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Effectiveness of Two Task-Oriented Interventions Over Cardiorespiratory Fitness and Motor Performance in Children with Developmental Coordination Disorder (DCD) - A Pilot Study

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Abstract

Developmental coordination disorder (DCD) is identified as a heterogeneous disorder of motor learning and functioning. Children with DCD avoid physical activities in school as because of low self-esteem; they perceive themselves less capable and avoids peer group interactions at school. They tend to isolate themselves from an academic task as well as from physical activity sessions. Neuromotor task training and WII training are task-based interventions designed to enhance motor performance among children with developmental coordination disorder. Aim of the study is to compare the effectiveness of two task-oriented interventions like NTT and WII on motor performance, isometric strength, the aerobic and anaerobic capacity of children with DCD attending primary schools in and around Chennai. Children of age 5-10 years were included and randomly assigned into two groups, Group A and B. Developmental coordination disorder questionnaire- DCDQ was used to screen children with DCD at the baseline. Dynamometer, functional strength assessment, sprint test and 6MWT – 6-minute walk test was used to assess the performance of children with DCD at baseline and after intervention with NTT and WII. Results of the study proved that no significant improvement was reported in both the groups for isometric strength development. However, the Motor performance was enhanced in group A treated with NTT. Wii training showed improvement in anaerobic performance. The study concludes by adding knowledge that both the interventions were safe to execute for children with developmental coordination disorder.

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INTRODUCTION

Developmental coordination disorder affects the activities of daily living and academic performance of children. The globally accepted prevalence rate of DCD ranges from 6-7%. However, among the primary school children, the prevalence estimate is higher as there is a perfect correlation between poor motor coordination and academic failure (American Psychiatric Association, 1994).

Children with DCD avoid physical activities in school as because of low self-esteem; they perceive themselves less capable and avoid peer group interactions at school. They tend to isolate themselves from

the academic task as well as from physical activity sessions. The result is they develop poor motor coordination skill, strength and cardio-respiratory fitness (Sankar and Monisha, 2018).

The problem will be exacerbated if a child with DCD is left unattended and if he is in a low socioeconomic zone. Parents perspectives of their child with DCD will also affect the child's motor skill development. Majority of the parents in the Indian context tend to isolate their child from a peer group, and their ultimate aim was to enhance the academic performance of their children with DCD (Sankar and Monisha, 2019c).

Previous researchers have documented those children with DCD experience difficulty in motor skill and task execution as they get older. Few children develop a significant anxiety disorder and mood impairments. The study done by the primary researcher in 2018 proved that children with DCD were prone to Obesity-related consequences. As the child develops obesity, they were more prone to get affected by cardiovascular disorders (Sankar and Saritha, 2011).

Early identification and intervention were necessary to prevent social problems faced by children with developmental coordination disorder. However, process-oriented intervention met the defects in bodily structure and function; it is only the task-oriented interventions which focus on motor learning. Researchers identified cognitive behavioural therapy, video gaming enhancing the functional skills for children with DCD (Shankar and Monisha, 2018).

Neuromotor task training will provide a platform for the child to acquire motor skill planning, sequencing and organizing. Wii is the gaming intervention, which focuses on the biofeedback (Smits-Engelsman *et al.*, 2013). However, both NTT and Wii focus on task-oriented therapeutic intervention to enhance motor performance and fitness for children with developmental coordination disorder (Sankar and Monisha, 2019a).

It has been proved that task-based interventions were recommended for enhancing motor skill performance in children with DCD. However, it is left unclear in task-based intervention, either NTT or Wii can facilitate strength, cardiovascular fitness and motor skill enhancement for children with DCD (Niemeijer *et al.*, 2006).

Methodology

After getting approval for proposal of the current study from SRM College of Occupational therapy, Children were selected from 5 primary schools in and around Chennai. A total of 20 children were screened as DCD and divided randomly into two groups. Group A with ten children and Group B is assigned with ten children. Children in Group A received NTT, and in Group B wii based task-oriented therapy was delivered. Children were screened for eligibility to include in the study at the baseline based on the criteria for selection. Children included were of age group5 -10 years. Motor performance was assessed using MABC and strength using a dynamometer; cardiovascular fitness was assessed using the 6minute walk test (6MWT).

Children were excluded if they found to have cerebral palsy or any other neuro-development disorders. NTT was delivered for nine weeks, Wii fit games were delivered with activities which mimic cycling, jogging, and running. Games were designed as per the requirements of the child. Children were instructed to choose the activity, pre-test and two researchers performed post-test analysis.

Outcome measures include MABC assessment, which consists of 8 subtests that assess the motor coordination defects in children with DCD. Three areas of motor task performance were assessed; it includes Manual dexterity, Aiming and catching and balance. The raw score obtained is converted into a total score. FSM- Functional strength measure was used in the current study to examine the muscle strength, endurance for performing the motor activity. The hand-held dynamometer was used to assess the isometric strength. 6MWT was used to examine the aerobic fitness among children with DCD (Sankar and Monisha, 2019b).

