THE CORRELATION BETWEEN AGILITY AND PERFORMANCE AMONG BLIND ANDVISUALLY IMPAIRED ATHLETES

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Abstract

Regular physical activity has benefits on physical fitness among visually impaired athletes. The purpose of this study is to investigate how the motor fitness of agility influences the performance of the athletes. Total of 39 athletes (24 males and 15 females) were recruited for this study and were differentiate between their medical classes (totally blind athletes (B1) – male (n=10); females (n=8) and partially blind athletes (B2)- males (n=14); females (n=7). Subject's height and weight was measured to determine the BMI level. Subjects was also required to undergo the lateral change of direction test was used to determine the agility among the athletes. Each of the subjects was required to complete 2 trials and the average score was recorded. The entire tests were analyzed using SPSS and presented as mean. Independent T-Test showed that there are significant differences in agility levels between b1 and B2 athletes. Correlation was also significant ($p < 0.01$; $r = –.581$) between classification groups and tests time scores. B1 and B2 athlete's agility levels were slightly difference which also will affect their performance. Based on this data, future studies were suggested on non-athletes population.

Keywords-*Lateral change of direction test; blind; visually impaired; agility; performance*

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I. INTRODUCTION

Blindness can cause low physical work capacity, posture problems, orientation difficulties, depression and problems with balance [1, 2, and 3].

Participation in physical activity during childhood can helps in the development of motor abilities and put the foundation for a good health [4]. Individual who engage in sports participation soon in life gain additional bone mineral content and mineral density during growth. Visually-impaired people need more support in their psychosocial and physical development. Sport gives the visually-impaired children the chance to be part of the group. Craft do suggested that physical education can promote the acquisition of daily living skills, orientation and mobility skills needed by visually-impaired students by helping them to develop their physical fitness and psychomotor abilities [2].

Literatures clearly shows that regular physical activity and related lifestyle changes can significantly reduce premature death and disability, improve the quality of life, and increase the chances for longevity in the population at large. Children who are visually impaired can gain those same benefits from physical activity. Children who are visually impaired consistently exhibited lower levels of fitness than their sighted peers [5, 6, 7, 8, 9]. Yet the need to be fit is even greater for individuals who are visually impaired, since activities of daily living demand increased energy when performed with impaired vision [8, 9, and 10]. Previous research on fitness of children with visual impairment is limited. In a review, [8] reported only 11 studies published between 1950 and 1993 that addressed physical fitness. In these studies, many different methods were used to assess cardiovascular endurance, muscular strength and endurance, and body composition; the degree of visual impairment of the participants varied widely among the studies; and not all researchers precisely defined the participants' visual status. Furthermore, sample sizes were frequently low. Nevertheless, with the exception of body composition scores in two studies [11,12], the participants who were visually impaired consistently exhibited lower fitness than did their sighted peers.

Children who are visually impaired consistently exhibited lower levels of fitness than their sighted peers [11, 12, and 13]. There are also many techniques or methods how to guide a blind runner to do the physical activity or sports in particular. In addition to the advantages of

running with a sighted guide, the runner who is using a tether has some space and feels more independent than other guiding techniques [17]. Therefore the aim of the study was to investigate the agility among the blind and visually-impaired athletes and to identify the ability differences between them.

II. METHODOLOGY

A. *Sample*

A total of 39 subjects comprises of athletes were recruited voluntarily for this study whereby 24 subjects were males and 15 subjects were females. From that number, they were divided based on their medical classification classes that are totally blind subjects (B1) – male (n=10); females (n=8) and partially blind subjects (B2) - males (n=14); females (n=7).The subjects were limited to visual impairment athletes who actively took part in two Paralympics Track and Field circuit recently. Participants were classified into three categories according to the criteria adopted by International Blind Sport Association (IBSA) and USABA (The United States Association of Blind Athletes) in 1981 as follows: B1-no functional vision, B2- a visual acuity of less than 20/400 or a visual field of less than 5 degrees [18].

