between severity of disability and social isolation and remaining significant after the intervention as children with severe disability posed more challenge to the mothers and more unresolved problems.

A decrease in the percentages of parents reporting significant score in the subscale of "attachment". Early intervention enhances parent- child relationship by teaching parents how to interact with their children and to respond to the unique characteristics of their child and to have a better relationship with their child.

Reinforcement of parents was the same after and before intervention (60%) and a significant relationship was found between severity of disability and 'child reinforce parents". Cerebral Palsy Child with severe disability has communication problems, which in turn hinder the reciprocal interactions between the parent and the child.

It is likely that other factors, such as socioeconomic and educationocultural status , spousal relationships and personel problems play a greater role in determining family difficulties

than did the presence of a child with disabilities ***(Hanson and hanline,1990)***

It seems that the family unit is the key regulating mechanism of child outcomes. Thus, rather than target the child exclusively, interventions and preventive strategies should also target caregivers, who will in turn be able to respond to the unique characteristics of their child, e.g., behaviors, temperament, and functional limitations, in ways that should decrease the impact of their child's disability on them ***(Lambrenos et al., 2006)***

This study has several limitations: first, a control group was not possible for ethical reasons , as all potential children were identified and none could be denied the accessibility to available service or placed on a 'waiting list' or other tactic to establish a control group. Second, sample sizes decreased are small due to number of drop out during the application of the intervention program that extended for one year intervention.

Recommendations

- There is a need to emphasize on the importance of early intervention programs to enhance the development of children with cerebral palsy.
- There is a need for a criterion –referenced tool that assesses the motor function of cerebral palsy children and demonstrate ability and sensitivity. The tools is to evaluate meaningful in Gross motor function in cerebral palsy children. It should not be designed to compare the function of children with cerebral palsy to typically developing children but to focus on the extent of achievement of a variety of gross motor activities.
- GMFCs is a test measure that doesn't require special skills or procedure. So, it can be early incorporated into clinical practice to assign classification level to an individual child and for follow up.
- Practitioners should be aware of the critical role of parent involvement for successful early intervention.
- As early intervention services expand ,the need for early intervention systems to consider family needs and goals in the delivery of services and to view the family as a system and to support them so that the most effective ways of serving not just the child, but children within the context of their families.

Summary

Early intervention was defined as any services designed to improve the cognitive, social /emotional or life skills of handicapped children that began before 66 months of age. Early intervention program prevent the development of secondary disabilities in young children with developmental problems, support the families of young developmentally disabled children so as to enable them to meet the needs of the children as effectively as possible, and /or promote adaptive family functioning.

The present study investigates the effectiveness of early intervention program on the development of children with Cerebral Palsy. As well as assessing the impact of early intervention program on parent stress and parent-child relationship. Thirty eight children fulfilled the inclusion criteria of the study. Only 15 continued the whole intervention training year and the remaining 23 were drop-outs. The fifteen children were (5 males, 10 females; mean age 33.2 months, age range15 months-58 months). Types of motor disorder were as follows: Spastic Quadriplegia (n=4); Spastic Diplegia (n=6); Hemiplegia (n=4), and Hypotonia (n=1). Participants were distributed across the following Gross Motor Function

Classification levels: level I, n=0; level II, n=1; level III, n=4; level IV, n=4; and level V, n=6. Developmental age and developmental rate before and after intervention were calculated for each domain (gross motor, fine motor, self help using the portage checklist. The parenting stress index was completed by the 15 mothers of children with cerebral palsy at 2 time point, one at the entry of the program and the second at the end of one year early intervention. An individual tailored program was designed for every child after assessing the child's abilities and skills

Children were attending weekly early intervention sessions. The sessions include: assessment of the child present abilities, activities that stimulate the acquisition of developmental milestones in the targeted domains using the Portage Program and the WHO manual "Stimulation the Development of Cerebral Palsy Children", Advice were given to carers about correct handling and guidelines for carrying out similar routines in their home. Families received information about their child's disability.

At the end of the intervention, It was found that the GMFCs have moved from the least independent motor function (level V) to the most independent motor function (level I). The children were distributed across the following

Gross Motor Function Classification levels after intervention as following: level I, n=1; level II, n=5; level III, n=6; level IV, n=3; and level V, n=1. It means that the child function improves. About 80% of children showed a Proportional Change Indices (PCI) above 1.00 indicating a gain in developmental rate of gross motor function In fine motor domain, all the 15 children attending early program intervention program gained skills and their score increased. Proportional Change Indices (PCI) was above 1.00 in 100% of children, indicating a gain in developmental rate over the 12-months early intervention program. In self help skills, 60% of children showed a Proportional Change Indices (PCI) above 1.00, indicating a gain in developmental rate over the 12-month early intervention program.

