

## EFFECTIVENESS OF CORE STABILITY TRAINING PROGRAMME ON IMPROVING TASK SPECIFIC PHYSICAL ACTIVITY IN DEVELOPMENTAL COORDINATION DISORDER CHILDREN

### EFICIENȚA PROGRAMULUI DE CREȘTERE A STABILITĂȚII TRUNCHIULUI ÎN ÎMBUNĂTĂȚIREA ACTIVĂȚILOR SPECIFICE LA COPIII CU PROBLEME DE COORDONARE

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**Key words:** Developmental coordination disorder, Core stability training, BOTMP scale, CSAPPA scale, task specific intervention.

**Abstract. Objectives:** The objective of study was to find out the effectiveness of core stability training programme in children with Developmental Coordination Disorder [DCD] to promote and improve task specific physical activity. **Design:** The research design used for the study was Randomized Control Trial. Setting: Pediatric physiotherapy department, tertiary level Pravara Rural Hospital (PRH), Loni-413736, Maharashtra, India. Participants: Thirty participants (13 male and 14 female) aged 6 to 16 years with clinical diagnosis of developmental coordination disorder. **Intervention:** Intervention group received core stability training programme and task specific physical activity and control group received task specific physical activity for 6 weeks. **Outcome measures:** Bruininks – Oseretsky test of motor proficiency [BOTMP], Children's self perceptions of adequacy in and predilection for physical activity (CSAPPA) and five point facial hedonic scale. **Result:** There was statistically significant difference in the average scores of BOTMP and CSAPPA in intervention group [group A] participants treated with core stability training program as compared to control group [group B]. Physical activity was measured with the help of Five Point Facial Hedonic scale and was improvement in group A compared to group B.

**Conclusion:** Physical activity promotion in children with DCD has potential to improve the quality of life and reduce health risk associated with sedentary life. **Clinical Trial Registration Number:** PMT/PIMS/RC/2011/16.

**Cuvinte cheie:** tulburări de dezvoltarea a coordonării, antrenarea stabilității trunchiului, scala BOTMP, scala CSAPPA, intervenția prin activități cu scop

#### Rezumat

**Obiective.** Studiul urmărește să demonstreze eficiența antrenamentului musculaturii trunchiului la copiii cu tulburări de dezvoltare a coordonării, în promovarea și îmbunătățirea activităților cu scop. **Design:** Designul folosit pentru cercetare a fost studiu randomizat de control. Locația: Departamentul de Kinetoterapie Pediatrică, nivel trei, Spitalul Orășenesc Pravara (PRH), Loni-413736, Maharashtra, India. Participanți: treizeci de participanți (13 băieți și 14 fete), cu vârste cuprinse între 6 și 16 ani, cu diagnosticul de tulburare a dezvoltării coordonării. **Intervenție.** Grupul de intervenție a urmat programul de creștere a stabilității trunchiului și terapie prin activități cu scop iar grupul de control a urmat doar program de activități cu scop, timp de șase săptămâni. **Mijloacele de evaluare.** testul Bruininks – Oseretsky [BOTMP], Autopercepția copilului privind adecvarea și predilecția pentru activități fizice (CSAPPA) și scala hedonică de cinci puncte a figurilor faciale. **Rezultate.** Au existat diferențe semnificative între mediile scorurilor pentru BOTMP și CSAPPA la grupul de intervenție [grupul A], unde s-a urmat programul de creștere a stabilității trunchiului, comparativ cu grupul de control [grupul B]. Activitatea fizică s-a evaluat cu ajutorul scalei hedonice de cinci puncte a figurilor faciale. S-au înregistrat îmbunătățiri la grupul A, comparativ cu grupul B. **Concluzii.** Promovarea activității fizice la copiii cu DCD are potențial în îmbunătățirea calității vieții și în reducerea riscului de îmbolnăviri asociate cu o viață sedentară. Numărul de înregistrare al studiului: PMT/PIMS/RC/2011/16

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## Introduction

Children with developmental coordination disorder [DCD] are generally described as awkward, with clumsy movements and poor coordination. Children who are 'normal' but nevertheless experience motor difficulties in their everyday activities at home and at school in absence of neurological disorder are now recognized by two major classification system as having distinct and identifiable disorder called Developmental coordination disorder [1] or specific developmental disorder of motor function. [2]. The Diagnostic and Statistical Manual – IV [DSM-IV] estimates that as high as 6% of children between 5 and 11 years of age have DCD[3]. Altered activation of postural muscles in particular may interfere with initiation, execution and completion of coordinated movement and thus task related timing are challenging to DCD children [4].