B. *Instrumentation*

Standing height was recorded to the nearest half cm with the subject barefoot and with the back against a vertical wall. Body weight was measured to the nearest 0.5kg with shoes, sweaters (SECA model 841). Body mass index (BMI) was defined as body mass (kg, measured using an electronic weighing scale to the nearest 0.1 kg) divided by height (m, measured to the nearest 0.1 cm) squared (kg/m^2).

Lateral change of Direction test (LCDT) was used to measure the physical fitness (specifically agility) of the subjects. The objective of this test is to monitor the development of the athlete's speed with directional change. This test is also known as the 20 meter shuttle run. We know that agility is very much affected with the disability of the subjects. This test will give the outcome, how far it is affected. Every subject was directed to do 4 trials – two on each side, left and right. Totally blind athletes executed this test with the help of the tester, assistant and also their friends. Methods that are used are guide wire system, tether or running side by side. To undertake this test, equipments required- flat surface (running track would be ideal), three

cones, stop watch and an assistant. The three cones are set five meters apart on a straight line. The athlete starts at the middle cone. The coach gives the signal to start and points in a specific direction, right or left. The athlete moves to and touches the first cone, returns past the middle cone (start) to the far cone and touches that one and then returns to the middle cone, touching that one. The coach starts the stopwatch on giving the 'GO' command and stops the watch when the athlete touches the middle cone. The better of two trails in each direction, left and right are recorded and the best score.

C. *Test administration and data collection*

All tests were administrated in group settings with up to 10 participants with two classifications that were B1 and B2 visually impaired (totally and partially blind). After the warm-up sessions, each of the participants will follow the researcher to one of the station to begin their test. Their height and weight will be recorded. Each station was administrated by the tester and supervised by the researcher that follows the participants. The testers were responsible to explain and demonstrate the tests to participants. The skill demonstrated and its verbal description was standardized according to the listed in the Test Manual of Physical Fitness. After the demonstration, a practice trial was given for each participant. Then participants were asked to perform only one test trials in turn, then the other one to complete each of the test. The test will be conducted in one day to ensure the good data collected.

D. *Analysis of data*

The results are presented as means and the standard deviations. The SPSS package (version 19.0) was used for the statistical analysis. Independent T-test was used to see the significance differences between classifications groups. Pearson correlation been used to see the relationship between two trials and two classification groups.

III. RESULTS

Table I.

Demographic data between male and female subjects according to their classification classes

	N	Male		N	Female		N	Overall	
		M	SD		M	SD		M	SD
Age	24	14.83	0.49	15	13.93	0.60	39	14.49	0.38
Height	24	1.51	0.12	15	1.4	0.12	39	1.50	0.09
Weight	24	49.1	14.8	15	42.0	11.9	39	46.4	0.14
BMI	24	22.4	5.5	15	18.9	6.8	39	21.0	6.2
Classification									
	N	**%**		**N**	**%**		**N**	**Overall**	
Totally blind (B1)	10	55.6		8	44.4		18	100	
Partially blind (B2)	14	66.7		7	33.3		21	100	

Table I. shows the Mean (M) of subjects according to age, classification, weight, height and BMI. Subjects for this study consists of totally and partially blind athletes (n=39; totally=18, partially=21) from Paralympics Circuit Championship. The age of male subjects is slightly higher than female subjects (male= M=14.83 yrs, SD=±0.49 ; Female= M=13.93 yrs, SD=±0.60). Subjects are classified into 2 categories B1=totally blind (N=10(male); N=8(female) and B2=partially blind (N=14(male); N=7(female). Male subjects were heavier than the female subjects (male- M=49.1; SD=±14.8) and female subjects (female- M=42.0; SD=±11.9). Classification of the athletes correlates with test 1 and test 2 (p= 0.01 (2-tailed)

Table II.