Data Analysis

The total sample that included in the study completed the study. Complete assessment for children with DCD at baseline and 9^{th} week was available with the primary researcher. The outcome was assessed and summarized for the group of children placed in the NTT group and also in the Wii group. The difference in demographic, anthropometric data was calculated at the baseline to avoid bias.

To analyze the effectiveness of an intervention, the linear model was used during the assessment time. T-test was used to figure out how two groups differed in the assessment.

RESULTS AND DISCUSSION

The study was initiated to compare the effects of two task-oriented interventions for children with developmental coordination disorder. Ntt and wii training was compared and analyzed for improvements

Table 1: Effects of NTT and Wii training on Motor performance

MABC-2	NTT		WII	
	Pre Test	Post Test	Pre Test	Post Test
Total Score	4.01	7.90	4.87	6.06
Manual Dexterity	6.56	7.87	6.08	6.98
Aiming and CA	7.86	8.98	7.56	7.98
Balance	4.32	9.45	7.00	8.98

Table 2: Effects of NTT and Wii Training On FSM

FSM	NTT		WII	
	Pre Test	Post Test	Pre Test	Post Test
Total score	8.98	6.09	6.56	6.88
Over hand throw	1.98	2.65	1.65	2.00
Long jump	1.08	1.09	1.07	1.07
Under hand throw	2.56	2.65	2.34	2.48
Lateral step up	25.09	26.09	25.10	28.99
Lateral step up-right	25.77	26.33	25.77	29.67
Chest pass	1.56	1.77	1.23	1.25
Sit to stand	20.12	24.21	20.32	26.87
Lift box	12.76	15.65	12.00	16.32
stairs	60.23	68.98	60.00	70.98

Table 3: Effects of NTT and Wii Training on Hand held dynamometer

Handheld dynamome	NTT		WII	
	Pre Test	Post Test	Pre Test	Post Test
Right elbow flexion	100.54	104.34	94.34	90.34
Left elbow flexion	100.87	106.54	91.99	89.65
Left elbow extension	90.34	88.12	75.09	78.98
Right elbow extension	84.00	81.00	71.00	79.00
Right knee extension	150.34	150.23	125.34	132.43
Left knee extension	156.23	142.56	120.22	135.45
Right grip force	42.34	46.54	35.23	45.23
Left grip force	35.23	45.00	32.43	42.77

Table 4: Effects of NTT and Wii Training on Six Minute Walk Test(6MWT)

6MWT	NTT		WII	
	Pre Test	Post Test	Pre Test	Post Test
Distance covered	1.52	1.65	1.62	1.62

in motor and anaerobic performance (Peters and Wright, 1999). Both baseline and at the end of the therapeutic intervention, recordings were analyzed and tabulated (Tables 1, 2, 3 and 4).

However, it was proved that a change in total motor score was more significant in group A children's treated with NTT. Children's documented with significant improvement in 3 motor task tested using MABC-2, and there is a significant gain in motor proficiency among children treated with NTT. At the baseline or before initiating the study it is not clear, whether the motor proficiency among children with DCD was enhanced using NTT (Ganapathy and Monisha, 2019).

In the current study, we had employed the small sample size, and it proves that NTT was superior to Wii intervention session. There is no statistically significant difference found in motor performance among children treated with Wii intervention sessions. Task-specific interventions will prove to show significant improvement in manual dexterity. But it was not true for Wii group (Gonsalves *et al.*, 2015).

Selecting the appropriate treatment strategy plays a vital role in the prognosis. A therapist has to assess and document resource availability before initiating any intervention. Factors such as age, problem severity, level of participating in play over green land and indoor and level of communication need documentation. Moreover, activities, where the child engaged, will enhance their motor competence needs proper monitoring (Snapp-Childs *et al.*, 2013).

Children with DCD reported to have difficulty in executing the motor skills; thus the therapist has to assess and depending on the level of severity of their motor difficulties, specific task-based interventions need to be designed and delivered.

Children in primary schools had limited access to participate in various therapeutic interventions delivered by physiotherapist and occupational therapist. This study adds knowledge on simple interventions that need to be implemented in primary schools to enhance motor skill and fitness level for children with developmental coordination disorder as well as for the age-matched peer children's.

CONCLUSIONS

It is noted that improvements were attained in children with DCD only for the task, which they were given training using NTT and Wii. The study concludes that Ntt was superior to Wii in enhancing Motor coordination, strength and cardiovascular efficiency. Further studies are needed to explore the intensity, duration and frequency for designing Wii intervention for children with developmental coordination disorder.

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Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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