

**USING FIELD TESTS FOR PREDICTING THE GENERAL  
PHYSICAL FITNESS LEVEL OF STUDENTS WITH  
HEARING-IMPAIRED**

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***Abstract***

Children with disabilities such as hearing impairment normally indicate lower physical fitness than their hearing peers and place them at risk for secondary health problems. Deafness or hearing impairment is referred as sensory disability with hearing loss exceeding than 55dB. Almost children indicated hearing impairment have demonstrated lower physical fitness levels than their hearing peers. Hearing impaired children need a healthy lifestyles behaviour, which the general consensus in this group has demonstrated lower physical fitness levels than their hearing peers. Therefore, the reasons why populations of this group have showed lower physical fitness still have limited of studies. The objective of the study is to determine the physical fitness levels and between genders among hearing-impaired students on selected fitness components. The demographic data consists of the age group, gender, height, weight, BMI and also selected fitness components was been compiled. The convenient sampling was used to determine the hearing-impaired students. The total sample of 61 hearing impaired students (male =49; female=12) was selected from a special school for the deaf. Demographic data was collected, and series of selected fitness test batteries was carried out such as 10m shuttle run test, handgrip strength test, vertical jump test, standing broad jump test, sit and reach test, sit up test and also

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1600m run test. Descriptive statistics was used to determine the level of fitness among the students. Results show that the male students performed better than the female students in all the test batteries. The most important thing was both students can perform all the fitness tests and also the test can be used to determine the level of fitness with comparison to their hearing peers. The finding of the study may enhance the identification of fitness level of hearing-impaired students which may improve the health outcomes in them.

*Keywords-component; physical fitness; battery of field tests; students with hearing-impaired; gender differences*

## I. INTRODUCTION

Children with disabilities are typically have decreased activity as well as fitness levels. This statement has supported by [1] the percentage of children and youth with disabilities typically have decrease fitness and normally prevents them to participating with their peers involve in any activity that lead them increase risk of secondary health problem. In unhealthy lifestyles will results of obesity and low psychological factors such as depression, anxiety and stress. Researchers have studies the effects of deaf or hearing impairment children on the motor development which is they stated that hearing impairment children has lag in motor skills because they have vestibular impairment compared to the healthy peers without vestibular impairment [2].

Health related fitness and skill related fitness is the two components in physical fitness. The concept of health related fitness are composed by cardio respiratory endurance, abdominal muscular strength and endurance, flexibility of lower-back/upper-thigh (sit and reach test) and body composition specifically fatness/ leanness [3, 4, 5, 6]. Skill related fitness also has been referred as athletic performance related physical fitness were involve agility or running speed(shuttle run), balance ( Flamingo balance), explosive strength or power (vertical jump), static strength (arm pull) and coordination [3, 4, 5, 6]. Relatively little is known about the physical fitness of children with hearing impairment from other countries, particularly Asia and there have been few efforts to conduct large-scale fitness test batteries including all components such as body composition, muscular strength/endurance, cardiorespiratory endurance and

flexibility) in this population. The levels of fitness is depends on age, gender, body type as well as constraints of doing physical activity. Therefore, everyone needs a minimal amount of fitness to be healthy and competent of achieving minimal fitness levels.

Hearing impairment or deaf is broad term used to describe hard of hearing or deaf from one or both ears. This term seems as the idea of disability, whereas the people with hearing impairment see themselves as unable to communication but they able with visual. People with milder hearing loss and able to communicate well in their community is usually refers as hard of hearing [7]. WHO (1980) was describe hearing impairment is complete or partial loss of the ability to hear in one or both ears. Hearing loss can be categorized as conductive HL, sensorineul HL and mixed HL [8]. Hearing loss has been categorized by The American Sign Language Hearing Association as mild (20-40dB), moderate (40-60dB), severe (60-80dB) and profound (over 80dB) [7].

Physical fitness illustrates to a physiologic state of well-being that allows individual meet the demands in one or both physical fitness which is health related fitness and skill or performance related fitness. However, skill related physical fitness refers to components more closely related to sports and athletic performance such as balance, agility, coordination and power; whereas health related physical fitness involves components of everyday functional fitness including cardiorespiratoty fitness, muscular strength or endurance, body composition and flexibility [9]. Levels of fitness is reflects the outcomes of regular physical activity and are expect of health and functional abilities. Most of the researchers have investigated factor influence the physical fitness that have disabilities have lower physical fitness and are there associated with participation in physical activity. The physical fitness of children with hearing impairment is the similar as children do not have loss of hearing.

