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INFLUENCE OF ADAPTED PHYSICAL ACTIVITIESON CARDIORESPIRATORY FITNESS AND LEG EXPLOSIVE POWER OF INDIVIDUALS WITH VISUAL IMPAIRMENT

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Abstract:

The purpose of this study was to assess the influence of adapted physical activitieson cardiorespiratory fitness and leg explosive power of individuals with visual impairment. Twenty-four participantswith visual impairment who are studying in various affiliated colleges of Bharathiar University, were included in this study. Participants were randomly assigned to adapted physical activities (N=12) and control (N=12) groups. Their age ranged from 18 to 25 years. The participants had not taken part in any regular exercise program before entering to this study. The experimental group has undergone 6 weeks of adapted physical activities, whereas control group maintained their daily routine activities and no special training was given. Training program for individuals with visual impairment was 30 minutes in length and met 3 days a week. Supervised exercise training is an important issue in increasing physical activity in people with visual impairment. The training was executed by adapting progressive method as slower pace and frequent repetition to aid in the maintenance of acquired skills. The following tests were performed: cardiorespiratory endurance (600 yard run/walk endurance test) and leg explosive power (standing broad jump). In the present study for the sake of analysis of data, mean and standard deviation of the variables were calculated and statistical t-test was used to compare the mean. The level of significance was set at $p<0.05$ level of confidence. For statistical calculations SPSS Statistical Package version 16 was used.The t test revealed that the adapted physical activitieshad significantly improved both variables namely cardiorespiratory endurance and leg explosive power. Therefore the findings suggest that adapted physical activities are important for individuals with visual impairment to increase their cardiorespiratory endurance and leg explosive power.

Key Words: Adapted Physical Activity, Visual Impairment, Cardiorespiratory Endurance and Leg Explosive Power.

Introduction:

Every disabled person should have a right to live in the world that does not see him or her as handicapped but as a person with a unique set of abilities and life potentials. Children and young people with disabilities continue to be one of the most disadvantaged groups in all our societies. Accepting them is a problem and knowing what to-do about it is quite different thing of course.

Children who are visually impaired, and blind consistently exhibited lower levels of fitness than sighted peers (Blessing, McCrimmon, Stoval, &Williford, 1993; Lieberman & McHugh, 2001; Skaggs & Hopper, 1996; Winnick & Short, 1985). The study of vision impairment performed as part of the Unique (1985) project, showed that in relation to the general population of children, low vision children have considerably lower speed, strength, flexibility, and cardiovascular endurance (Short F.S., Winnick J.P., 1986). Significantly lower performances' of visually impaired children were found in cardio-respiratory endurance, arm and shoulder strength and flexibility, while the general level of physical fitness was insufficient for achieving a healthy life style (Lieberman L.J. and McHugh E., 2001). It has been determined that when physical abilities are studied, low vision children aged 8 to 13 demonstrate lower achievement levels.

Furthermore, for children who are blind, activities of daily living demand increased energy; and the need to be fit might be even greater (Buell, 1982). Other research has shown that children with disabilities including visual impairments are often neither fully socialized and not expected to pursue a full range of life options (Stein, 1996). Physical activity levels of children who are visually impaired and blind can be improved, therefore improving comfort and success of movement (Lancioni, Olivia, Bracalente, ten Hoopen, 1996; Lieberman, Butcher and Moak, 2001).

Physical Education is important for the health and well being of people of all ages. It is enjoyable, builds self- confidence and improves ones health and fitness. Students experience a variety of lifetime and recreational activities. Students who are blind or visually impaired also need to experience physical activity. The visually impaired student with additional disabilities should experience a program designed to improve their fitness levels by participating in various games, activities and exercises. Some students may have developed poor circulation, limited lung capacity, poor muscle tone, poor posture, and a tendency to become overweight. A

regular physical activity program will improve fitness and give the student confidence to move through space without instructions. It can also develop motor skills needed for daily living and mobility.

Though the advantages of physical training programs have been mentioned earlier but the result are not still enough to conclude. So the present study was under taken to contribute to the body of knowledge about the affectivity of adapted physical activitiesprogram on cardiorespiratoryendurance and leg explosive power of individuals with visual impairment. Thus the purpose of the present study was to find out theinfluence of adapted physical activitieson cardiorespiratory fitness and leg explosive power of individuals with visual impairment.

Material and Methods:

Participants:

Twenty four participants withvisual impairment (n=24, males) who are studying in various affiliated colleges of Bharathiar University, were included in this study. All participants were eligible for inclusion in this study on the basis of their teacher's recommendation, as indicated by their diagnosis in their medical record, and determined that they could co-operate with the assessment and exercise procedures and that they could undertake exercise safely. Their age ranged from 18 to 25years.After their eligibility was confirmed, the participants were familiarised with the test procedure for one week before baseline measurements were conducted. Following this, participants were randomly allocated into two groups namely experimental (N=12) and control (N=12) groups. Additionallyan inform consent was obtained from the participants and their parents.The experimental group underwent six weeks of adapted physical activities, while the control group carried out their usual activities. Outcomes were measured at baseline and after the 6 weeks of intervention.

