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Effect of Inclusive Games and Physical Exercises on Selected Physical Variables among the Intellectually Challenged Children

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Abstract

Intellectual disability affects around 2% to 3% of the world's population, with mild intellectual disability affecting 75 to 90% of those affected. In India, the estimated prevalence of ID is 10.5 per 1000 persons. The goal of the study was to figure out inclusive games and physical exercises affected certain physical parameters in children with intellectual disability.45 male children with mild intellectual disabilities (aged 7–15 years) from Vidivelli St. Anne's Rehabilitation Centre for the Mentally Handicapped Children, Tiruchirappalli, Tamil Nadu, India, were chosen for this study based on their mental intelligent quotient (IQ) scores ranging from 55 to 69.The 45 subjects were divided into three equal groups of 15 wherein Treatment Group I received inclusive games, Treatment Group II underwent physical exercises, and the control group had no instruction other than their regular activities. The treatment took place over 12 weeks. Muscular endurance was measured by 30 seconds sit-ups test and muscular strength and coordination were measured by the timed chair rising test.To establish the significance of the mean differences, the pre and post-test data were statistically analysed using Analysis of Covariance (ANCOVA), when the adjusted test's 'F' ratio was detected to be significant; the Scheffe's post hoc test was applied. To test the hypotheses, 0.05 was chosen as the level of significance. The statistics reveal that the treatment groups improved significantly on chosen physical parameters when compared to the control group after the training sessions. The physical exercises group outperformed the other two groups in terms of muscular endurance. The inclusive games group also excelled the control group in terms of muscular strength and coordination.

Key Words:inclusive games, physical exercises, muscular endurance, muscular strength and coordination, intellectual disability, mentally retarded children

Introduction

Intellectual disability affects around 2% to 3% of the world's population, with mild intellectual disability affecting 75 to 90% of those affected. The people who are affected are at a higher risk of developing health problems (Daily, Ardinger, & Holmes, 2000). India is home to the world's biggest population of children, the majority of whom are at risk of developmental impairments. In India, the estimated prevalence of ID is 10.5 per 1000 persons(Lakhan, Ekúndayò, & Shahbazi, 2015).

Intellectual disability is interpreted by the American Association on Intellectual and

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Developmental Disabilities (AAIDD) as “a disability characterized by significant limitations both in intellectual functioning and in adaptive behaviour, which covers many everyday social and practical skills. This disability originates before the age of 18” (Tassé, Luckasson, &Schalock, 2016). Mental retardation (MR) is characterized by a significant deficit of intellectual functioning and adaptive behaviour (Durand, 2001).

The Intelligence Quotient (IQ) has been classified into four levels: Mild level IQ (50 – 70), Moderate Level IQ (35-49), Severe Level IQ (20-34) and Profound Level IQ (less than 20) (Kubilay, Yildirim, Kara, &HarutoğluAkdur, 2011). IQ based studies can be compared to determine the interactive games and physical exercises among the intellectually disabled (Tsimaras et al., 2014).

Kids with movement differences have similar aspire, comforts and outlooks to possess and accomplish an activity as their seasoned peers. Adapted equipment, modified rules and innovative programming should be given to disabled children to attain their respective physical and recreational benefits on a par with the proficient peer.

The children must be encouraged to participate in active games to improve cardiovascular endurance, muscular strength and endurance, body composition and flexibility. Employing inclusive games, the children can be educated for their victory, strengths and restrictions of the surroundings involved, and advancement to do a task in an easy manner (Kasser, 1995). Designing exclusive adapted physical education curriculum (i.e., movement games) and accomplishing motor movements among the children. Further, they lead to being motivated and significantly acquiring the tasks of group activities(Aurora, 2013). Play competencies of the children with mental retardation can be improvised through early intervention and which make it possible to overall development (Lorenzi, Horvat, & Pellegrini, 2016).

