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Correlation Between BMI & Cardiorespiratory Fitness in Developmental Co-Ordination Disorder Children – An Observational Study

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Abstract

Background: In recent years, a growing issue of interest has been the physical health of children with DCD. In light of the increasing prevalence of hypo activity and cardiovascular disease risk factors observed in children and adolescents, those with compromised motor proficiency may experience additional challenges engaging in physical activity. In fact, research exploring the fitness and physical activity patterns of children with poor motor proficiency has provided a rather alarming risk profile for cardiovascular disease, due to higher percentage of body fat, decreased aerobic capacity, and generally decreased participation in physical activity. **Aims & objective of the study:** To observe and analyze the correlation between BMI and Cardiorespiratory Fitness in developmental co-ordination disorder children using physical activity. **Data Analysis and Results:** This study results shows that there is statistically significant improvement in the variables of Heart Rate (HR), Oxygen Saturation (SPO₂), Systolic Blood Pressure (SBP), Rate pressure product (RPP) in developmental coordination disorder children with p values $p < 0.05$. **Conclusion:** From this study results it is concluded that Physical Activity is used to assess the BMI, Cardio respiratory fitness for developmental coordination disorder children. As a whole Physical Activity was improving the strength of DCD children in their various day to day activities has been proved by this study results.

Keywords: Cardio Respiratory fitness, Systolic Blood Pressure, Maximal O₂ consumption, Rate Pressure Product, Physical Activity.

1. Introduction

Physical activity is an important for improving cardiorespiratory fitness several studies have demonstrated that more active children have better cardiorespiratory fitness than inactive ones.¹⁻³

Further studies have found children who do regular activity have greater muscle strength⁴ and flexibility⁴ than children who do not do regular physical activity. These findings suggest a link between Physical activity and Physical fitness, particularly in improving cardiorespiratory fitness.

Developmental coordination disorder (DCD) is a neurodevelopmental condition affecting approximately 5-8% of school aged children⁵. The most prominent feature of DCD is a marked impairment in the development of motor coordination that can affect the performance of daily activities such as writing, handling small objects, and engaging in physical activity like riding a bike or catching a ball¹⁶. The movement difficulties experienced by children with DCD are not due to a pervasive developmental disorder or other intellectual or neurological impairments that could explain the deficits. It is generally believed that DCD is a chronic impairment that persists into adulthood⁶⁻⁷. Increasingly, literature focusing on the motor deficiencies experienced by children with DCD has revealed the heterogeneity of this condition, with some children having challenges with fine motor skills, gross motor skills, or both, and with some children having more profound and complex difficulties than others⁸⁻⁹. While our understanding of this condition has markedly improved over the last few decades; there are still many areas that require further exploration.

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In recent years, a growing issue of interest has been the physical health of children with DCD. In light of the increasing prevalence of hypo activity and cardiovascular disease risk factors observed in children and adolescents, those with compromised motor proficiency may experience additional challenges engaging in physical activity. One of the many consequences of reduced physical activity is that health-related fitness components such as cardiorespiratory fitness (CRF) are compromised¹⁰. In fact, research exploring the fitness and physical activity patterns of children with poor motor proficiency has provided a rather alarming risk profile for cardiovascular disease, due to higher percentage of body fat, decreased aerobic capacity, and generally decreased participation in physical activity¹¹. Children with DCD may avoid physical activity because they often lack a sense of competence when participating in activities compared to typically developing children¹². The consequences of this avoidance may include not only decreased opportunity to develop overall physical fitness, but also social and emotional challenges such as depression and social isolation¹³.

To observe and analyze the correlation between BMI and Cardiorespiratory Fitness in developmental co-ordination disorder children using physical activity. By getting this study results that we can learn the BMI and Cardio respiratory fitness in Developmental co-ordination disorder children and recommend physical activity as a simple way to measure BMI and Cardio respiratory fitness among various population. By doing this study significance of using physical activity to assess BMI and Cardiorespiratory fitness in Developmental coordination disorder children will be strengthened and ascertained.

2. Materials And Methods

Study Design

An observational study.

Study setting

Abhinav Physiotherapy and Fitness Centre, P&T Nagar, Madurai.

Study Duration

12 months.