As task specific intervention is an approach that focuses on problem solving and direct teaching of specific functional, meaningful skills, with goal of optimizing movement efficiency and performance given the individual's abilities. [5].

“Proximal stability for distal mobility” is a well known phrase that is the underlying principle of intervention with therapeutic exercise. Core stability is training to superficial and deep intrinsic muscles of lumbopelvic and abdominal region that provide the trunk motion and maintenance of segmental stability of spine during motion and postural adjustments. Use of core stabilizing muscles is fundamental when developing awareness of position and movement, and when performing stabilization exercise and basic functional activities. The activation of stabilizing musculature is then reinforced when developing an aerobic exercise programme and practicing functional activities throughout the rehabilitative process with the anticipation that it will become habitual in all daily activities and functional challenges. Therefore in children with DCD core stability training is to improve strength, balance, extremity function, proximal stability, coordination and endurance. This type of training is thought to improve trunk stability through the promotion of muscular capacity (strength and endurance) and improved recruitment at the level of neural control. [6].

As there is hardly any studies done on core stability training programme in children with DCD, so presented study, is to find the effectiveness of 6 weeks of core stability training to improve physical activity in children with DCD. Primary objective of study was to find out the effectiveness of core stability training programme in children with developmental coordination disorder to promote and improve task specific physical activity [13].