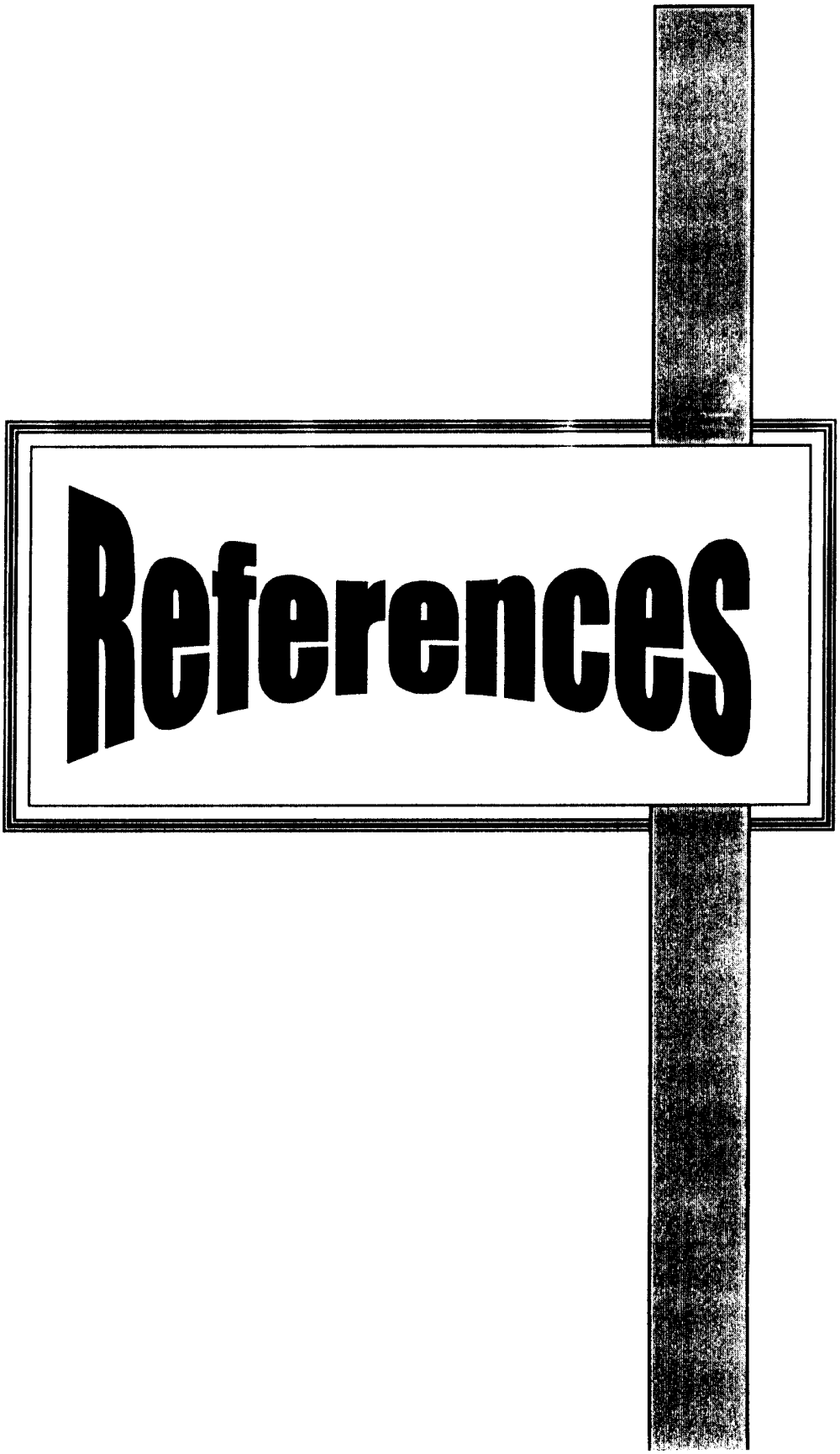
Forty % of parents had a significant total stress score before intervention compared to 20 % after intervention (all of them are spastic quadriplegia with GMFCs lies between level IV and V). Twenty (20%) of parents (all are parents of spastic quadriplegia) had a child related stress score above the clinical cut off before intervention and remain the same after intervention. Twenty seven (27%) of parents recorded significant score in the parents' related domains before intervention compared to 13% (all are parents of spastic

quadriplegic child after intervention. The results showed better adaptation among parents who participated in the program. After intervention, these parents had lower level of parental distress as they got more positive perceptions and attitudes concerning their child's disability and their parental situation. They are more confident in their own capabilities, the surrounding resources and the support they could receive from others.

The results support the effectiveness of early intervention program in facilitating the acquisition of skills measured in the program contexts by children with cerebral palsy. The individual results indicate every child gained skills during early intervention. In addition, Parent training is an additional component that may have resulted in the skills gains. Parent training and participation can improve parent–child interaction and relationships, which can affect child development. In early intervention program, parents learned new ways of interacting with their children as they worked with their children under the supervision of the trainer, and these are very likely to have transferred to the home setting. These change in parent–child relationships affected the gains reported in this study.

On the other hand, early intervention not only accelerates child development but can also modify predictor-variables of stress in parents of a disabled child. Given to the parents' involvement in the intervention program, intervention indirectly benefit children by improving parent- child relationship and reducing the stress the parents experienced in caring for a child with motor disabilities. Early intervention improves the parents understanding of how to arrange the environment to stimulate the children and maximize their ability as well as increase the parents' sense of satisfaction.

