Original Article

OUTCOMES OF UNIVERSAL EXERCISE UNIT (UEU) IN COMBINATION WITH CONVENTIONAL PHYSICAL THERAPY ON TRUNK CONTROL IMPROVEMENT IN SPASTIC AND ATHETOID TYPE CEREBRAL PALSY CHILDREN

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ABSTRACT:

Objective: To measure outcomes of Universal exercise unit in combination of other therapies on trunk control of cerebral palsy.

Material and Methods: A sample of 25 children were selected and a baseline measurement (pre-intervention) was taken by using trunk impairment (TIS) scale three to ten days before the interventions. Interventions were carried out 5 days in a week for one hour daily. A post-intervention measurement was taken after the 06 months.

Results: In this study descriptive statistical tools were used to analyze the data. Mean Pre-intervention TIS score was 10.60±2.64. Mean post-intervention TIS score was 15.04±3.63. Mean change in TIS score after 06 months was 4.44±3.15. Mean of pre-intervention score and post-intervention score are compared by using Wilcoxon signed rank test, p=0.000 showing significant change between pre-intervention and post-intervention.

Conclusion: The Conclusion was that Universal exercise unit in combination of conventional physical therapies have significant effects to improve the trunk control of children diagnosed with cerebral palsy.
Key words: cerebral palsy, trunk stability in cerebral palsy, universal exercise unit therapy.

INTRODUCTION:

Human brain is the command center of human body that controls all of our senses as well as ability to move[1]. Brain can only function properly if continuous supply of oxygen and nutrients is maintained[2]. It can undergo irreversible damage if not supplied with enough oxygen or nutrients through blood. This kind of brain damage may cause a group of disorders of movement control known as cerebral palsy. These movement disorders can be identified during first year of a child's life. In CP the brain's power to control posture and movements disturbed but brain damage usually does not get worse over time. It is one of the most common movement disorders in children and is second only to autism as the most common disability in children[3]. Prevalence rate is 2/1000 in general population[4]. Problems that may occur with CP are spasticity of muscles or floppy muscles, fine motor skills can get worse, difficulties in bladder and bowel control, difficulty maintaining balance and walking, weakening in arms and legs, involuntary movements, excessive drooling when facial muscles are affected. There are many causes of cerebral palsy and one of them most common is maternal infection that infection may be due to urinary tract infection or uses of antibiotics during pregnancy[5]. CP may be diagnosed in early age because of delayed developmental mile stones. It can also be diagnosed by testing motor skills and reflexes and using specialized tests[6]. Children with

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cerebral palsy may also show weakness in trunk control movement that involves stability of the trunk and selective trunk movement that is in forward flexion, extension, side flexion and rotation[7]. The severity of motor dysfunction in activity of daily living can be identified by using the Gross Motor Function Classification System (GMFCS) which contain five levels of severity (level 1 the least affected to level 5 the most affected)[8]. However, to find out the reason why a child's activity of daily living is limited we need to have good investigatory methods and techniques which focus the body structure, function and activity[9]. Trunk stability is very essential for active and selective trunk and extremity movements[10]. Clinical scales are used in clinical practice to explore the problems, interchange communication and direct the progress. There is no standardized clinical scale to measure trunk performance in children with CP. The Trunk Impairment Scale (TIS) developed by Verheyden et al, was developed to measure motor impairment in adults after a stroke. The TIS can also be used for children with CP due to their postural abnormalities[11]. For training of trunk control we used a gadget known as universal exercise unit. It also named as spider cage that provides multisensory inputs from somatosensory, visual and vestibular system. This system provide the patient to learn more active movements, weight shifting, postural control and assisted movements such as transition from sit to stand, quadruped position, squats, and jumping, walking[12]. This system is very helpful for weight bearing in different position. The therapist gives the direction to the child through exercises to strengthen body muscles and allow the patient to experience more efficient movements. Universal exercise unit is used in Lahore in different special schools recently. Universal exercise unit is being used along with other conventional therapies for the benefits of the children. Evidence related to this therapy is not still available. So purpose of my study is to conduct a research that measure the effects of universal exercise unit on trunk control in children with cerebral palsy and providing evidence related to this therapy. Trunk control has prime importance in learning skills as posture is primary thing to learn a skill.