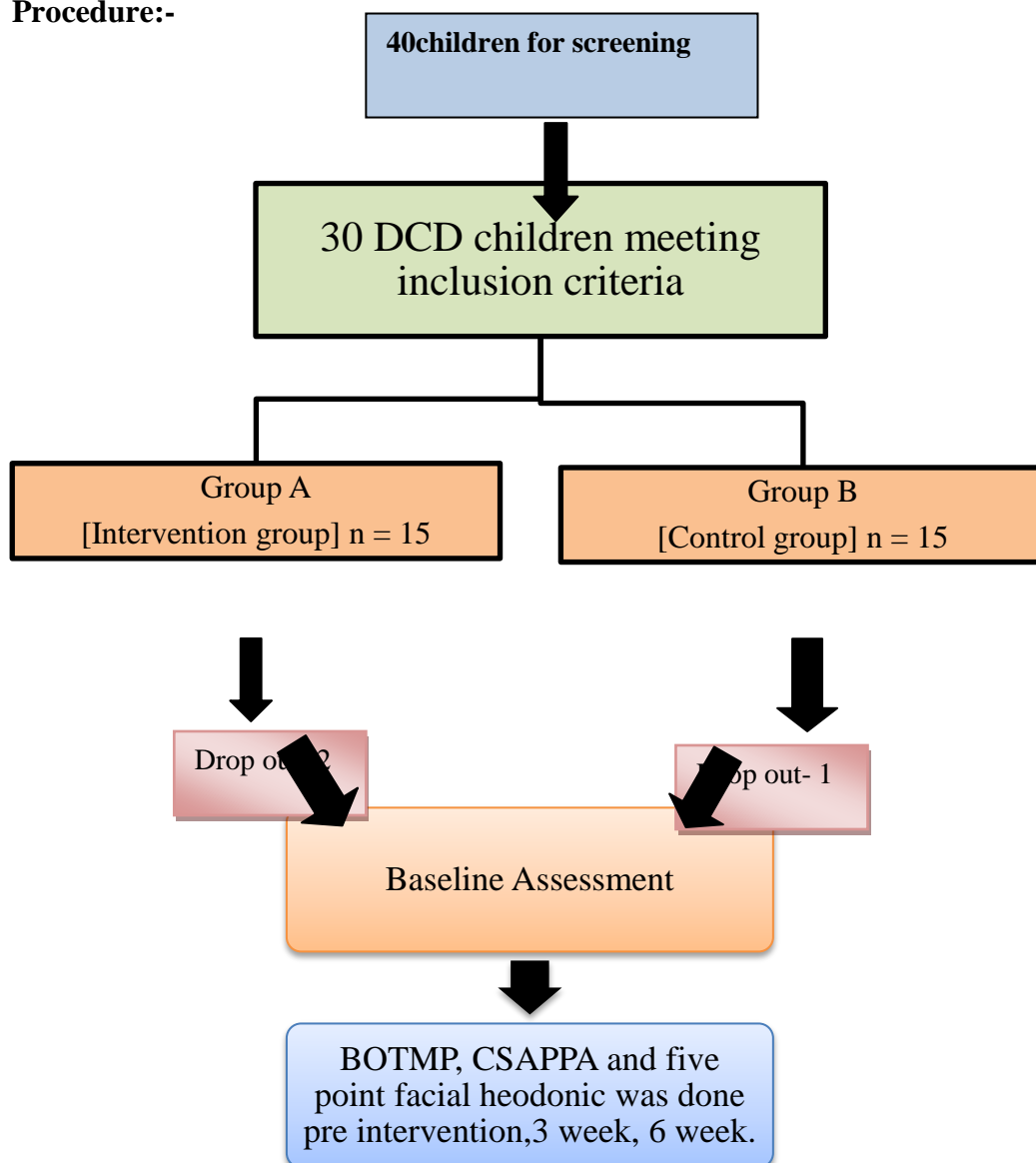
## Methods

### Subjects

Total 40 children were screened with DCD aged 6 to 16years for study through Little flower school, Loni, Tal- Rahata, Dist-Ahmednagar, Maharashtra State, India- 413 736 from Jan 2011- Nov 2011 considering inclusion and exclusion criteria of which 30 children were eligible and agreed to participate in study. Three participants drop out as they lost follow up. Intervention group A has 13 participants where as control group has 14 participants. Inclusion criteria: The criteria for inclusion in the study were 1] Male and female children aged more than 6 yrs and less than 16 yrs with clinical diagnosis of DCD (diagnosed by pediatrician according to diagnostic and statistical manual – 1V). 2] Children with attention deficit with or without hyperactivity. 3] Children with Fine and gross motor delays. 4] Children with Panic attacks, anxiety disorder. 5] Children with learning disability. The exclusion criteria was 1] DCD children with mental retardation [Children whose Wechsler intelligence scales score were less than 70. 2] DCD children with any congenital cardio-respiratory condition, congenital musculoskeletal condition. 3] DCD children with any neurological condition like Autism. 4] DCD children with visual, hearing disability. The study was design as Randomized Control Trial.

**Outcome measures:**

BOTMP [Bruininks-Oseretsky Test] of Motor Proficiency was selected to assess motor proficiency with highest reported reliability is 0.84. CSAPPA [Children's self perceptions of adequacy in and predilection for physical activity] was used to measure changes in self-efficacy for physical activity with highest reported reliability of CSAPPA is 0.87-0.91. Five point Facial Hedonic scale used to allow participants to rate their perceived ability to perform their self-selected goal.

**Procedure:-**

After the approval from ethical committee from Pravara institute of medical science, Loni participants were individually assessed and selected based on the inclusion/exclusion criteria.

Those willing to participate were briefed about the intervention in the language best understood by them and a written informed consent was obtained. Allocation of participants to the two groups was done on alternate basis. Baseline assessment was done using BOTMP, CSAPPA and five point facial hedonic scale before core stability training programme. Reassessment was done after the 3<sup>rd</sup> week and after the 6<sup>th</sup> week.

**Group A (n=13):-**

Participants in group A were given core stability training programme and task specific physical activity. Each session consisted 20 min of aerobic warm up, 15 min of core stability

exercise, 20 min of task specific intervention and sports skills training based on Childs chosen goals.