However, it is still unclear why deaf children generally score lower on physical fitness tests than hearing children. A valid and reliable modified version of the popular Fitness test battery was used to assess physical fitness. Test items included percent body fat (skinfolds and weight and height scale), cardiorespiratory endurance, abdominal strength/endurance (curl-ups), and flexibility (sit-and-reach). According to [1], the percentage of school aged-children with disabilities typically have decrease fitness and normally avoid them to participating with their peers involve in any activity that result in less of psychological aspect such as less self-esteem

and metabolic syndrome (diabetes). Therefore the aim of the study is to determine the physical fitness levels and between genders among hearing-impaired students on selected fitness components.

## II. METHODOLOGY

### A. *Sample*

A total of 61 subjects (n = 49 males, n = 12 females) participated voluntarily in the study. The subjects are mainly student who are studying at a various schools (special or integration classes) in Kuala Lumpur. All subjects were informed of the study procedure, purposes and all gave their inform consent by their teachers, parents or the guardians. The school authority are keeping their medical files so, it is difficult to get the information on their medical and disability status.

### B. *Instrumentation*

This study will use seven (7) tests, which are 10m shuttle run test, handgrip strength test, vertical jump test, standing board jump test, sit and reach test, sit up test and also 1600m run test.. The entire test been conducted to the subjects. Before start the test, the permission been granted by the team manager and the coaches. The subject fill in the personal detail form, the consent form and also been briefed about the tests. A demonstration session also been conducted by the test administrators. The entire test conducted for a day. The subjects had been given two (2) trials to complete the tests.

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).

Coaches often use vertical jump to measure athlete's lower body muscular power [3]. The vertical jump (counter movement jump with 90° knee flexion before the extension). The jump was performed on a hard and flat surface using the Vertec equipment adjusted to each of the participants. The subjects were asked to do a counter movement jump in which they began in a standing position, dropped in to the semi-squat position, and immediately jumped as high as possible. The jump height was given automatically by the Vertec. Two tests were performed with five minutes of rest between them. The best jump was used for analysis.

Grip strength is an important prerequisite for good performance of the upper limb. In the study, handgrip strength was measured using a standard adjustable handgrip strength test (Takei model TKK5401). Maximum handgrip forces for dominant hand were recorded in kilograms as the highest of two trials. Before testing the subjects individually, the researcher gave a brief orientation to the entire group. The dynamometer was adjusted to the size of the hand of participant. The arm, the hand and the body position were standardized according to the suggestion of the American Society of Hand Therapists. Subjects were sitting with shoulder adducted and neutrally rotated, elbow flexed at 90° resting on the table surface and the forearm in neutral and wrist in 0-30° extension. The test was performed by squeezing calibrated hand dynamometer as forcefully as possible with the dominant hand. Static strength was assessed.

Sit reach test use to measure the flexibility of the hamstrings, buttocks and lower back [10]. The subjects were instructed to reach as far as possible from a sitting position (Acuflex model 1).

Sit up test use to measure muscular endurance of the abdomen. The subjects need to lie down on the exercise mat, with both their leg bend at 90°. Upon receive the signal Go, the subjects need to perform sit up with their chest touching their leg as many as they can within 1 minute. The score will be recorded.

Standing broad jump test is use to measure leg power. Subjects need to stand behind a starting line, and try to jump as far as they could horizontally. The measurement will be taken from the nearest part of the feet to the starting line.

10m agility shuttle run test is to measure agility. Mark two lines 10 meters apart using marking tape or cones. The two blocks are placed on the line opposite the line they are going to start at. On the signal "ready", the subjects place their front foot behind the starting line. On the signal, "go!" the subjects sprints to the opposite line, picks up a block of wood, runs back and places it on or beyond the starting line. Then turning without a rest, they run back to retrieve the second block and carry it back across the finish line. Two trials are performed.

1600m endurance run test is to measure cardiovascular endurance. Subjects need to run a distance of 1600m in a 400m synthetic track.