Study Sampling

Convenient Sampling

Study Population

Developmental coordination disorder children including Cerebral palsy, Muscular Dystrophy.

Study Sample

30 Children of developmental coordination disorder children

Criteria Selection

Inclusion criteria

Developmental coordination disorder children including Cerebral palsy, Muscular Dystrophy.

Age – 2 years to 8 years

Sex - Both

BMI – 18.0 to 30.0

Exclusion criteria

Congenital Cardiovascular diseases.

Metabolic diseases.

Psychological disorders.

Non-Cooperative subjects and parents.

Variables

Heart Rate. (HR)

Blood pressure. (BP)

SPO₂.

Rate Pressure Product. (RPP)

Interventions

Physical Activity with Swiss Ball, Balance Boards and Audiovisual Cues.

Materials and Tools

Stethoscope for heart rate measurement.

Sphygmomanometer for blood pressure measurement.

Stopwatch.

Pulse oximeter.

Clipboard with reporting sheet and pen.

Procedure

30 Developmental coordination disorder children who fulfills the criteria of selection were selected and recruited for this study through convenient sampling. Their informed consents were taken with their parents. Their Demographic data and pretest values of heart rate, spo₂, respiratory rate pressure and blood pressure were collected and documented. Then were performed the intervention of physical activity with swiss ball, balance boards and audiovisual cues for minutes. Interventions were given for 60 minutes a session, 1 session a day for 3 sessions a week for 12 weeks. After doing the physical activity, the patients post intervention values of variables were measured and documented. Suitable statistical method for data analysis was done by spss 16.0 software version for windows.

3. Data Analysis and Results

Shapiro Wilk test was used for checking normality distribution of data and student t test was used for analysis between variables.

This study results shows that there is statistically significant improvement in the variables of Heart rate (HR), Oxygen Saturation (SPO₂), Systolic Blood Pressure (SBP), Rate pressure product (RPP) in developmental coordination disorder children with p values p<0.05. Thus, null hypothesis has been rejected and alternate hypothesis has been accepted for this study.

Table 1: Comparison of pre and intervention values of mean, SD and p value in subjects with paired student t test (Source: Author).

No of Subjects	Variables	Pre-Intervention Mean ± SD	Post Intervention Mean ± SD	P value
30	HR	86.2 ± 38.84	97.1 ± 39.21	0.00052
	Oxygen Saturation (SPO ₂)	95.8 ± 2.18	98.8 ± 1.29	0.00003
	Systolic Blood Pressure	94.5 ± 27.39	127.1 ± 68.99	0.00001
	Rate Pressure Product	81.43 ± 54.27	123.29 ± 102.27	0.00001



Fig.1: Play Therapy in Swiss Ball (Source: Author).



Fig. 2: Measurement of Parameters (Source: Author).

4. Discussion

The cardio respiratory system and metabolic system of DCD children has been severely compromised when compared to normal children of that age group. Their neuromuscular and musculoskeletal system is affected. Due to that their demand of cardiovascular and respiratory parameters is increased when compared to the demand of normal children of that same activity.

This study results endorses the research work of published studies which explored the fitness and physical activity patterns of children with poor motor proficiency has provided a rather alarming risk profile for cardiovascular disease, due to higher percentage of body fat, decreased aerobic capacity, and generally decreased participation in physical activity.¹⁴⁻¹⁶

Cermak & Larkin, 2002 presented a comprehensive review of studies on physical activity and fitness in children with DCD. Since then, the body of knowledge examining various aspects of physical activity, fitness, and health of children with DCD has been steadily increasing. Fitness

components including body composition, cardio respiratory fitness, muscle strength and endurance, anaerobic capacity, power, and flexibility are important in the proper development of children's health and wellbeing.¹⁷

This study results shows that Physical Activity is used to assess the BMI, Cardio respiratory fitness for developmental coordination disorder children. As a whole Physical Activity was improving the strength of DCD children in their various day to day activities has been proved by this study results. This study can be explored further by increasing the number of subjects, advanced study design to get better results.

5. Conclusion

From this study results it was concluded that Physical Activity is used to assess the BMI, Cardio respiratory fitness for developmental coordination disorder children. As a whole Physical Activity was improving the strength of DCD children in their various day to day activities has been proved by this study results.

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