

A PRELIMINARY STUDY TO COMPARE MOTOR SKILLS ABILITY AMONG PEOPLE WITH ALBINISM IN MALAYSIA AND AUSTRALIA

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Abstract

In the past, researchers had the tendency to include people with albinism under the same category of visually impaired individuals when motor skill study is conducted. Thus, this study investigated on the differences in motor skills potential in children and adults among people with albinism (PWA) in Malaysia and Australia. Apart from that, it also aimed to compare motor skills ability between the PWAs and the normal individuals of the two countries. Two tests were carried out to evaluate fine motor skill namely the match-board and Phepple-type stabilimeter. In finger movements test, the results indicated that both Australian PWA children and adults groups are more skilled and with better dexterity in their finger movement compared to PWAs in Malaysia. In arm stability test, Australian PWAs have greater number of touches than Malaysian to complete the tracing cycle. In term of speed it was the opposite. In conclusion, the motor skill among PWAs is lower compared to the pigmented individuals by two grades. Interventions such as extra time and provision of visual aid should be instituted to help them.

Keywords: albinism, motor skills, visual impairment

Abstrak

Pada masa lalu, penyelidik mempunyai kecenderungan untuk memasukkan individu penghidap Albinism (PA) di bawah kategori yang sama dengan individu yang cacat penglihatan apabila kajian kemahiran motor dijalankan. Kajian ini dijalankan untuk mencari potensi dan perbezaan kemahiran motor dalam kalangan kanak-kanak dan orang dewasa penghidap Albinism di Malaysia dan Australia. Selain daripada itu, ia juga bertujuan untuk membandingkan keupayaan kemahiran motor di antara penghidap Albinism dan individu normal kedua-dua negara. Dua ujian telah dijalankan untuk menilai kemahiran motor halus iaitu match-board dan Phepple stabilimeter. Dalam ujian pergerakan jari tangan, keputusan menunjukkan bahawa kedua-dua kumpulan kanak-kanak dan dewasa Australia lebih mahir dan dengan ketangkasan yang lebih baik berbanding kumpulan-kumpulan di Malaysia. Dalam ujian kestabilan lengan, penghidap Albinism Australia mempunyai bilangan sentuhan yang lebih tinggi dari Malaysia untuk melengkapkan satu kitaran gerakan. Daripada segi kelajuan, ia adalah sebaliknya. Kesimpulannya, kemahiran motor di kalangan penghidap Albinism adalah lebih rendah sebanyak dua gred berbanding dengan individu-individu yang berpigmen yang normal penglihatan. Intervensi seperti masa tambahan dan peruntukan bantuan visual wajar diberi untuk membantu mereka.

Kata kunci: albinism, kemahiran motor, cacat penglihatan

INTRODUCTION

Visual Impairment and Fine Motor Skills

The visual impairment has an impact on all aspects of child's development (Warren, 1994). One of the most significant fields is the development of fine motor skills which include reaching, grasping, carrying, release, in-hand manipulation, eye-hand coordination and bilateral hand use. These abilities are essential for interaction with the environment (Henderson & Pehoski, 1995; Exner, 2001). In a normal and pigmented individual, the development of fine motor skills provides children avenues to engage in self-care tasks, play and later to accomplish in career of their choice and thus experience their actions on the world (Exner, 2001).

Piek *et al.* (2010), Poulsen, Ziviani, Johnson & Cuskelly (2008), Skinner & Piek (2001), Verrips *et al.* (1999) and Sleuwenhoek, Boter & Vermeer (1995) reported that motor skills also play a crucial role in the social and emotional functioning of child such as anxiety (Shaffer *et al.*, 1985), anxious and depression (Piek *et al.*, 2010) and may impact quality of life and well being. People with albinism have been reported as emotion unstable compared to pigmented normal individuals (Mai Shihah & Yogeswaran, 2009; Mai Shihah & Julismah, 2005; Ezeilo, 1989). Research has demonstrated the significant relationship between fine and gross motor ability, self perceptions and self worth in children and adolescents (Piek *et al.*, 2006) in both athletic and scholastic competencies. Therefore, would poor motor skills often noted among people with albinism lead to poor performance in physical activities and cognitive domain? In which may reduce a child's sense of competence in both worlds? Subsequently, it may lead to withdrawal from movement activities that would, in turn, lead to limited opportunities to practice motor skills in physical activities (Skaggs & Hopper, 1996) and participate socially (Skinner & Piek, 2001).