Independent T-Test for test 1: Left and right movement during the Lateral change of direction test

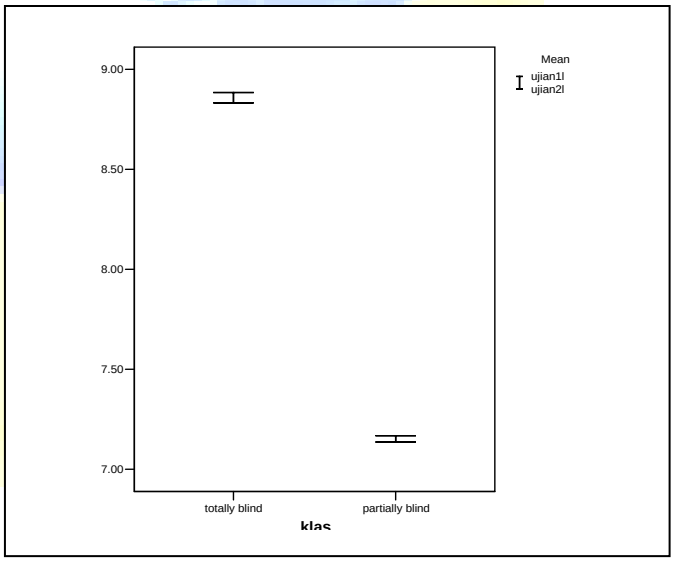
Class	M	SD	F	t	df	P value
Test 1 Left: B1	8.83	1.48	4.3	4.20	26.56	.000
Test 1 Left: B2	7.16	.87				
Test 1 Right: B1	8.85	1.54	4.91	4.20	26.70	.000
Test 1 Right: B2	7.12	.91				

Independent sample T-Test was used to determine the significant different between B1 and B2 subjects on Test 1 and Test 2. Results showed that there was a significant different between B1 and B2 subjects on Test 1 **(**Table II.). Test 1 on the left movement showed that there was a significant different ($p<0.05$; .000) between B1 and B2 subjects while the Test 1 on right movement showed that there was a significant different between B1 and B2 subjects ($p<0.05$; .000).

Table III.

Independent T-Test for test 2: Left and right movement during the Lateral change of direction test

Classificati on	M	SD	F	t	df	P valu
Test 2 Left:	8.89	1.56	3.77	4.20	26.81	.000
Test 2 Left:	7.13	.925				
Test 2	8.84	1.55	3.89	4.14	26.85	.000
Test 2	7.12	.924				



Independent T-Test also was used to determine the significant different between B1 and B2 athletes on Test 2. Results in Table III showed that there was a significant different between B1 and B2 athletes on Test 2. Test 2 on the left movement showed that there was a significant different ($P<0.05$; .000) between B1 and B2 athletes. The Test 2 on the right movement during the Lateral Change of Direction Test showed that there was a significant different between B1 and B2 athletes ($P<0.05$; .000).

Results indicated that the levels of agility between totally and partially blind athletes showed differences in terms of performance score.

Table IV.

Pearson Correlation (PC) between test 1 and test 2 on the lateral change of direction test

	Class	Test 1 Left	Test 1 Right	Test 2 Left	Test 2 Right
Class PC	1	-.582*	-.583*	-.581*	-.577*
Sign (2 tailed)		.000	.000	.000	.000
N	39	39	39	39	39

*p<0.01

Correlation testing was conducted to identify which test correlates significantly with the classification system. Results in Table IV shows a significant correlations with the Test 1 (left and right movement) and Test 2 (left and right movement; (P=0.01; 2-tailed). Correlation range from r = - .577, p= 0.000 to r = -.583, p= 0.000 with all tests shows significant correlates each other. The result of the score suggested that partially blind athletes have better agility than their totally blind athletes.

Figure 1. *Mean time for test 1 and test 2 (lef t movement) for totally blind subjects (B1) and partially blind subjects (B2)*

Figure 1 shows mean time for Test 1 and test 2 (only the left movement) for both totally blind and partially blind subjects. The left movements performed by the partially blind subjects are far better than the B1 subjects.