Material & methods

Participants

To accomplish the study's goal, 45 male children with mild intellectual disabilities (aged 7–15 years) from Vidivelli St. Anne's Rehabilitation Centre for the Mentally Handicapped Children, Tiruchirappalli, Tamil Nadu, India, were chosen for this study based on their mental intelligent quotient (IQ) scores ranging from 55 to 69.

All the participants were informed about the nature of the study and their consent was obtained through the school administratorto co-operate till the end of the experiment and the testing period. The participants were instructed to withdraw their consent if they had felt any discomfort during the training period, but there were no dropouts.

Procedure

Initial assessment of the physical variables was done before commencing experimentation. After the completion of 12 weeks training session of the inclusive games and physical exercises, the final assessment was performed. Appropriate facilities were given to the participants according to the children’s special needs. The 12-weeks training program with the intellectually challengedchildren consisted of 3 sessionsper week onalternate days,

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each lasting 45 min.Before and after every training session within the fixed time frame, theparticipants underwent each 5-minute warm-up exercise as well as warm down exercise. All the activities with the ID children for the training session were performed in the outdoor and indoor grounds with the appropriate support of the special school teachers. All the participants' health conditions were enquired about and observed entire training session.

Exercise Training Program

Every day the workout lasted for 45 minutes. However, they were involved in regular activities of the school routine. The participants underwent their respective training programmes under the researcher's strict supervision. Before and after every training session, participants underwent each 5-minute warm-up exercise as well as warm down exercise.

Table 1. Comprehensive schedule for inclusive games group

Days	**Time – 45 Minutes**				
	5-Minutes	**10**–Minutes	**10**-Minutes	**15**-Minutes	**5**-Minutes
Monday	Warm-up	Centipede	Rollover	Octopus tag	Warm-down
Wednesday	Warm-up	Toy soldier	Steal the bacon	Pinball	Warm-down
Friday	Warm-up	Ponies in the barn	Crows and cranes	Poison ball	Warm-down

The inclusive games were required to complete the training program (Table 1) for Treatment Group I (IGG) with the following selected games namely centipede, rollover, octopus tag, toy soldier, steal the bacon, pinball, ponies in the barn, crows and cranes, and poison ball (Kasser, 1995).

Table 2.Comprehensive schedule for physical exercises group

Days	**Time – 45 Minutes**				
	5-Minutes	**10**–	**10**-Minutes	**15**-	**5**-Minutes
Monday	Warm-up	Freehand exercises	Catching and throwing	Simple relay	Warm-down
Wednesday	Warm-up	Flexibility exercises	Stair climbing - One leg, both legs, step-ups	Hopping relay	Warm-down

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Friday	Warm-up	Balance exercises	Standing broad jump	Dodge ball	Warm-down

The physical exercises were utilized to complete the training program (Table 2) for Treatment Group II (PEG) with the following selected exercises namely free hand exercises (shoulder strengthening exercise, hip strengthening exercise, knee strengthening exercise, calves and thigh strengthening exercise), catching and throwing, simple relay, flexibility exercises (head and neck stretching, shoulders, chest, and upper backstretching, thigh, quadriceps, and hip stretches, calves and ankles stretching, lower back, abdominal, and hamstring stretching), stair climbing (one leg, both legs, step-ups) hopping relay, balance exercises (static and dynamic exercises for balance), standing broad jump, and dodge ball.

Measurements

Muscular Endurance (30 - Seconds Sit-Ups Test)

Subjects lie on back with legs flexed at the knees and feet approximately 12 - 18 inches apart. The hands should be placed behind the head with fingers interlacing position. A partner holds the subject's ankles and keeps the feet in contact with the floor while counting each sit-up. On the signal to begin, the subject sits up, turns the trunk touching one elbow to the opposite knee and returns to the starting position. The next sit-up is performed touching the other elbow to the knee. The sequence of the test can be continued till the time-bound. One complete sit-up is counted each time the subject returns to the starting position. Subjects were clearly instructed to do the sit-ups without releasing the interlace of the fingertips behind the head of the participants' and the elbow must be touched by the opposite knee for each successful credit (Fogelholm, Stigman, Huisman, & Metsämuuronen, 2008).