Study Protocol: Table 1

Dimension	Component	Test	Units
Physical Fitness Variables	Cardiorespiratory Endurance	600 yard run/walk Endurance Test	In seconds
	Leg Explosive Power	Standing Broad Jump	In centimeters

Intervention Program:

The 6-week adapted physical activities programme was designed and implemented by following the principles of progression during the entire training phase of the study. The well structured endurance training programme was implemented three days per week for 6 weeks on Mondays, Wednesdays and Fridays within the training hours. Supervised exercise training is an important issue in developing cardiorespiratory endurance and leg explosive power among visually impaired students. In order to train the visually impaired students, the inclusive education programme (unified concept) was adopted for better result.

A weekly training program is planned to be effective and interesting especially to the visually impaired students. Due to sensory impairment, explanation of training programme to the participants that gives challenge to the instruction of physical training. The investigator has well versed in split method and simple to complex progressive teaching to make the participants understand.

Table 2: Training Schedule of Adapted Physical Activities

1 to 2 weeks (20 Minutes)					
S.No	Exercise	Duration	No of Repetition	Rest in between rep	Total Duration
1	Sighted guide – Shoulder	8 minutes	2	2minutes	20 minutes
2	Sighted guide – Elbow				
3	Sighted guide – Hand				
3 to 4 weeks (25 Minutes)					
S.No	Exercise	Duration	No of Repetition	Repet. in between Rest	Total Duration
1	Sighted guide – Shoulder	10 minutes	2	2.5 min	25 minutes
2	Sighted guide – Elbow				
3	Sighted guide – Hand				
4	Tether running – Short Rope				
5 to 6 weeks (30 Minutes)					
S.No	Exercise	Duration	No of Repetition	Repet. in between Rest	Total Duration
1	Sighted guide – Shoulder	12 minutes	2	3 min	30 minutes
2	Sighted guide – Elbow				
3	Sighted guide – Hand				
4	Tether running – Short Rope				
5	Guidewire running – 50 m				
6	Circular with Tether				

Statistical Analysis:

In the present study for the sake of analysis of data, mean and standard deviation of the variables were calculated and statistical t-test was used to compare the mean. The level of significance was set at $p<0.05$ level of confidence.The analysis of data was performed by using 16.0 Statistical Package for the Social Sciences (SPSS).

Results and Discussion:

Twenty four participants were recruited and underwent familiarisation and baseline testing. All participants completed pre-test measurements, the experiment group undergone the training intervention and post-test measurements after 6 weeks. Exercise sessions and outcomes were supervised and measured by the investigator along with two qualified physical educators who had five years of experience including three years of working specifically with people with disabilities. After the analysis of the data the obtained results are presented in the following table 3.

Table 3: Descriptive analysis of pre and post test means of experimental and control group on cardiorespiratory endurance and leg explosive power variables

S.No	Variables	Pre Test Mean	Post Test Mean
1	Cardiorespiratory Endurance	Exp : 391.45	Exp : 295.08
		Con : 389.25	Con : 385.41
2	Leg Explosive Power	Exp : 38.25	Exp : 65.37
		Con : 37.95	Con : 39.08

The above table documents the pre & post tests means of experimental group (adapted physical activities) and control group on cardiorespiratory endurance and leg explosive power of individuals with visual impairment.Computation of t ratio on cardiorespiratory endurance and leg explosive power of individuals with visual impairmentis given in the following table IV.

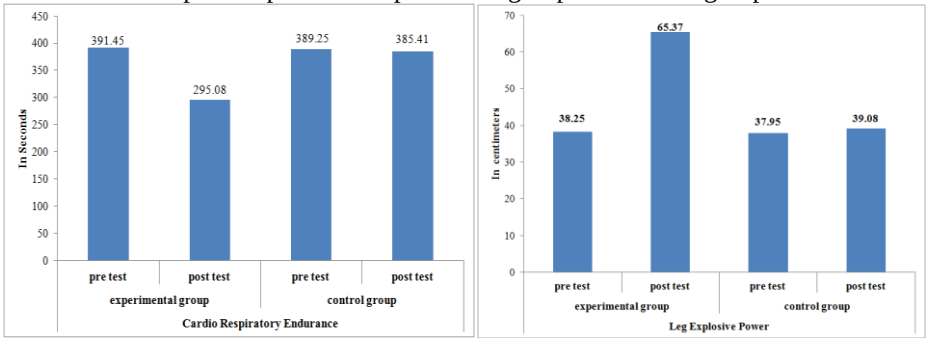
Table 4: Computation of 't' ratio on cardiorespiratory endurance and leg explosive power of individuals with visual impairment