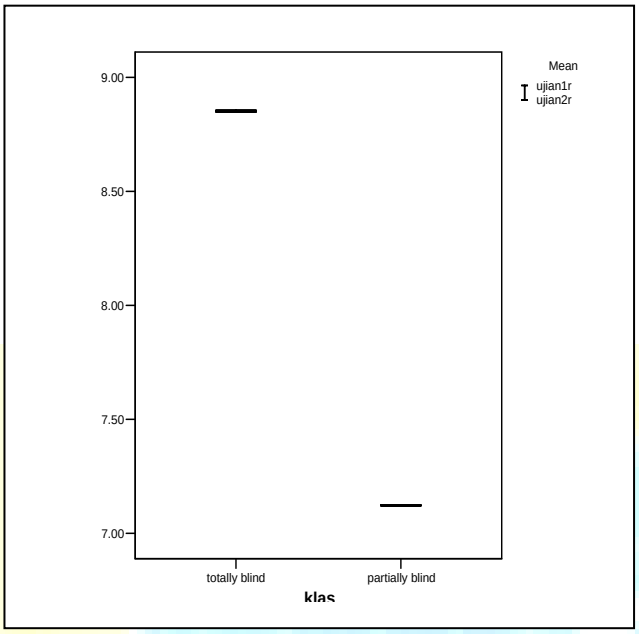


Figure 2. Mean time for test 1 and test 2 (right movement) for totally blind subjects (B1) and partially blind subjects (B2)

Figure 2 shows the mean time for Test 1 and Test 2 (only the right movement) for both totally and partially blind subjects. There is not much different comparing between Test 1 and Test 2 for the right movement produced by the totally blind subjects.

IV. DISCUSSION

Agility is important in all activities and sports. Agility tests are best used for diagnostic purposes, to determine which impairment has possessed poor agility. In the present study shows, the totally blind have possessed low level of motor skills. Both tests for totally blind athletes shows very slow results compared to the partially blind athletes. Both visually impaired athletes face difficulties to focus on the speed and the length or space between two points.

In agility test, they are three items have to be completed which are (1) change in running direction, (2) change in body position, and (3) change in body part direction. This is difficult for totally blind athletes because they have to control their speed during the execution of the test. The athletes must know how fast they must go and how far is the length or space that they must run. In the other hand, they also afraid to run faster because they might fall down and might be hit something or someone. These are the reason why both the totally and partially blind athletes face some difficulties to perform this test.

Despite the lack of significant differences between the totally blind athletes and partially blind athletes, the patterns of differences are truly major compared with the sighted athletes. In this study, all partially blind athletes performed better than the totally blind athletes, but very low compared to the sighted athletes. Children with visually impaired have a greater need to be fit because engaging in everyday tasks demands more energy than for their sighted counterparts [13,14,15]. For example, performing activities for daily living without sight requires additional attention to directional orientation, safety, and location of objects in space [8].

Several studies have determined that the energy cost of running and walking for children with visually impaired is significantly higher than for sighted children because of biomechanical inefficiency when running such as backward lean, decreased stride length and “guarded posture” [14, 15,16]. In addition, individuals with visually impaired demonstrated increased metabolic demands for motor tasks, presumably because of increased stress and tension from the lack of visual feedback [17].

These increase in metabolic demands, mechanical inefficiency and energy expenditure for daily tasks may, in turn contribute to an inactive lifestyle [18]. Adversely affecting health and quality of life. Thus a vicious cycle is apparent: reduced levels of activity because of fewer opportunity lead to poor fitness, which leads to a decreased ability to perform daily tasks and even lower level of fitness.

Some of the reasons that leads to lower level of motor skill in this study is the totally blind athletes must have an individual / partner to guide them in order to perform activities especially in this test. They must have a partner that can really run together with the same speed. In this test also athletes have to run and change body position and direction, running with a partner might be difficult, especially when it comes to turn their body. The totally blind athletes and his / her partner must have corporation to perform the test to prevent any injuries. The totally blind athletes must choose the right guide technique and also a reliable guide runner or assistance to guide them throughout the test. Choosing the wrong technique and not a suitable partner might lead to dragging each other during the test and automatically reduce the speed of the athletes. The timing also affected. For partially blind, in this study posse's great performance during the Test 1 and Test 2 because they do not need assistance to performed the test.