Scoring

The total number of completed sit-ups in 30 seconds is recorded as the score.

Muscular Strength and Co-ordination (Timed Chair Rising Test)

The test was performed sitting on a chair with knees 90° flexed and the hands-on the shoulders. Each participant was asked to stand up from the chair and sit again five times without stopping (Brodin, Ljungman, & Stibrant Sunnerhagen, 2008).

Scoring

The time in seconds for the five repetitions was recorded. Increased time of repetition showed weakness in muscle strength and coordination problems.

Statistical Analysis

To establish the significance of the mean differences, the pre and post-test data were

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statistically analysed using Analysis of Covariance (ANCOVA), when the adjusted test's 'F' ratio was detected to be significant; the Scheffe's post hoc test was applied. To test the hypotheses, 0.05 was chosen as the level of significance.

Results

Below is a full description of the data analysis and interpretation technique:

Table 3. Descriptive statistics summary on selected physical parameters in children with intellectual disabilities

Sl.No	Groups	Muscular Endurance				Muscular Strength and Coordination			
		Pre-test	SD (±)	Post-test	SD (±)	Pre-test	SD (±)	Post-test	SD (±)
1	**Inclusive Games**	7.00	1.89	10.53	1.25	12.23	1.05	10.60	0.67
2	**Physical Exercises**	8.13	1.46	10.46	1.13	12.20	0.96	10.95	0.72
3	**Control Group**	7.33	1.50	7.66	1.59	12.65	1.42	12.52	1.07

Table 3 shows the summary of pre and post-test means and standard deviations for three groups of intellectually challenged children on chosen physical characteristics.

Table 4. Analysis of Covariance on chosen physical parameters in children with intellectual disabilities

Sl. No	Variables	Source of Variance	Sum of Squares	df	Mean Squares	F-Value
Pre-test						
1	Muscular Endurance	Between	10.17	2	5.08	1.92
		Within	111.06	42	2.64	
2	Muscular Strength and Co-ordination	Between	1.86	2	0.93	0.76
		Within	51.12	42	1.21	
Post-test						
1	Muscular Endurance	Between	80.31	2	40.15	22.54*
		Within	74.80	42	1.78	
2	Muscular Strength and Co-ordination	Between	31.25	2	15.62	23.76*
		Within	27.61	42	0.65	
Adjusted Post-test						

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1	Muscular Endurance	Between	82.47	2	41.23	23.90*
		Within	70.72	41	1.72	
2	Muscular Strength and Co-ordination	Between	28.28	2	14.14	21.74*
		Within	26.66	41	0.65	

*P < 0.05 Table F, df (2, 42) (0.05) = 3.21

The pre-test values on muscular endurance (1.92) and muscular strength and coordination (0.76) were smaller than the table value of 3.21 in the analysis of variance suggesting that at the 0.05 level of confidence, it was insignificant for the degrees of freedom (2,42) and precisely pointing out the meaningful random sample. The degrees of freedom (2, 42) at the significance level of 0.05 was significant when the analysis of variance of post-test scores on muscular endurance (22.54) and muscular strength and coordination (23.76) was more than the table value of 3.21.The adjusted post-test scores on muscular endurance (23.90) and muscular strength and coordination (21.74) were greater than the table value of 3.22, indicating that the degrees of freedom (2,42) were significant at 0.05 level of confidence. Table 4 shows the findings of the analysis of covariance.