Warm up – Jump and twist and standing tummy crunches repeat continues for 3 min without pause. 3 repetition and 2 min rest between each repetition. Core stability exercises – Perform all exercises 5-10 times mentioned below. Exercise carries hold for 10 sec each. Within each exercise in there was 5 sec rest and from one set to another a 10 sec rest. That includes bird dog, plunk, hip bridge, roll up with a ball, single leg bean bag kick. Task specific intervention – It included individual's direct teaching sports skills (age appropriate) such as football, skipping, jumping, running. Therapist provided child with verbal and visual cues and made child to adjust movements for improving efficiency.

#### **Group B (n=14):**

Children in group B were given only task specific intervention i.e. football, skipping, jumping, and running for 20 min thrice in week for 6 weeks.

### **Results**

Statistical analysis was done using the Graph Pad InStat software [Trial version 3.30] Various statistical measures such as mean, standard deviation [S.D.] and test of significance such as Paired't' test was used to compare the difference in scores between the pre-intervention and post-intervention values within a single group. Unpaired't' test was used to compare the difference in scores between the two groups i.e. the intervention group (Group A) and the control group (Group B). The results were concluded to be statistically significant with  $p < 0.05$  and highly significant with  $p < 0.01$ . Paired't' test was used to compare the difference in scores between the pre-intervention and post-intervention values within a single group. Unpaired't' test was used to compare the difference in scores between the two groups i.e. the intervention group (Group A) and the control group (Group B). The baseline demographic data was comparable [Table 1]. There was statistically significant difference in the average scores of BOTMP in control group and intervention group participants treated with core stability training program. [Table 2 & fig. 1] There was statistically significant difference in the average scores of

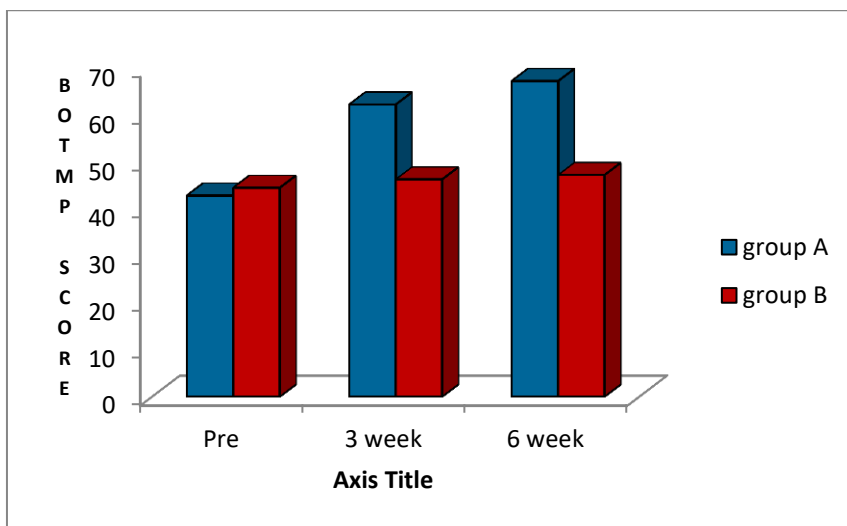
Children's self perceptions of adequacy in and predilection for physical activity (CSAPPA) in control and intervention group participants treated with core stability training program. Five point facial hedonic scale showed statistically significant difference.

**Table 1: Showing demographic profile in both the groups**

Group item	Group A (n=13)	Group B (n=14)	P- value
Age [years]	9.46 ± 3.69	10.29±3.47	0.51
Gender [F/M]	5[39%]/8[61%]	9[64%]/5[36%]	