When vision is impaired, motor problems will occur (Brambring, 2006) and Warren (1994) has indicated that several variables are linked to impaired vision such as environmental opportunities and barrier to movements. Houwen, Visscher, Lemmink & Hartman (2008, 2009) in their review reported that data concerning the motor skill performance of school-age children and adolescents with visual impairment remain scarce as most of the research is based on motor fitness performance or motor development in infants with visual impairment.

Visual information plays an essential and guiding role in the planning and execution of voluntary goal-directed movements, especially during development and learning (Reimer, Cox, Boonstra & Smits-Engelsman, 2008; Cox & Smithsman, 2006; von Hofsten, 2002). The complex visual system, in particular, is part of many perception-action couplings that allow individuals to meet the demands coming from a dynamic environment. Children with visual impairment are partly or completely deficient in the input of one of the vital sensory organs. If the visual information is incomplete or impoverish, the information necessary for action becomes more dependent on the remaining senses, and, as a result, behaviour often becomes less effective and efficient.

Reimer *et al.* (2008) showed that there are specific differences in sensory motor control between children with visual impairment and children with normal vision. What makes their findings more interesting is that, the differences were not all caused directly by the poor vision per se, but seemed to result from poorer calibration of the sensory information necessary for task performance. Various aspects of children's everyday behaviour (e.g. goal-directed movements and

spatial orientation), as well as the general cognitive, social and emotional development, are negatively influenced by this condition (Troster, 1993).

Qualitatively and quantitatively, the motor development of the two groups, normal vision and visually impaired are different and it cohesively with both fine-motor and gross-motor skills abilities (Houwen *et al.*, 2008; Vervloed, 1996). People with visual impairment are observed to experience uncertainty and insecurity with respect to the position and movements of their own body in space, of their own limbs with respect to their body, and of other people and objects in a room. On top of these deficiencies, it takes them more effort to complete tasks involving fine-motor skills, such as object manipulation, object-oriented play and tool use.

Smit-Engelsman, Reimer & Siemonsma-Boom (2003) in their study, comparing the two groups found that children with visual impairment, the performance was slower and more on one side of the body than in children with normal vision. Furthermore, they are risk for insufficient development in their fine-motor skills and eye-hand coordination (Johansson, Westling, Backstrom & Flanagan, 2001). The drawback is that, these children are lack the intrinsic motivation to explore small objects and are less aware of, and as a result show less interest in, the detail-information that things possess (Cox *et al.*, 2009). These, of course, give rise to negative effect on the amount of time they spent on performing fine-motor activities or task typically associated with exploration and manipulation of objects, compared to their normally sighted peers.

ALBINISM AND THEIR VISUAL PROBLEMS

In most cases, researchers tend to group people with albinism as individuals with visual impairment and conclusions are made without including important variables such as photophobia, pixellation, astigmatism and nystagmus which are very significant to them (Evans, personal communication, 2009). Evans described photophobia as a dislike to light which is primarily caused by a lack of pigment inside the eye that leads to transillumination (technical term to describe a faulty of the iris). In dull sunlight, this results in a blurry picture on the retina. On the other hand, in bright sunlight the retina gets too much light which causes pain and worsen the vision. In people with albinism's eyes, retina has fewer cones (function for higher definition daylight colour vision) so daylight visual acuity is not as good as it should be for them and the impact is what Evans coined it as pixellation.

When transillumination and pixellation are not improved and benefited by wearing spectacles but astigmatism does. Most people with albinism eyes have more significant distortion in shape (oval, and round in most normal pigmented person) which leads to noticeable defocus in either vertical or horizontal edges. The implications are fuzzy reading verticals which slow the reading speed and also allow letters to run into one another, for example rn becomes m. Tipping head or rotating text will minimize this effect. Nystagmus is an eye wobble which is controlled by the brain and individuals with albinisms reduced this problem by having different head posture.

Albinism, Reading Ability and Motor Skills

There is more than merely "visual impairment" and reading difficulties among people with albinism as demonstrated by Mai Shihah (2009). As an intervention, CERT (calculator to estimate

reading time) was invented (Mai Shihah, 2006) to facilitate the additional time required by PWAs in Malaysia. On top of it, albinism gives impact on visual perceptual-motor abilities. It includes both visual perception and visual-motor integration. Visual perception-motor are skills those involved in processing and using visual information for movement. Thus, integration of variables such as visual spatial perception, motor perception and visual-motor coordination play important role in the motor skill performance of children with visual impairment (Sleeuwenhoek *et al.*, 1995; Winnick & Lavay, 2005).