Table5. Scheffe's Post-Hoc test for selected physical variables in children with intellectual disabilities

Sl. No	**Variables**	**Adjusted Post-test Means**			**Mean Difference**	**CI**
		IGG	**PEG**	**CG**		
1	Muscular Endurance	10.44	10.59	---	0.15	1.21
		10.44	---	7.63	2.81*	
		---	10.59	7.63	2.96*	
2	Muscular Strength and Co-ordination	10.62	10.97	---	0.35	0.74
		10.62	---	12.48	1.86*	
		---	10.97	12.48	1.51*	

* Significant at 0.05 level of confidence

Table 5 reveals the mean differences in muscular endurance (2.81, 2.96) and muscular strength and coordination (1.86, 1.51) between the inclusive games group and the control group, as well as the physical exercises group and the control group, are greater than the confidential interval values of 1.21 and 0.74, respectively, which was significant at the 0.05 level of confidence. The mean differences in muscular endurance (0.15) and muscular strength and coordination (0.35) between the inclusive games and physical activities groups were smaller than the confidential interval values of 1.21 and 0.74, respectively, which were insignificant at the 0.05 level of confidence.

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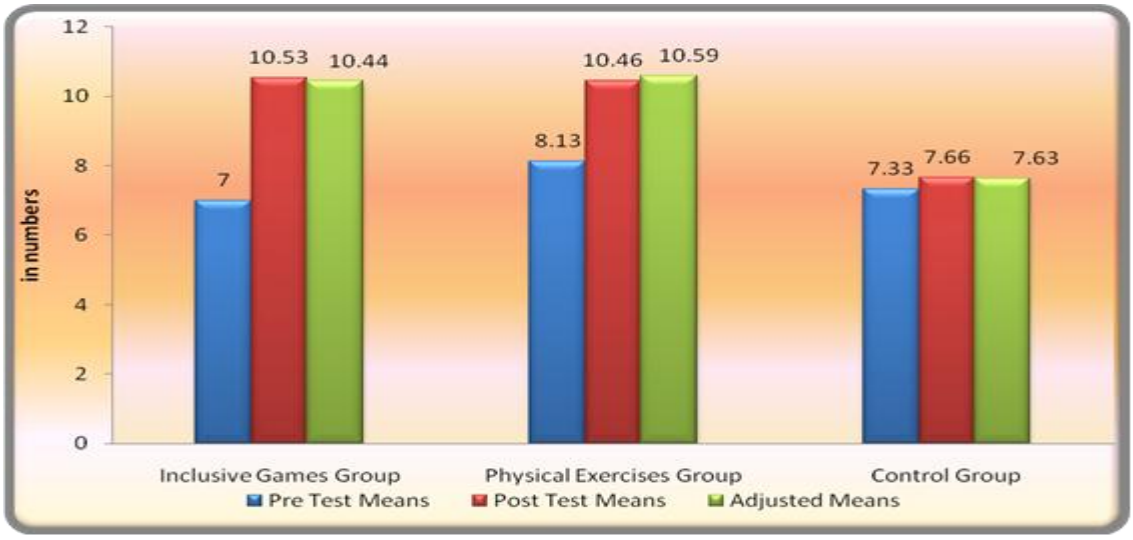

Fig.1 Pre Post and Adjusted Post Test Differences of the Inclusive Games Physical Exercises and Control Groups on Muscular Endurance