**Table 2: Comparison of outcome measure  
[change scores of within group and between groups comparison]**

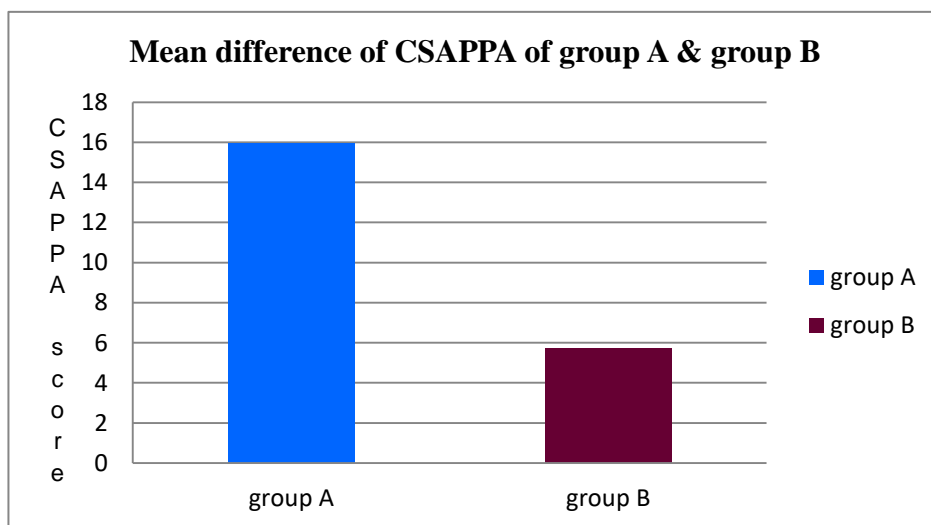
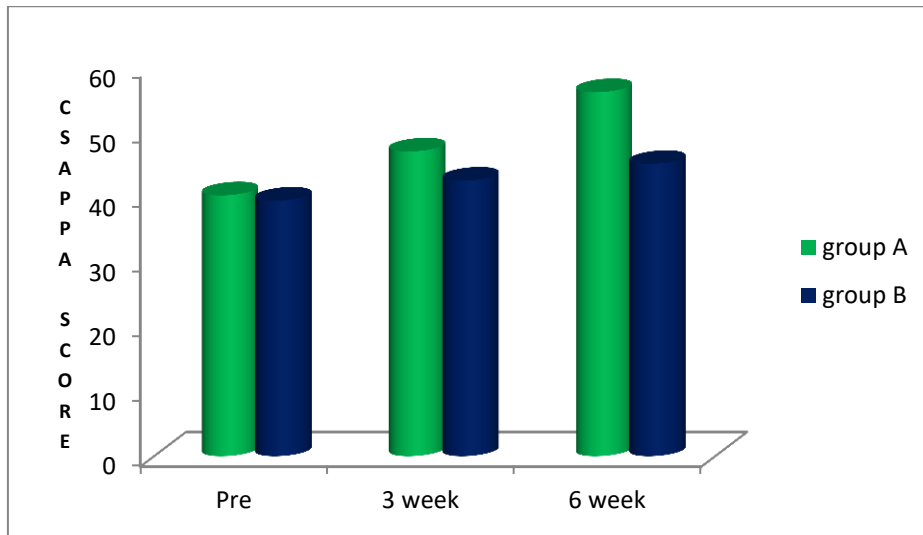
Outcome Measures	Intervention group[Group A] [within group comparison] <sup>b</sup>				Control group[Group B] [within group comparison] <sup>b</sup>				
	Pre	3 week	6 week	Change scores [post-pre]	Pre	3 Week	6 Week	Change scores [post-pre]	P value <sup>c</sup>
BOTMP Score <sup>a</sup>	42.84± 10.908	62.23± 13.596	67.23± 14.149	24.38± 6.911	44.5 ± 11.127	46.28±11.452	47.214 ±11.342	2.928± 1.639	0.01



Graph 1:- Mean difference of BOTMP in Group A and Group B:

Table 3:- Comparison of outcome measure [change scores of within group and between groups comparison]

Outcome Measures	Intervention group[Group A] [within group comparison] <sup>b</sup>				Control group[Group B] [within group comparison] <sup>b</sup>				
	Pre	3 week	6 week	Change scores [post-pre]	Pre	3 Week	6 Week	Change scores [post-pre]	P value <sup>c</sup>
CSAPPA Score <sup>a</sup>	40.23± 10.30	47 ±9.60	56.15 ±9.136	15.923± 8.261	39.42 ± 9.95	42.5 ±9.68	45.0714 ±9.219	5.714 ±1.637	0.01