C. *Test administration and data collection*

In this study, 10m shuttle run test, handgrip strength test, vertical jump test, standing board jump test, sit and reach test, sit up test and also 1600m run test been selected.. The entire test been conducted at 10.00 a.m. to 4.00 p.m. at Kampung Pandan Sports Complex, Kuala Lumpur. Before conducting the test, the test administrators give the briefing for the subjects how the test was conducted. Besides that the weight and height the subjects been taken and the test administrators conduct the warm up and stretching for 15-20 minutes to prepare the body from injury. Then the subjects perform the test and follow the procedure and the best's score been recorded in the scores sheet.

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.

III. RESULTS

Table I.

*Demographic data between male and the female*

Gender	Male			Female		
	n	Mean	SD	n	Mean	SD
Age	49	16.94	3.32	12	16.17	2.04
Height (cm)	49	160.30	11.93	117	152.87	9.65
Weight (Kg)	49	53.37	10.34	11	44.33	8.10
BMI	49	20.23	3.83	11	18.37	2.84

The study consists of 49 males and 12 females that are voluntarily selected. The mean age of the male students with hearing-impaired were  $16.94 \pm 3.32$  years and  $16.17 \pm 2.04$  years old for females students. The mean of height and weight for the male students were  $160.30 \pm 11.93$  m and  $53.37 \pm 10.34$  kg. For the female's students, the mean of height was  $152.87 \pm 9.65$  m and  $44.33 \pm 8.10$  kg for their weight. The demographic data of the subjects was shown on Table 1.

Table II.

*Level of fitness among the subject according to the selected components*

	n	Mean	SD
Shuttle Run test (sec)	61	11.54	1.22
1600m run test (min-sec)	57	9.51	2.77
Handgrip strength test (Right) (Kg)	61	30.93	10.19
Handgrip strength test (Left) (Kg)	61	29.77	9.80
Standing broad jump test (cm)	61	1.84	0.43
Vertical Jump test (cm)	61	40.05	11.44
Sit and reach test (cm)	61	29.94	8.32
Sit-up test (num/min)	61	28.15	7.18

Based on the data (refer Table II), shows the overall performance of the subjects. For shuttle run test, the mean score was  $11.54 \pm 1.22$ . The mean score for 1600m run test was  $9.51 \pm 2.77$ . For the handgrip strength test was  $30.93 \pm 10.19$  (right) and  $29.77 \pm 9.80$  (left). In standing broad jump test, the mean score was  $1.84 \pm 0.43$ . The mean score for vertical jump test ( $40.05 \pm 11.44$ ), sit and reach test ( $29.94 \pm 8.32$ ) and sit up test ( $28.15 \pm 7.18$ ) respectively (refer Figure 1).

Table III.

*The level of fitness among the subject according to the selected components and gender*

Gender	Male (n=49)		Female (n=12)	
	Mean	SD	Mean	SD
Shuttle run test (sec)	11.19	1.00	13.00	0.95
1600m run test (min-sec)	9.15	2.17	10.99	4.32
Handgrip strength test (Right) (Kg)	33.69	9.27	19.68	4.22
Handgrip strength test (Left) (Kg)	32.47	8.76	18.73	4.85
Standing broad jump test (cm)	1.97	0.37	1.31	0.19
Vertical jump test (cm)	43.10	10.41	27.58	5.48
Sit and reach test (cm)	30.90	8.40	26.04	6.99
Sit-up test (num/min)	30.08	6.39	20.25	4.25

The above table shows the level of fitness among the subjects according to the selected component and gender. From the table, shows the differences between male and female hearing-impaired subjects on selected fitness components. Overall, we can say that the male did better than the female on the entire test.

#### IV. DISCUSSIONS

Growth maturation as well as body composition are the factors likely to influence and affects the results of fitness testing in schools [11]. Poor physical fitness among children with hearing impairment population is associated with lack of active physical activity lifestyle. Besides that, lack of motivation can give affect on the physical activity as well as physical fitness.



Height and weight index is to assess the body fat with BMI index, which is the BMI, is positively related with age for children from 7 years onwards. Height and weight are practical variables to determine the rate of growth and development [12]. Among the children with hearing impairment, studies showing that BMI of male is higher than female students. [2] was supported the statement, boys is larger percentage of were overweight (24.7%) than girls (20.4%). The prevalence of overweight deaf children aged 6-11 years was above the national percentage for same age and gender. However, girls after aged of 8 years showed a consistent decrease in BMI with increasing age but not for the boys. Previous research showing that, height, body weight and body fat ratios is greater than female students than in the boys [12]. The body composition demonstrates dynamic pattern throughout childhood and adolescence. The differences due to gender are imitated by the differences in fatty mass between male and females. The total body mass among male children is constitute for 25% of body weight in birth, and may increase over 40% in adults, because the changes in hormonal level associated with testosterone hormone production, meanwhile among females the increases of body fat effect by elevation in estrogen level [12].