LITERATURE REVIEW:

To find out the reliability of Trunk Impairment Scale used for cerebral palsy children, between and within the observer groups, Rannei Saether carried out a study in June 2010. In video recording method population of 25 children was selected; age ranging from 5 to 12 years. 5 children had no motor impairment and 5 children in each gross motor classification level from 1 to 4 were analyzed by three observers on two occasion. His study show that the total score and sub-scales are highly reliable and each item have moderate to very good kappa values. Experience in physiotherapy and with Trunk Impairment Scale may have influenced within-subject standard deviation. The Trunk Impairment Scale is used to classify the children according to their gross motor function; seemingly most demanding to examine children at 2nd level of gross motor classification, children with moderate trunk performance[9]. On Universal Exercise Unit, a study was by Elizabeth C S Datorre that shows a report on 12 years old boy who was diagnosed for cerebral palsy. Study shows that universal exercise unit combines with other therapy like therasuit improve motor function of child. Farjad and colleagues conducted a study on universal exercised unit combined with conventional therapy on children with cerebral palsy and concluded that universal exercise unit with other conventional therapy can improve the motor function of children with cerebral palsy[12]. Another study was conducted on two children in which universal exercise unit was used with intensive physical therapy protocols and they concluded that further investigation and studies are needed on intensive physical protocol[13].

MATERIALS AND METHODS:

Study was conducted in these two settings, COMPASS: (Center of Mentally and Physically Affected Special Students), Khursheed Alam Road, Cantt, Lahore and Mobility quest: Cavalry ground, Cantt, Lahore. Duration of study was 06 months. Children who full filled

the criteria to be included in the study were assessed prior to application of intervention by using TIS for pre assessment. Post assessment was also done using TIS after 06 months of intervention. Study was Non-randomized, non-blinded and Quasi experimental study. Sample size of 25 children was taken in the study. Convenient sampling method was used. Subjects were selected on volunteer basis and an informed consent was signed by the guardians of selected children. Population of interest was children diagnosis with cerebral palsy athetoid and spastic types, already taking treatment in Mobility Quest and COMPASS. Inclusion criteria were 3-15 years age group**,** diagnosed cerebral palsy children**,** male and female**,** spastic type cerebral palsy and athetoid type of cerebral palsy. Exclusion criteria were severely handicapped children**,** recommended for orthopedic surgery**,** family not willing to give data**,** children with mental retardation. Materials used in study were universal exercise unit**,** Trunk Impairment Scale**,** exercise balls**,** rolls of different sizes**,** scooter board**,** swing therapy, balancing board**.** Convenient sampling technique was most appropriate technique because all the CP children getting treatment were included in this study. Data was collected and outcomes were measured by TIS (trunk impairment scale). The TIS was used first time by Verheyden et al., in patient having stroke. This scale was modified for cerebral palsy children. It consists of three subscales:[1]. Static subscale.[2]. Dynamic subscale.[3]. Co-ordination subscale

1. The static subscale:

i) Maintenance of sitting position while feet on floor
ii) Maintenance of a sitting position with passively crossed legs
iii) Balance sitting position while actively crosses their legs by subject. In recent research children crossed the leg which was strongest over the weaker one.

2. The dynamic subscale

It includes trunk side flexion and one side hip Result show Wilcoxon signed rank test using Z-statistic. P-value is shown to be .000. On lifting.

3. Co-ordination subscale

It includes rotation of upper or lower part of trunk actively 6 times; movements are initiated either from the shoulder girdle or from the pelvic girdle. Each item consists of 2, 3 or 4 point ordinal scale. Highest score on the static and dynamic sitting balance and coordination subscales are 7, 10 and 6 points respectively. The score TIS ranges from 0 to 23, 0 indicates minimal performance and 23 for maximal performance.

METHODOLOGY:

Informed consent was taken from parents. A defined inclusion criterion was used to select the children. A baseline measurement was taken by using trunk impairment scale. Therapy sessions were taken for 5 days in a week and for one hour daily. At the start of the study children was assessed by trunk impairment scale and after those children were treated in universal exercise unit along with conventional physical therapy.
Children will diagnosis of cerebral palsy received a therapy session according to their need and demands. Interventions were Neurodevelopment technique, Bobath concept using gym ball, balance board, scooter board, Strength training, Balance training, Serial Casting ,Splints ,Normal movement pattern and postural control, Gentle Stretching technique including gentle joint approximation and separation.
Children were re-assessed after six month by using trunk impairment scale. Descriptive statistical analysis was used. Score was presented as mean with standard deviation. Significance level was 0.05.Wilcoxon signed rank test was used as a non-parametric test include pre intervention to post intervention which also measure the percentage of change.

RESULTS:

Descriptive and statistical analysis of the research gave following results Above table is showing pre-intervention score on Trunk impairment scale. Score is calculated by three sub scale modified by trunk impairment scale. significance level .05. In these results p-value < .05 so that results are significant and there

is significant difference in score between pre-intervention and post-intervention. This affirms the condition that we will reject our null Hypothesis (pre-intervention score is equal to post-intervention) and accept our alternative hypothesis (there is significant difference between pre-intervention and post-intervention score). Universal exercise unit (UEU) combined with traditional physical therapy techniques improved trunk control in children with cerebral palsy CP. Wilcoxon signed rank test showed that treatment was effective.