Cultural Differences and Motor Skills

Cultural differences especially parental attitudes, beliefs and practices have demonstrated to be related to children's performance in various domains (Eccles, 1993; Goodnow & Collins, 1990; Hess & Hollaway, 1984). Parent is a great source of influence in children's beliefs and achievement motivation through the messages they communicate regarding their own competence and preferences (Eccles, 1993). A recent study by Huntsinger, Jose, Krieg & Luo (2011) found that cultural differences in Chinese American and European American children's drawing skills, which requires a massive effort in fine motor skills. This aspect is regard may be important in the development of children with albinism because of limited interaction and confined among family members especially the parent.

OBJECTIVES

Due to scarce information in context of people with albinism's motor skill abilities, the objectives of this preliminary study are as follows:

- a. To assess skills and dexterity of finger movements and stability of the arm among PWAs in Malaysia and Australia.
- b. To compare motor skills ability between the two groups.
- c. To compare motor skill abilities between PWAs and the normal individuals.
- d. To put forward recommendations on intervention for people with albinism.

METHODOLOGY

This experimental study investigated the potential differences in motor skills between people with albinism (PWA) in Malaysia and Australia. The diagnosed respondents with albinism, (Australian: n=13, age 7-60 (mean=26.77 years), 2 male and 11 female; Malaysian: n=11, age 3-62 (mean=25.96years), 4 male and 7 female) while the individuals with 6/6 eye acuity, Australian (n=9, age 23 – 46 years, 6 female and 3 male); Malaysian (n=8, age 6-51 years, 4 female and 4 male) were tested. This study was approved by International Islamic University of Malaysia Ethical Committee.

Two tests were carried out to evaluate fine motor skill namely the match-board (Figure 1) on skill and dexterity in the movement of fingers and Phepple-type stabilimeter (Figure 2) on wrist and arm stability. The respondents' performances were graded according to age-group scale as described in method for an Aptitude Test by Masahide Kato (1950). The scores are between 7 to 13 and grades A to G (Tables 1 – 5).



Figure 1. Match-Board



Figure 2: Phepple-type stabilimeter

Briefly, for tests on skill and dexterity in the movement of fingers, the respondent is asked to take out one by one the small sticks from the holding box with his/her dominant hand and placed them into the holes in the plate as fast as he/she can in the right order from the upper left to right (reversed order for left-handed respondents). Each is given a preliminary practice with five sticks. When ready, the test is carried out for two minutes. The general score based on the number of sticks placed into the holes as in Table 1 and according to age group as in Table 2.

Table 1: General Score for Match-Board Test

| Grade | 13 | 12 | 11 | 10 | 9 | 8 | 7 |
|------------------|--------------|-------|-------|-------|-------|-------|--------------|
| Number of sticks | More than 81 | 80-75 | 74-69 | 68-63 | 62-57 | 56-51 | Less than 50 |

(Methods for an Aptitude Test, Masahide Kato, 1950)

In Phepple-type stabilimeter test, the respondent is to pinch the stylus with his/her index and middle fingers applied from the lower side and his/her thumb applied from the upper side. Then he/she is told to place the stylus into the groove until the tip of the stylus is positioned 5 to 10 cm inside from the surface of the metal panel. Then the respondent is to hold the stylus at an angle of slightly more than 90° to the left side panel with groove and move it to the right end, trying to prevent the stylus coming into contact with the edge of the groove or the surface of the inside plate. However, should the sound of buzzer went, the respondent is required to take it from it and continue the tracing until he/she is through with it.

Prior to the test, the respondent is allowed to make a preliminary tracing to get the hang of it. The time (in seconds) taken and the number of touches made by the respondent to complete the test are recorded and evaluated according to reference Tables 3, 4 and 5.

Table 2: Score for Match-Board Test according to Age-Group

| Score | Gender | A | B | C | D | E | F | G |
|------------------------|---------------|--------------|----------|----------|----------|----------|----------|--------------|
| Less than 12 years old | Boys | More than 74 | 73-68 | 66-62 | 61-56 | 55-50 | 49-44 | Less than 43 |
| | Girls | More than 74 | 73-68 | 66-62 | 61-56 | 55-50 | 49-44 | Less than 43 |
| 13 years old | Boys | More than 77 | 76-71 | 70-65 | 64-59 | 58-52 | 51-47 | Less than 46 |
| | Girls | More than 78 | 77-72 | 71-66 | 65-60 | 59-54 | 53-48 | Less than 47 |
| 14 years old and above | Boys | More than 78 | 77-71 | 70-65 | 64-59 | 58-53 | 52-47 | Less than 46 |
| | Girls | More than 79 | 78-73 | 72-67 | 66-61 | 60-55 | 54-49 | Less than 48 |