In conclusion, we need to emphasize on the importance of early intervention programs to enhance the development of children with cerebral palsy. Also, Practitioners should be aware of the critical role of parent involvement for successful early intervention.



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Annex (1)

The Gross Motor Function Classification System (GMFCs)

This is a recently developed system which has been found to be a reliable and valid system that classifies children with cerebral palsy by their age-specific gross motor activity. The GMFCs describes the functional characteristics in five levels, from I to V, level I being the mildest in the following age groups: up to 2 yrs, 2 - 4 yrs, 4 - 6 years and between 6 to 12 years. For each level, separate descriptions are provided. Children in level III usually require orthoses and assisting mobility devices, while children in level II do not require assisting mobility devices after age 4. Children in level III sit independently, have independent floor mobility, and walk with assisting mobility devices. In level IV, affected children function in supported sitting but independent mobility is very limited. Children in level V lack independence even in basic antigravity postural control and need power mobility.

Gross motor Function Classification System for cerebral palsy is based on self-initiated movement with particular emphasis on sitting (truncal control) and walking. When defining a 5 level **Classification** System, our primary criterion was that the distinctions in **motor function** between levels must be clinically meaningful. Distinctions between levels of **motor function** are based on functional limitations, the need for assistive technology, including mobility devices (such as walkers, crutches, and canes) and wheeled mobility, and to much lesser extent quality of movement. Level I includes

children with neuromotor impairments whose functional limitations are less than what is typically associated with **cerebral palsy**, and children who have traditionally been diagnosed as having "minimal brain dysfunction" or "**cerebral palsy** of minimal severity". The distinctions between Levels I and II therefore are not as pronounced as the distinctions between the other Levels, particularly for infants less than 2 years of age. The focus is on determining which level best represents the child's present abilities and limitations in **motor function**. Emphasis is on the child's usual performance in home, school, and community settings. It is therefore important to classify on ordinary performance (not best capacity), and not to include judgments about prognosis. Remember the purpose is to classify a child's present **gross motor function**, not to judge quality of movement or potential for improvement. The descriptions of the 5 levels are broad and are not intended to describe all aspects of the **function** of individual children. For example, an infant with hemiplegia who is unable to crawl on hands and knees, but otherwise fits the description of Level I, would be classified in Level I. The scale is ordinal, with no intent that the distances between levels be considered equal or that children with **cerebral palsy** are equally distributed among the 5 levels. A summary of the distinctions between each pair of levels is provided to assist in determining the level that most closely resembles a child's current **gross motor function**. The title for each level represents the highest level of mobility that a child is expected to achieve between 6- 12 years of age. We recognize that **classification** of **motor function** is dependent on age,

especially during infancy and early childhood. For each level, therefore, separate descriptions are provided for children in several age bands. The functional abilities and limitations for each age interval are intended to serve as guidelines, are not comprehensive, and are not norms. Children below age 2 should be considered at their corrected age if they were premature. An effort has been made to emphasize children's **function** rather than their limitations. Thus as a general principle, the **gross motor function** of children who are able to perform the functions described in any particular level will probably be classified at or above that level; in contrast the **gross motor** functions of children who cannot perform the functions of a particular level will likely be classified below that level.

Gross Motor Function Classification System for Cerebral Palsy (GMFCs) Before 2nd Birthday

Level I

Infants move in and out of sitting and floor sit with both hands free to manipulate objects.
Infants crawl on hands and knees,
pull to stand and take steps holding on to furniture.
Infants walk between 18 months and 2 years of age without the need for any assistive mobility device.

Level II

Infants maintain floor sitting but may need to use their hands for support to maintain balance.

Infants creep on their stomach or crawl on hands and knees.
Infants may pull to stand and take steps holding on to furniture.

Level III

Infants maintain floor sitting when the low back is supported.
Infants roll and creep forward on their stomachs.

Level IV

Infants have head control but trunk support is required for floor sitting.
Infants can roll to supine and may roll to prone.

Level V

Physical impairments limit voluntary control of movement. Infants are unable to maintain antigravity head and trunk postures in prone and sitting. Infants require adult assistance to roll.

Between 2nd and 4th Birthday

Level I

Children floor sit with both hands free to manipulate objects.
Movements in and out of floor sitting and standing are performed without adult assistance.
Children walk as the preferred method of mobility without the need for any assistive mobility device.

Level II

Children floor sit but may have difficulty with balance when both hands are free to manipulate objects.

Movements in and out of sitting are performed without adult assistance.

Children pull to stand on a stable surface.

Children crawl on hands and knees with a reciprocal pattern, cruise holding onto furniture and walk using an assistive mobility device as preferred methods of mobility.

Level III

Children maintain floor sitting often by "W-sitting" (sitting between flexed and internally rotated hips and knees) and may require adult assistance to assume sitting. Children creep on their stomach or crawl on hands and knees (often without reciprocal leg movements) as their primary methods of self-mobility.

Children may pull to stand on a stable surface and cruise short distances.

Children may walk short distances indoors using an assistive mobility device and adult assistance for steering and turning.