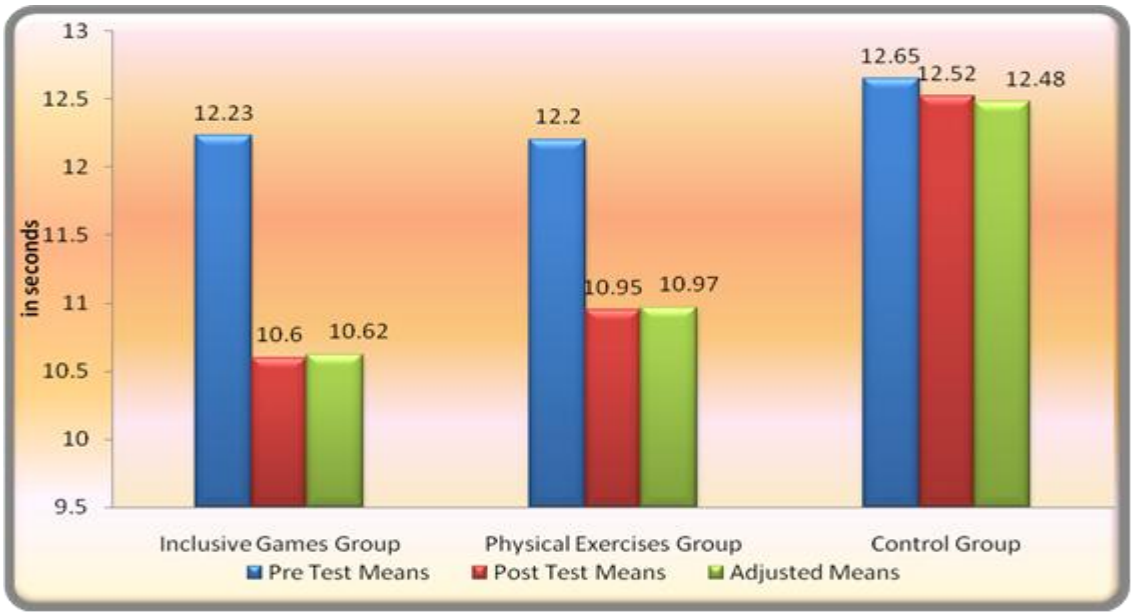

Fig. 2 Pre Post and Adjusted Post Test differences of the Inclusive Games Physical Exercises and Control Groups on Muscular Strength and Coordination

Discussion

The investigator explained the purpose of the training programme and explained the involvement of the participants. Before the commencement of the training programme, the inclusive games and physical exercises training techniques were taught to the Treatment group I (IGG) and Treatment Group II (PEG) respectively. Three one-hour sessions were spent on alternate days to practice the techniques. This helped them to perform the training exercises perfectly by avoiding injuries.

When comparing the treatment groups to the control group after twelve weeks of testing on the selected physical variables, the study demonstrates that the treatment groups showed a considerable improvement. Further, the post hoc analysis showed that there were

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significant differences exist between the treatment groups, clearly indicating that the physical exercises group was better than the inclusive games group in improving muscular endurance among the intellectually challenged children. The studies conducted by (Kubilay et al., 2011)and (Wu et al., 2010)proved that there was an improvement in muscular endurance.

Moreover, the post hoc analysis showed that there were significant changes that persist between the treatment groups, clearly showing that the inclusive games group was better than physical exercises in improving muscular strength and coordination of the intellectually challenged children. The following scholarly workswere conducted by (Millor, Lecumberri, Gómez, Martínez-Ramírez, & Izquierdo, 2013) and (Hayes & Johnson, 2003) and found that there was an improvement i n muscular strength and coordination.

All the participants were instructed about the nature of the study and their consent was obtained to co-operate till the end of the experiment and the testing period. But there were no considerable discomfort and dropouts.

Conclusions

Eventually, the study was found that the significant outcomes usedsome limitations for the treatments and through which the following conclusions were exposed. The results of the study show that the treatment groups improved significantly on chosen physical parameters as compared to the control group after twelve weeks of inclusive games and physical exercises training sessions.

The physical exercises group outperformed the other two groups in terms of muscular endurance.The inclusive games group also surpassed the other two groups in terms of muscular strength and coordination.

The following are appropriate recommendations for future research studies: to determine whether criterion measures improve periodically, the same study might be designed with repeated measures, and a more detailed investigation to examine changes in physical, physiological, and psychomotor parameters might be done.