The factors of flexibility are associated with physical characteristics of skeletal muscle, tendons and fibrous tissue, and also related neuromuscular activation of related muscle groups. The flexibility of children remains constant between ages 5 to 8 years of age. The peak declination of flexibility is at 12 to 13 years of age with advancing age [12]. The flexibility values can be found in this present study, male is the higher than female of hearing impairment in primary school children. It is because muscle are elongates during pre adolescence in response to increased bone length a decrease in flexibility during period of rapid development.

Grip strength has been previously reported to correlate with gender and age also hand dominance. A study conducted by [13] show grip strength of the hand increased with age peak in subjects, and decreased steadily thereafter. Current study demonstrate, the right hand is larger value than the left side, which is can be explain the right hand is the dominant hand on this population. The decrease of the peak strength of the forearm muscles may be frequently in daily functional activities such as lifting heavy load. Grip strength at both gender begin to decline at pubertal period. The handgrip strength among school-aged children in this study showed that handgrip strength is greater in males. Similarly, there studies in which the handgrip strength was

found to be superior in males than females with significant maturation differences [12]. Previous studies found out in the same way, female students with hearing impairment shows the lowest result compare to blind girls and also to the male in the same age groups [14]. The reason why female are lowest result than male in most of the studies, because sustained isometric handgrip can be certified to limit blood flow by intramuscular pressure in stronger men contracting at a greater absolute force but similar relative contraction intensity as weaker women [15].

Abdominal strength and endurance levels is the ability of a muscle, or a group of muscles, to sustain repeated contractions measured by the number of sit-ups were significantly lower in female primary school, but as age increase male secondary school are perform lower than female in same age. According to [16], the results of poor abdominal muscle strength and endurance is going to compromise trunk stability during many gross motor skills, more difficult making skill acquisition and performance thus lead to musculoskeletal problem such as lower back pain.

Meanwhile in vertical jump is related to estimates explosive leg power. The techniques of vertical jump need forces are directed upward and projection takes place with the center of gravity directly over the base of support. Jumping is an integral part of movement that is used every day in physical activity. The other studies are found body weight or body size can clarify vertical jump performance because it is directly measure of muscle power and also the energy storing capacity of the musculo-tendinous apparatus [17]. The important in performing vertical jump is strength of the knee extensor. In current studies are found, male muscle leg power in both age groups are perform greater than female and significantly ( $p < 0.05$ ) in gender differences. In addition, the power parameters were influenced by the contribution of force and velocity, which is the time to reach, was assumed to reflect muscle contraction speed reaching a fixed force level [18].

Measures up to in agility, male students are indicating significantly greater compare to female student of both groups [15]. Physical fitness is a function of both physical activity and hereditary factors as well as is regulated by hormonal system, but we are not measure any relative of contribution of physical activity and these other factors with physical fitness [17]. Few studies for Hong Kong children were found less cardiovascular endurance and muscular

fitness are associated less physical activity [5]. If hearing impairment students are regular participate in physical activity which is associated with important health gain, thus suggesting lifelong benefits. Physical fitness itself are correlated with the ability to perform fundamental motor skills, such as jumping, throwing or kicking has been positively associated with physical activity participation in children and is considered an important prerequisite to sport participation [19].

## V. CONCLUSIONS

The comparison among hearing impairment between gender in both age groups and physical fitness showed significant difference ( $p < .05$ ). Height and body weight as well as total body mass will increase as increase of age. Growth maturation as well as body composition are the factors likely to influence and affects the results of fitness testing in schools. The finding in term of health related fitness and skill related fitness revealed variations in body composition, abdominal endurance, flexibility, cardiovascular endurance, muscle power, handgrip strength and agility between gender in both age groups.

The information of physical fitness among hearing impairment children can be gained through simple modification of the same batteries used for hearing children. In studies conducted using different method it has been found male in primary and secondary than the girls. This is suggestion for a fitness test battery as popular as the fitnessgram and especially one that is used within the school system where accountability has increased in over the years. The information is not only does permit easier identification levels of fitness among children but also helps parents and teachers to assess improvement with respects for those children who have hearing impairment.

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