DISCUSSIONS:

Results of this study are similar to the case report of[14] in which UEU was used with other technique in an intensive program of physiotherapy, that improved the (TIS) trunk impairment scale score. This study also support that universal exercise unit can be used with other physiotherapy intervention to improve the motor function of children with cerebral palsy[12]. The scale used in this study that is trunk impairment scale is reliable [9]. In which reliability of TIS was found. Universal exercise unit UEU provides support to the child. With the help of cords attached to the child, he/she can perform the movements which are not possible without support. The study showed that there was more improvement in the subscales of static sitting balance and dynamic sitting balance. In this study improvements are due to UEU combined with conventional physical therapy, so further investigation is required to show which therapy was effective and produce best results. Also there is need of further research to include more types of cerebral palsy and see the effects of therapy on other types too. UEU is still new concept in Pakistan and further evidences are required regarding effectiveness of this type of therapy. New modes of therapy should be devised apart from conventional physical therapy to see the effects and researches should be conducted to generate more evidence. Trends are changing in the field of physical therapy and traditional physical therapy is moving towards the latest techniques. Intensive pediatric physical therapy, therasuit, thera togs, spider cage and spider web are used in these latest trends. This study concluded that universal exercise unit when used with other physiotherapy intervention, can improved the trunk stability in children with cerebral palsy. Trunk control is very important to learn gross motor as well as fine motor skills because postures play vital role in the development of skills[15].

Pre-Intervention scores:

	Pre-intervention Static Sitting Balance Score	Pre-intervention Dynamic Sitting Balance Score	Pre-intervention Coordination Balance Score	Pre-intervention Trunk impairment score
Mean	3.76	4.80	2.04	10.60
Std. Deviation	1.01	1.22	0.84	2.64

Post-Intervention scores:

	Post-intervention Static Sitting Balance Score	Post-intervention Dynamic Sitting Balance Score	Post-intervention Coordination Balance Score	Post-intervention Trunk impairment score
Mean	5.36	6.60	3.08	15.04
Std. Deviation	1.22	1.58	1.15	3.63

Above table is showing post-intervention score on Trunk impairment scale. Score is calculated by three sub scale modified by trunk impairment scale

Pre to Post Trunk Impairment Scale:

	PRE INTERVENTION TIS(trunk impairment score)	POST INTERVENTION TIS (trunk impairment score)	DIFFERENCE TIS (trunk impairment score)
Mean	10.60	15.04	4.44
Std. Deviation	2.64	3.63	

Difference in mean between pre intervention and post intervention sore was 4.44.

Wilcoxon signed Rank Test:

Ranks

		N	Mean Rank	Sum of Ranks
Post-test TIS score – Pre-test TIS score	Negative Ranks	0[a]	00	.00
	Positive Ranks	25[b]	13.00	325.00
	Ties	0[c]		
	Total	25		

a. post intervention < pre-intervention

b. post intervention > pre-intervention

Test Statistics

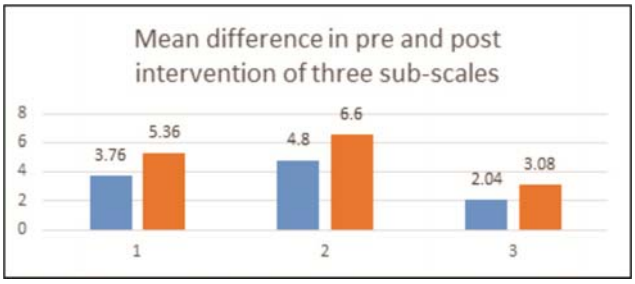
c. post intervention = pre-intervention

Results show improvement in all 25 participants on TIS.

	post test TIS score - pre test TIS score
Z	-4.410[b]
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.



Bar chart of mean difference in pre and post intervention of three sub-scales:

Results show that mean Score before intervention was low which improved after intervention was applied.

CONCLUSION:

The results of this shows that UEU combined with conventional physical therapy methods such as Neurodevelopmental technique, balance training, gym ball therapy, functional training, orthotics, postural training and stretching have significant effects on improvement of trunk control. This was measured by trunk impairment scale (TIS) in children with spastic and athetoid cerebral palsy between ages of 2-17 years. Limitations of the study were,

1) There was limited timed session and duration of study was also limited.
2) Sample size was small as therapy was applied in only two settings.
3) Non randomization and lack of control group.
4) Subjects in the study were already receiving interventions.

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2	Farjad Afzal	Co-Author Statistical analysis Supervisor
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