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References

1. Aurora, U. (2013). Contributions to the psychomotor development of children with motor disabilities from the perspective of their social integration through adapted physical activities. *Journal of Physical Education and Sport, 13*(1), 57–65. https://doi.org/10.7752/jpes.2013.01010
2. Brodin, E., Ljungman, S., & Stibrant Sunnerhagen, K. (2008). Rising from a chair A simple screening

test for physical function in predialysis patients. *Scandinavian Journal of Urology and Nephrology*, *42*(3), 293–300.

3. Daily, D. K., Ardinger, H. H., & Holmes, G. E. (2000). Identification and evaluation of mental retardation. *American Family Physician*, *61*(4), 1059–1067.
4. Durand, V. M. (2001). Future directions for children and adolescents with mental retardation. *Behavior Therapy*, *32*(4), 633–650.
5. Fogelholm, M., Stigman, S., Huisman, T., & Metsämuuronen, J. (2008). Physical fitness in adolescents with normal weight and overweight. *Scandinavian Journal of Medicine & Science in Sports*, *18*(2), 162–170.
6. Hayes, K. W., & Johnson, M. E. (2003). Measures of adult general performance tests: The Berg Balance Scale, Dynamic Gait Index (DGI), Gait Velocity, Physical Performance Test (PPT), Timed Chair Stand Test, Timed Up and Go, and Tinetti Performance-Oriented Mobility Assessment (POMA). *Arthritis Care & Research: Official Journal of the American College of Rheumatology*, *49*(S5), S28–S42.
7. Kasser, S. L. (1995). *Inclusive Games* (Champaign,). Human Kinetics.
8. Kubilay, N. S., Yildirim, Y., Kara, B., & Harutoğlu Akdur, H. (2011). Effect of balance training and posture exercises on functional level in mental retardation. *Fizyoterapi Rehabilitasyon*, *22*(2), 55–64.
9. Lakhan, R., Ekúndayò, O. T., & Shahbazi, M. (2015). An estimation of the prevalence of intellectual disabilities and its association with age in rural and urban populations in India. *Journal of Neurosciences in Rural Practice*, *6*(4), 523–528. https://doi.org/10.4103/0976-3147.165392
10. Lorenzi, D. G., Horvat, M., & Pellegrini, A. D. (2016). Division on Autism and Developmental Disabilities Physical Activity of Children With and Without Mental Retardation In Inclusive Recess Settings Author (s): David G . Lorenzi , Michael Horvat and Anthony D . Pellegrini Source : Education and Training in.
11. Millor, N., Lecumberri, P., Gómez, M., Martínez-Ramírez, A., & Izquierdo, M. (2013). An evaluation of the 30-s chair stand test in older adults: Frailty detection based on kinematic parameters from a single inertial unit. *Journal of NeuroEngineering and Rehabilitation*, *10*(1), 1–9. https://doi.org/10.1186/1743-0003-10-86
12. Tassé, M. J., Luckasson, R., & Schalock, R. L. (2016). The relation between intellectual functioning and adaptive behavior in the diagnosis of intellectual disability. *Intellectual and Developmental Disabilities*, *54*(6), 381–390. https://doi.org/10.1352/1934-9556-54.6.381
13. Tsimaras, V., Papaioannou, M., Proios, M., Fotiadou, E., Kokaridas, D., & Kotzamanidou, M. (2014). The effect of a digital interactive game in distractibility, hyperactivity and impulsivity in individuals with attention deficit hyperactivity disorder and intellectual disability. *Journal of Physical Education and Sport*, *14*(4), 500–506. https://doi.org/10.7752/jpes.2014.04077
14. Wu, C. L., Lin, J. D., Hu, J., Yen, C. F., Yen, C. T., Chou, Y. L., & Wu, P. H. (2010). The effectiveness of healthy physical fitness programs on people with intellectual disabilities living in a disability institution: Six-month short-term effect. *Research in Developmental Disabilities*, *31*(3), 713–717. https://doi.org/10.1016/j.ridd.2010.01.013