S.No	Variables	Mean diff	SD	σ DM	't' ratio
1	Cardiorespiratory Endurance	Exp: 96.37	Exp:±18.28	Exp: 5.27	18.256*
		Con: 3.83	Con: ±26.56	Con: 7.66	0.500
2	Leg Explosive Power	Exp: 27.125	Exp:±5.274	Exp: 1.522	17.814*
		Con: 1.125	Con: ±1.823	Con:0.526	2.138

* Significant at 0.05 level * t value 0.05 (1,11) = 2.20

As per table IV, the obtained t ratio oncardiorespiratory endurance and leg explosive powerare 18.256* and 17.814*respectively are greater than the required value 2.20 at 0.05 level of confidence. Since the observed 't' value were greater than the table value on cardiorespiratory endurance and leg explosive power, there exists significant difference between the groups.

Figure 1 & 2: Bar diagram showing the pre mean and post mean of cardiorespiratory endurance and leg explosive power of experimentalgroup and control group



Discussion:

Children who are blind are born with potentials equal to those born with sight; yet lack of opportunities, limited expectations, and lack of training lead todevelopmental delays and decreases in fitness levels (Jankowski & Evans, 1981; Shephard, Ward & Lee, 1987).Research shows that because of inefficient movement patterns in almost every daily activity, individuals who are blind expend more energy than sighted individuals (Arnhold & McGrain, 1985; Buell, 1973; Peake & Leanard, 1971). Activities of daily living require additional attention, such as directions, safety, locations of everyday things, in addition to need for more strength, balance, and coordination (Buell, 1973). Arnhold and McGrain (1985) and Kobberling, Jankowski, and Leger (1989), determined energy costs of running and walking were significantly higher than for individuals with sight. In addition, increased metabolic demands were exhibited for most motor tasks due to increased tension and stress from lack of visual feedback (Buell, 1973; Hladky, Blazkova, Frantik, Hlavkova, Kozena, & Prochazka, 1996; Shephard, 1990). Increases in metabolic demands, energy expenditures, and mechanical

inefficiencies often lead to inactive lifestyles for individuals who are blind, greater than the visual impairments themselves (Auxter, Pyfer, &Huettig, 1997; Short & Winnick, 1986).

Running is the most common fundamental movement requirement in sports, and often a choice of exercise for improving cardiovascular fitness. Proper mechanics are important for efficiency and reduced chances of injuries. Student comfort level with running should not be overlooked, because students who are blind may initiate running activities which are readily accessible to them if taught safe techniques permitting success.

Results of this study indicated these participants who are blind preferred guide wires for safety, quality of running, and speed. Teaching a student to run using a guide wire could help the individual feel both safe and successful. With the guide wire technique, a student is not dependent on another person for tactile or verbal cues. Possibilities of tripping or losing contact with a rope are not present. The guide wire seemed to provide necessary tactile assistance without greatly restricting joint movements. Participants felt comfortable with their running.

In the present study, the cardiorespiratory endurance and leg explosive power has increased significantly in the experimental group after 6 weeks of adapted physical activities. It can be explained that as both groups had similar conditions at the beginning of the study, adapted physical activitiescaused the increase among the experimental group. Thus an association between training programs and improvement of criterion variables was supported by our data.

The study also correlates with the other findings as Blessing, McCrimmon, Stovall, and Williford (1993), Gleser, Margulies, Nyska, Porat, and Mendelberg (1992), Lee, Ward, and Shephard (1985), Longmuir (1998), McHugh (1995), Ponchillia, Powell, Felski, and Nicklawski (1992), Williams, Armstrong, Eves, and Faulkner (1996), and others show that children who are blind and engage in regular physical activity programs demonstrate improvements in physical fitness performances or levels of fitness.

All participants in the study reported that they enjoyed the adapted physical activities. Our study also showed that the experimental group was able to have more endurance capacity and muscle power as opposed to what they have been able to before participating in prescribed training programme. In this study, we are able to demonstrate the strong need for more effective physical therapy programs for those with other levels of visual impairment.

Conclusion:

In conclusion, well-planned adapted physical activities that utilize appropriate equipment maximize a person's abilities and minimize any special challenges they may face. Adapting a game or activity increases the opportunity for fun, skill development and self-confidence. Learning a new sport or recreational activity improves the quality of a person's life who has a visual impairment and creates a general sense of well being and competence. The results of the study support the use of adapted physical activities. It is also found that the experimental group has shown a significant improvement in cardiorespiratory endurance and leg explosive powerthan the control group.This could be related to their physical and physiological structures as a result of exercise quality (mode, intensity, or duration of the training) and also longer period of time is needed to have a significant effect on cardiovascular functions of individuals with visual impairment. Future investigations should determine the effects of different training modalities on the physical fitness components and physiological functions of people with visual impairment.

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