Level IV

Children sit on a chair but need adaptive seating for trunk control and to maximize hand **function**.

Children move in and out of chair sitting with assistance from an adult or a stable surface to push or pull up on with their arms.

Children may at best walk short distances with a walker and adult supervision but have difficulty turning and maintaining balance on uneven surfaces.
Children are transported in the community. Children may achieve self-mobility using a power wheelchair.

Level V

Physical impairments restrict voluntary control of movement and the ability to maintain antigravity head and trunk postures. All areas of **motor function** are limited. Functional limitations in sitting and standing are not fully compensated for through the use of adaptive equipment and assistive technology. At Level V, children have no means of independent mobility and are transported. Some children achieve self-mobility using a power wheelchair with extensive adaptation

Between 4th and 6th Birthday

Level I

Children get into and out of, and sit in, a chair without the need for hand support. Children move from the floor and from chair sitting to standing without the need for objects for support. Children walk indoors and outdoors, and climb stairs. Emerging ability to run and jump.

Level II

Children sit in a chair with both hands free to manipulate objects. Children move from the floor to standing and from chair sitting to standing but often require a stable surface to push or pull up on with their arms. Children walk without the

community. Children may achieve self-mobility using a power wheelchair.

Level V

Physical impairments restrict voluntary control of movement and the ability to maintain antigravity head and trunk postures. All areas of **motor function** are limited. Functional limitations in sitting and standing are not fully compensated for through the use of adaptive equipment and assistive technology.

At level V, children have no means of independent mobility and are transported. Some children achieve self-mobility using a power wheelchair with extensive adaptations.

Distinctions Between Levels I and II Compared with children in Level I, children in Level II have limitations in the ease of performing movement transitions; walking outdoors and in the community; the need for assistive mobility devices when beginning to walk; quality of movement; and the ability to perform **gross motor** skills such as running and jumping.

Distinctions Between Levels II and III Differences are seen in the degree of achievement of functional mobility. Children in Level III need assistive mobility devices and frequently orthoses to walk, while children in Level II do not require assistive mobility devices after age 4.

Distinctions Between Level III and IV Differences in sitting ability and mobility exist, even allowing for extensive use of assistive technology. Children in Level III sit independently,

need for any assistive mobility device indoors and for short distances on level surfaces outdoors. Children climb stairs holding onto a railing but are unable to run or jump.

Level III

Children sit on a regular chair but may require pelvic or trunk support to maximize hand **function**. Children move in and out of chair sitting using a stable surface to push on or pull up with their arms. Children walk with an assistive mobility device on level surfaces and climb stairs with assistance from an adult. Children frequently are transported when travelling for long distances or outdoors on uneven terrain.

Level IV

Children sit on a chair but need adaptive seating for trunk control and to maximize hand **function**. Children move in and out of chair sitting with assistance from an adult or a stable surface to push or pull up on with their arms. Children may at best walk short distances with a walker and adult supervision but have difficulty turning and maintaining balance on uneven surfaces. Children are transported in the community. Children may achieve self-mobility using a power wheelchair.

level V

Physical impairments restrict voluntary control of movement and the ability to maintain antigravity head and trunk postures. All areas of **motor function** are limited. Functional limitations in sitting and standing are not fully compensated for through the use of adaptive equipment and assistive technology. At

Level V, children have no means of independent mobility and are transported. Some children achieve self-mobility using a power wheelchair with extensive adaptations.

Between 6th and 12th Birthday

Level I

Children walk indoors and outdoors, and climb stairs without limitations. Children perform **gross motor** skills including running and jumping but speed, balance, and coordination are reduced.

Level II

Children walk indoors and outdoors, and climb stairs holding onto a railing but experience limitations walking on uneven surfaces and inclines, and walking in crowds or confined spaces. Children have at best only minimal ability to perform **gross motor** skills such as running and jumping.

Level III

Children walk indoors or outdoors on a level surface with an assistive mobility device. Children may climb stairs holding onto a railing. Depending on upper limb **function**, children propel a wheelchair manually or are transported when travelling for long distances or outdoors on uneven terrain.

Level IV

Children may maintain levels of **function** achieved before age 6 or rely more on wheeled mobility at home, school, and in the

have independent floor mobility, and walk with assistive mobility devices. Children in Level IV **function** in sitting (usually supported) but independent mobility is very limited. Children in Level IV are more likely to be transported or use power mobility.

Distinctions Between Levels IV and V Children in Level V lack independence even in basic antigravity postural control. Self-mobility is achieved only if the child can learn how to operate an electrically powered wheelchair.

Examples of Portage Activity Card

Age 0-1 **Motor 22**

Title: Sits self supported: - What to do:

1. Sit on the floor with child sitting between your legs so that lie can support himself by placing his hands on your legs.
2. Place the child's hands flat on the floor, palms down. As he is sitting push down lightly on his shoulders in bouncing manner.
3. Place interesting object in front of child so desire to sit is maintained.
4. Use pillows around him to cushion fall if he tips over. Sit facing him with feet outstretched, roll a ball or push a toy car to him.