Graph 2:- Mean Difference CSAPPA in Group A and Group B

Table 4: Comparison of five point facial hedonic scale pre, 3 week and 6 week of group A

	PRE	3 WEEK	6 WEEK
Not good at all	5 [38.46 %]	1 [7.69%]	0
Ok	2 [15.38%]	2 [15.38%]	4 [30.76%]
Average	3 [23.07%]	3 [23.07%]	0
Good	3 [23.07%]	6 [46.15%]	6 [46.15%]
Really good	0	1[7.69%]	3 [23.07%]

Table 5: comparison of five point facial hedonic scale pre, 3, 6 week of group B

	PRE	3 WEEK	6 WEEK
Not good at all	5 [35.71%]	0	0
Ok	4 [28.57%]	6 [42.85%]	6 [42.85%]
Average	2 [14.28%]	2 [14.28%]	2 [14.28%]
Good	3 [21.42%]	6 [42.85%]	4 [28.57%]
Really good	0	0	2 [14.28%]

## Discussion

Core stability training program has significant effect on task specific physical activity of children with developmental coordination disorder. BOTMP scale was used to find motor proficiency in children with DCD in relation to coordination, strength, balance and speed and agility. As core stability training exercise is thought to improve trunk stability through promotion of muscular capacity [strength and endurance] suggested by Revie G and Larkin D. Improvement in physical activity following core stability training programme is enhanced because of incremental gain in coordination by 9.20%, balance by 8.52%, strength by 4.10% and speed and agility by 3.05% in intervention group i.e group A after receiving core stability training programme.

Children with movement difficulties may already demonstrate social and affective characteristics such as anxiety, introversion, and awareness of decreased self-esteem associated with their physical limitations. [7]. The results of the *Kyra Kane* [8] demonstrated pilot program explored the use of a modified core stability programme and task-specific training as a means to address motor performance in children with DCD. In these children there is increase in aerobic fitness and decrease risk of obesity, and cardiovascular disease [9].

The self perceptions for physical activity were found by calculating the Children's self perceptions of adequacy in and predilection for physical activity (CSAPPA) for physical activity. The challenges of physical activity promotion are not entirely unique to children with DCD. Motivation has been identified as a key factor in improving physical activity participation in various populations, across developmental levels [10] as children with coordination problems experience this developmental shift in the relative contributions of social supports (i.e., parents to peers), their self-esteem and perceived self-efficacy may be affected, especially if comparisons are made with peers without coordination difficulties. Lower feelings of self-worth have a demonstrable effect on the enjoyment of Physical Activity, and, in turn, motivation to participate or perform may decline [11, 12].

Five point facial hedonic scale this scale allows children to rate whether they were "not good at all" through to "very good" at each of their self-chosen goal i.e. football. This shows that there was enhanced motivation and increase in task-specific confidence for physical activity. In our experience, group programs such as this one have the potential to be a motivating means of service training in DCD delivery because children are provided the opportunity to participate in more typical age-appropriate peer interactions. We believe that incorporating physical activity into a child's daily activities is likely to be a key component of a successful intervention plan; however, the barriers to changing family lifestyle patterns present a challenge to implementation. . In this study, a follow-up of the participants who participated in the study was not taken to assess long term effectiveness of the intervention given. The sample size is twenty seven which is considered to be small. Hence the chances of errors could be more. It would seem that the quantitative portion of this core stability measure alone was not sensitive enough to measure change, requiring more reliance on qualitative observations was required.

## Conclusion

The conclusion of this study is that, there is a significant effect of core stability training programme on coordination, strength, balance and speed that improve task specific physical activity of children with DCD. Thus Physical activity promotion in children with DCD has potential to improve the quality of life and reduce health risk associated with sedentary life.

## Acknowledgements

Ethical approval: Ethical Committee of Pravara Institute of Medical Sciences, Loni, Maharashtra state, India. (PMT/PIMS/RC/2011/16)

Funding: No funding was gained for the study.

Conflict of interest: None declared.

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