V. CONCLUSION

It is important to find new ways to encourage social relations between visually-impaired persons and their peers as well as other people outside their homes [7]. Sport is an integration factor of the physically handicapped as it enables a disabled person to participate with peers. Competitive sports such as wrestling and judo become increasingly available for visually-impaired athletes. However blind people can also perform a commendable performance and the results of this study are strongly indicates of its tangible potential in enhancing a number of motor skills in this special need group.

REFERENCES

[1] M.A. Abolfotouh & A. Telmesani. A study of some psychosocial characteristics of blind and deaf male students in Abha City, Asir Region, Saudi Arabia. Public Health 107, pp261-269.1993.

[2] D. Craft, Curriculum adaptations, in: Foundations of education for the blind and visually-handicapped children and youth, G.T, school, ed., New York: American Foundation for the Blind, pp.396-397, 1986.

[3] S.Sundberg. maximal oxygene uptake in relation to age in blind and normal boys and girls. Acta Paediatrr. Scand. 71, pp 603-608, 1982.

[4] Y.Koutedakis & C, Bouziotas. National physical education curriculum: motor and cardiovascular health related fitness in Greek adolescents, Br, J, Sports Med, 37, pp311-314, 2003.

[5] Buell, C. E. (1973). Physical Education and Recreation for the Visually Handicapped. (Eric Document Reproduction service No. E. D. 079288).

[6] Bergeron, J.W. Athletes with Disabilities. Recreational Sports Injuries, 1999. 10 (1). 213-229.

[7] Kobbering, G., Leger, L., & Jankowski, L.W (1989). Physical Capacity in Visually Impaired Persons. Science et motricite, 7, 38-41

[8] Kobberling, G., Jankowski, L. W., & Leger, L., (1989). Energy Cost of Locomotion in Blind Adolescents. Adapted Physical Activity Quarterly, 6, 58-67.

[9] Arnhold, R. W., & McGrain, P. (1985). Selected Kinematic Patterns of Visually Impaired Youth in Spring Running. Adapted Physical Activity Quarterly, 2, 206-213.

[10] Nakamura, T. (1997). Quantitative Analysis of Gait in the Visually Impaired. Disability and Rehabilitation, 19, 194-197.

[11] Skaggs, S., & Hopper, C. (1996). Individuals with Visual Impairments: A Review of Psychomotor Behavior. Adapted Physical Activity Quarterly, 13, 16-26.

[12] Y.Koutedakis & C, Bouziotas. National physical education curriculum: motor and cardiovascular health related fitness in Greek adolescents, Br, J, Sports Med, 37, pp311-314, 2003.

[13] R.H, Labronici, M.C, Cunha, A.D, Oliveira & A.A, Gabbai. Sport as integration factor of the physically handicapped in our society. Arq. Neuropsiquiatr. 58, pp 1092-1099, 2000.

[14] D.R, Patel & D.E, greydanus. The pediatric athletes with disabilities. Pediatr. Clin. North Am. 49, pp 803-827, 2002.

[15] P.E, Ponchillia, B, Strause & S.V, Ponchillia. Athletes with Visual impairment: Attributes and sports participation, Journal of Visual Impairment and Blindness 96, pp 267-276, 2002.

[16] A.L.F. Rodacki, N.E. Fowler & S.J. Bennett. Vertical jump coordination: fatigue effects. Med. Sci. Sports Eexerc. 34, pp 105-116, 2002.

[17] Houwen, S., Visscher, C., Hartman, E., & Lemmink, K. A.Gross Motor Skills and Sports Participation of Children With Visual Impairment. *Research Quarterly for Exercise and Sport , Vol 78*, pp16-23,2007

[18] Winnick, J. P., & Short, F. X. (1985). Physical Fitness Testing for the Disabled: Project UNIQUE. Champaign, IL: Human Kinetics