Age 0-1 **Motor 23**

Title: From sitting position, turns to hands and knecs position: What to do:

1. Place the child in a sitting position and encourage the child to come to you, using toys or snacks to tempt him..
2. Help the child by giving him support and reward the slightest turn of the hands or body which should be associated with getting into a crawl position.
3. Sit child on the bed, gently tip him to hands and knees position by pushing.

4. In sitting position on floor, pat the floor in front of child. Encourage child to lean forward and pat the floor to get him to put his hands down and lean forward.

Age 0-1 **Motor 24**

Title: Moves from stomach to sitting position: - What to do:

1. When child is lying on stomach, roll him to the side, lift his kneos toward his chest have him push with his hands and sit up – right. Praise him while you're giving him aid. Gradually reduce aid..
2. Place the child on the floor on his stomach. Offer the child a piece of cracker or toy and then gradually move it to the side and then raise it to encourage the child to reach and at the same time to change position. Reward with the toy or treat
3. Provide object to use as lever so he can grasp it and pull himself up.
4. Show child how to back up to a chair or wall and push upward with hands to sitting position.

Age 0-1 **Motor 25**

Title: Sits without hand support

1. Place your arm behind the child's back to provide support, while encouraging him to manipulate a toy. Gradually reduce the amount of support you are giving him.

2.Place the child in a sitting position between your legs and allow him to place his hands on your legs for support. As he becomes steadier, give him a toy to play with so he will not use him hands to support himself.

3. Sit child on floor with pillows around him to make him secure, make certain he is sitting firmly on buttocks with legs outstretched for balance. Reinforce by talking and playing with him.

Age 0-1 **Motor 26**

Title: Flings objects haphazardly

1. Sit next to the child and give him a ball. Then move a few feet away and hold out your hands, saying, "throw it". Praise success

2.Place your hand around his and help him fling the ball, toy or paper and praise him.

3. Sit on the floor, facing the child. Ask him to throw the ball to you. Praise him regardless of the direction the ball is thrown in.

4. Use object that makes noise when thrown. (Bean bag with jingle bells sewn on or rattle). Or lot child throw object in water so it splashes.

Age 0-1 **Motor 27**

Title: Rocks back and forth on hands and knees

1. Place a bench towel under child's chest holding the ends, Lift up so only his hands and knees touch the floor. More towel back and forth so child rooks.
2. Hold child at hips. Move forward and backward
3. Model rocking back and forth for the child. Then physically guide him through the motions.
4. Place a pillow or bloster under child's chest. Initially guide him in rocking back and forth. Praise him and verbalize "rock –rock" or "back and forth"

واجــب الأســرة

تطبيق الأم لواجب الأسرة من واقع البرنامج

الهدف	النشاط	رقم الأسبوع

تعــلــيق الأم

هل يتجاوب الطفل مع الأم ؟ (نعم / لا)

التطبيق بالمسبة للام (سهل / صعب / يحتاج لوقت)

توقعات الأم :

شفاء تام | تحسن | لا تاثير | تعليقات أخرى

Observation Sheet

I. GENERAL OBSERVATION

VISION

a) Does he appear to look at objects? b) Does he track horizontally and vertically?

c) does he havea squint? d) Any other visual problems? (Describe):

HEARING

Does he respond to a sound made behind him by:

a) Becoming still b) Blinking or startling

c) Turning his eyes to the source of sound

d) Turing his head to the source of sound e) Any other reaction

EPILEPSY:

a) Has he ever had convulsions? b) When was the last convulsion

c) Is he on any anti- convulsant drugs?

If yes, give details:

COMMUNICATION:

Does the child communicate by:

a) Crying b) Facial expression c) Making sounds

d) Making gestures e) Talking f) Any other means

Does he have any other medical problems?

Any other comments (include behaviour problems, if any?)

If yes, give details:

II- PHYSICAL OBSERVATION

- **SUPINE**

Can the child get into this position by himself?

Can the child maintain this position

POSTURE

Head	Shoulder
Arms	Trunk
Pelvis	Hips
Knees	Feet

In supine is body weight:
a) Equal b) More on the right side c) More on the left side
Describe the predominating posture in supine:

- **ABILITY IN SUPINE**

(Describe pattern of movements)

Can he turn his head:
a) To both sides b) To the right side c) To the left side

Can be bring his hands to midline:
Can he reach out with:
a) Both arms b) The right arm c)The left arm
Can he roll over to side lying or to prone:
a) Right side b) Left side
Can he roll over from prone to supine:
a) Right side b) Left Side
Can he sit up from supine:
a) From side lying, pushing up on arms
b) By turning into prone and sitting between legs
Describe muscle tone at rest and any change of tone on activity:
Describe pattern of respiration:
Reflex reaction testing:
1. Asymmetrical tonic neck reflect 2. Moro
3. Neck righting reaction 4. Plantar grasp
4. Palmer grasp 5. Supra-pubic
6. Crossed extension withdrawal 7. Flexor

- **PRONE**

Can the child get into the prone position:
Chan the child maintain this position:

POSTURE
Head Shoulder
Arms Pelvis
Hips Knees
Feet

Is body weight:

a) Equal b)More to the right side c)More to the left side

Describe the predominating posture in prone:

reflex reaction testing:

1. Symmetrical tonis neck reflex 2. Galant's trunk incurvation
3. Tonic labrynthine

- **SITTING**

(this is observed with the baby in long sitting position, with his legs out in front of him as straight as possible)

Can be get into this position independently:

Can he maintain the sitting position:

a) With support b) Without support

(Mention where support is given)

POSTURE

Head	Shoulders
Arms	Trunk
Pelvis	Hips
Knees	Feet

Describe the predominating Posture in sitting:

Describe any abnormal reflex activity:

Parachute reaction sideways Parachute reaction forwards

Parachute reaction backwards

- **ABILITY IN SITTING**

(Describe pattern of movements)

Can he hold his head up:

Can be turn his head:

a) To both sides b) To the right side c) To the left side

Can he prop himself with:

a) Both arms b) Right arm c) Left arm

If he can sit without support, can he reach out keeping both arms together:

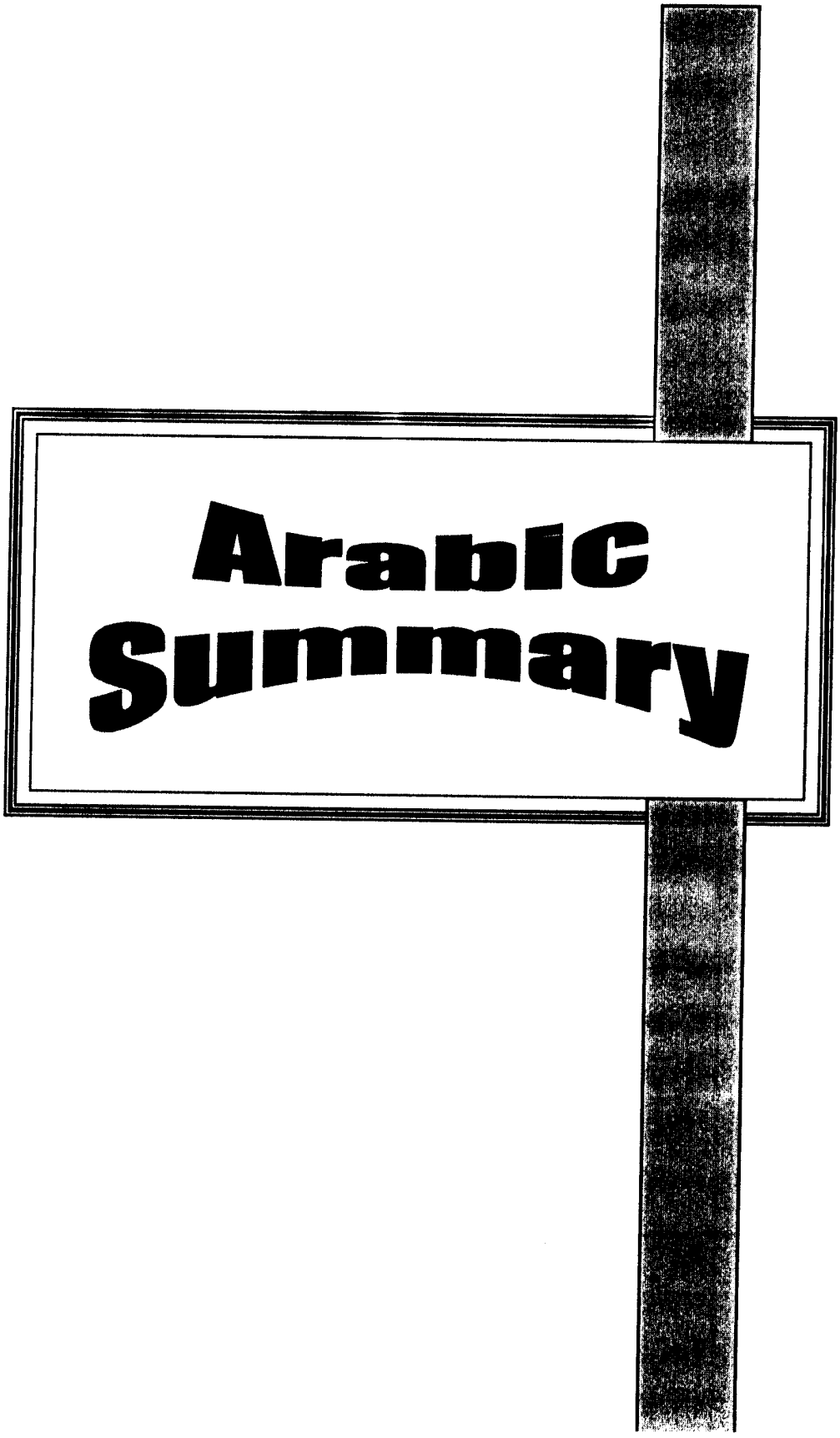
a) Forwards b) Upwards

c) Kneeling d) Standing

Can he get into a crawling position:
If yes, can he maintain this position:
a) Only momentarily b) For a longer period of time

Can he shift his weight:
i) Forwards ii) Backwards iii) To the right side
iv) To the left side

From the crawling position, can he get into kneeling:
a) With support b) Without support



الملخص

التدخل المبكر هى الخدمات التى تصمم لتحسين المهارات الادراكية،الانفعالية، و مهارات الحياة للاطفال ذوى الاعاقة من الولادة و حتى الخامسة من العمر. يحول التدخل المبكر من حدوث الاعاقات الثانوية و يساند اسرة الطفل ذوى الاعاقة على رعاية طفلها بكفاءة و كذلك يساعد الاسرة على التكيف مع اعاقة الطفل

هدف هذه الدراسة هو تقييم مدى فاعليةبرنامج التدخل المبكر على تطور اطفال الشلل الدماغىو كذلك تقييم اثر التدخل المبكر على الضغوط الوالدية و العلاقة بين الطفل و الوالدين.

تكونت عينة الاطفال فى هذا البحث من١٥ طفل لديهم شلل دماغى ٥ ذ كور و ١٠ اناث و يتراوح اعمارهم من ١٥ شهر- ٥٨ شهر ومتوسط العمرفى العينة ٣٣ شهر. كان توزيع الاطفال على حسب نوع الشلل الدماغى كلاتى:شلل رباعى(عدد ٤)، شلل الجانبين (عدد ٦)، شلل نصفى(عدد٤)، شلل ارتخائى(عدد١). و تم توزيع الاطفال على المستويات المختلفة للتصنيف الوظيفى للحركة الكبرى كالاتى:المستوى الاول (عدد= ٠)، المستوى الثانى (عدد=١)، المستوى الثالث(عدد =٤)، المستوى الرابع(عدد=٤)، المستوى الخامس (عدد=٦). تم حساب العمر التطورى و معدل التطورقبل و بعد برنامج التدخل المبكر فى مجالات الحركة الكبرى، الحركة الصغرى، و مجال الرعاية الذاتية باستخدام قائمة بورتاج للطفولة المبكرة. و تم ملىء استمارة مقياس الضغوط الوالدية بواسطة الام قبل و بعد البرنامج التدريبى.

تكون البرنامج التدريبى من تقييم للطفل فى مجالات الحركة الكبرى، الحركة الصغرى، الرعاية الذاتية ثم وضع الاهداف التعليمية و الانشطة لتنمية

اكتساب الطفل للمهارات بالمشاركة مع الاسرة و كذلك تدريب الام على طـرق المعللجة و الاوضاع الصحيحة من خلال الجلسـات الاسـبوعية. و كـذلك حصلت الاسرة عن معلومات عن اعاقة الطفل و كيفية تنفيـذ الانشـطة فـى المنزل.

عند إعادة تقييم الطفل فى نهاية البرنامج التدريبى وجد ان مسـتوايات الوظيفية للحركة الكبرى فد تحرك من المستوى الاكثر اعتمادية و هو المستوى الخامس للمستوى القل اعتمادية وهو المستوى الاول. وكان توزيع الأطفال على المسويات الوظيفية للحركة الكبرى كالاتى: المستوى الاول (عدد=١) ، المستوى الثانى

(عدد=٢)، المستوى الثالث(عدد=٦)، المسـتوى الرابـع (عـدد=٣)، المستوى الخامس (عدد=١) و هو يعكس تقدم الطفل فى مجال الحركة الكبرى. و زاد معدل التطورفى مجال الحركة الصغرى فى ١٠٠% من الاطفال و٦٠% من الاطفال فى مجال الرعاية الذاتية. سجل ٤٠% من الاسر قبل البرنـامج التدريبى عل درجة كلية مرتفعة فى المقياس الكلى للضعوط الوالدية بينما سجل ٢٠% من الاسر درجة كلية مرتفعة فى المقياس الكلى للضعوط الوالدية. لوحظ ان هؤلاء الاسر لديهم اطفال يعانون من شـلل دمـاغى ربـاعى و المسـتوى الوظيفى للحركة الكبرى يقع بين المستوى الرابع و الخامس. كذ لك وجـد ان ٢٠% من الاسر حصلت على درجة مرتفعة ذات دلالة فى مقيـاس الضـغوط الوالدية المتعلقة بخصائص الطفل و بقت كما هى بعد التدريب. سـجلت ٢٧% من الاسر درجة مرتفعة ذات دلالة فى مقيـاس الضـغوط الوالديـة المتعلقـة بخصائص الوالدين قبل البرنامج التدريبى بينما حصل ١٣% من الاسر علـى درجة كلية مرتفعة ذات دلالة فى مقياس الضغوط الوالدية المتعلقة بخصـائص الوالدين بعد البرنامج التدريبى.

النتائج اثبتت مدى فاعلية برنامج التدخل المبكر فـــى اكســـاب الطفـــل مهارات وزيادة معدل التطور فى مجالات الحركة الكبرى والصغرى والرعاية الذاتية لأطفال الشلل الدماغى. كذلك ان مشاركة الاسر فى البرنـــامج وتعلمهـــا طرق جديدة للتفاعل مع اطفالها ادى الى تحسين التفاعلات و العلاقة بين الطفل والاسرة وبالتالى تحسن فى مستوى تطور الطفل وهذا التغيـــر فـــى مســـتوى التفاعلات بين الاسرة و الطفل يفسر التقدم الذى احرزه الطفل. ان برامج التدخل المبكر المرتكزة على الاسرة لا تؤثر فقط على مستوى تقدم الطفل بل تساعد فى تقليل الضغوط الوالدية بالتاثير على العوامل المؤدية الى الضغوط الوالدية.

فى النهاية، نحتاج الى الاهتمام ببرامج التدخل المبكرللاطفـــال اللـــذين لديهم شلل دماغى والتاكيد على أهميتها فى تحسين قدرات الاطفـــال و كـــذلك التقليل من الظغوط الوالدية نتيجة رعايتهم للاطفال ذوى الاعاقة. كذلك لابد من التاكيد على اهمية مشاركة الاسرفى البرنامج لضمان نجاح البرنامج.

مســـــتخلص

أن برنامج التدخل المبكر يحفز تطور الأطفال ذوى الإعاقة. بالإضافة أنه يساند الأسرة التى لديها طفل ذوى إعاقة حتى تكون قادرة على سد احتياجات الطفولة بكفاءة وكذلك يساعد على تكيف الأسرة.

هذه الدراسة تهدف إلى تقييم مدى فاعلية برنامج التدخل المبكـــر علـــى تطور الأطفال الذين لديهم شلل دماغى وكذلك تقييم أثر برنامج التدخل المبكـــر على الضغوط الوالدية والعلاقة بين الطفل والوالدين.

تكونت العينة من ٣٨ طفل ولكن كان عدد الأطفال الذين أكملوا برنامج التدخل المبكر لمدة عام هو ١٥ طفل.

النتائج أثبتت مدى فاعلية برنامج التدخل المبكر فى إكســـاب الطفـــل مهـــارات وزيادة معدل التطور فى مجالات الحركة الكبرى والصغرى والرعاية الذاتية . كذلك ساعد البرنامج على تكيف الأسر التى شاركت فى البرنامج. وكان مستوى الضغوط الوالدية أقل مقارنة بما كان قبل بدء البرنامج .

التدخل المبكر لا يحسن فقط تطور الأطفال بل يساعد أيضاً فى تعـــديل بعض العوامل المؤدية إلى الضغوط الوالدية.

فى النهاية، تحتاج إلى التركيز على أهمية التدخل المبكر فـــى تعزيـــز تطور الأطفال الذين لديهم شلل دماغى كذلك لابد على العـــاملين فـــى مجـــال الطفولة المبكرة أن يكونوا على دراية بالدور الحرج لمشاركة الأسر فى نجـــاح برامج التدخل المبكر.

الكلمات الكاشفة:

التدخل المبكر – الشلل الدماغى – الضغوط الوالدية

شكر

اشكر السادة الأساتذة الذين قاموا بالإشراف

وهم :

١- أ.د/ حامد احمد الخياط أستاذ طب الاطفال – كلية الطب – جامعة عين شمس.

٢- أ.م.د/ سامية سامى عزيز أستاذ مساعد بقسم الدراسات الطبية معهد الدراسات العليا للطفولة.

٣- أ.م.د / هدى يحى طموم أستاذ مساعد طب الاطفال – كلية الطب – جامعة عين شمس

ثم الأشخاص الذين تعانوا معى البحث

وهم :

١-

٢-

٣-

وكذلك الهيئات الآتية :

١-

٢-

٣-

صفحة العنوان

اسم الطالبة : مادلين صبرى عزمى

الدرجة العلمية : دكتوراة

القسم التابع له : الدراسات الطبية

أسم المعهد : معهد الدراسات العليا للطفولة

الجامعة : عين شمس

سنة التخرج : ٢٠٠٧

سنة المنح : ٢٠٠٧

شروط عامه

يوضع شعار الجامعة على الغلاف الخارجى

رسالة : دكتوراة

اسم الطالبة : مادلين صبرى عزمى

عنوان الرسالة : (التدخل التاهيلى المبكر لأطفال الشلل الدماغى)

أسم الدرجة : الدكتوراة

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٣- أ.م.د / هدى يحى طموم	أستاذ مساعد طب الأطفال – كلية الطب – جامعة عين شمس

تاريخ البحث : / / ٢٠٠

الدراسات العليا

ختم الإجازة : / / ١٩٩

أجيزت الرسالة بتاريخ : / / ١٩٩

موافقة مجلس الكلية / / ١٩٩

موافقة مجلس الجامعة / / ١٩٩

جامعة عين شمس
معهد الدراسات العليا للطفولة
قسم الدراسات الطبية

التدخل التأهيلى المبكر لأطفال الشلل الدماغى

بحث مقدم من

الطبيبة/ مادلين صبرى عزمى

للحصول على درجة الدكتوراه فى دراسات الطفولة المبكرة

قسم الدراسات الطبية

تحت اشراف

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استاذ مساعد دراسات الطفولة الطبية
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٢٠٠٧