Table 3: Grading for Score for Time Taken in Phepple-Type Stabilimeter

| Grading score | 13 | 12 | 11 | 10 | 9 | 8 | 7 |
|----------------------|----------------|-----------|-----------|-----------|----------|----------|----------------|
| Score | More than 19.5 | 19 | 18.5-18 | 17.5-17 | 16.5-16 | 15.5-15 | Less than 14.4 |

(Methods for an Aptitude Test, Masahide Kato, 1950)

Table 4: Grade for Speed (Time in Seconds)

| Age group | Gender | A | B | C | D | E | F | G |
|---|---------------|-------------|----------|----------|----------|----------|----------|--------------|
| 6 th grade in elementary school | boys | Less than 7 | 8-12 | 13-17 | 18-22 | 23-27 | 28-32 | More than 33 |
| | girls | Less than 8 | 9-13 | 14-18 | 19-23 | 24-28 | 29-33 | More than 34 |
| 1 st grade in Junior high school | boys | Less than 4 | 5-6 | 7-8 | 9-10 | 11-12 | 13-14 | More than 15 |
| | girls | Less than 4 | 5 | 6-7 | 8-9 | 10-11 | 12-13 | More than 14 |
| 2 nd grade in junior high school | boys | Less than 4 | 5-6 | 7-8 | 9-10 | 11-12 | 13-14 | More than 15 |
| | girls | Less than 4 | 5 | 6-7 | 8-9 | 10-11 | 12-13 | More than 14 |

Table 5: Grade According to Number of Touches

| Age group | Gender | A | B | C | D | E | F | G |
|---|--------|--------------|-------|-------|-------|-------|-------|--------------|
| 6 th grade in elementary school | boys | Less than 12 | 13-18 | 19-24 | 25-30 | 31-36 | 37-42 | More than 43 |
| | girls | Less than 8 | 9-14 | 15-20 | 21-26 | 27-32 | 33-38 | More than 39 |
| 1 st grade in Junior high school | boys | Less than 8 | 9-14 | 15-20 | 21-26 | 27-32 | 33-38 | More than 39 |
| | girls | Less than 8 | 9-14 | 15-20 | 21-26 | 27-32 | 33-38 | More than 39 |
| 2 nd grade in junior high school | boys | Less than 7 | 8-13 | 14-19 | 20-26 | 26-31 | 32-37 | More than 38 |
| | girls | Less than 7 | 8-13 | 14-19 | 20-26 | 26-31 | 32-37 | More than 38 |

RESULTS AND DISCUSSION

The experimental design of this study required respondents to perform two types of movement, the skills and dexterity of finger movements and arms stability. Preliminary analysis revealed that there were differences between the two groups of children, AC and MC. Out of 5 Australia PWA children (AC), 3 were graded E (mean= 51 sticks) and 2 with grade G (mean= 35 sticks) compared to Malaysia PWA children (MC), 5 were graded as G (mean = 42 sticks) and 1 with D (mean = 60 sticks). The average sticks placed in the holes correctly for AC is 44.6 and MC is 42.67 and both groups fall in the G grade.

Among the adults, Australian PWA (AA) fared better than Malaysian PWA (MA) with mean sticks of 68.5 (grade C) to 48.4 (grade G). The results indicated that both Australian PWA groups are more skilled and with better dexterity in the movement of fingers compared to Malaysian PWAs.

Phepple-type stabilimeter test was carried out to measure the stability of the arm. Among the AC, the average touches were 9.87 counts (grade B) to complete the tracing cycle compared to with 6.4 counts (grade A) among the MC. AC scored an average speed of 7.39 seconds (grade C) compared to MC with 4.39 seconds (Grade A). When comparison was made between the adults, AA showed arm stability with an average 9.96 touches (grade B) and speed 8.75 seconds (grade D) to 6.6 touches (grade A) and speed of 6.13 seconds (grade C) among MA. The arm stability test result showed that children have better arm stability compared to adults.

The preliminary study on the pigmented individuals with 6/6 visual acuity showed that both nationalities scored between grade C to A in both tests. Interestingly, the study revealed that the Malaysian group (with and without albinism) fared better in the number of touches (4.25 to 7.22 touches) but worst in the speed (4.30 to 4.02 seconds) in arm stability test to those the Australian. Interestingly, both the pigmented groups from both countries fared equally well in their motor skill and dexterity of the fingers.

Table 6 displays the group averages between people with albinism and normal pigmented individuals in the skills and dexterity test and also the arm stability tests.

Table 6: Dependent Variables as a Function in Skills, Dexterity for Finger Movement and Arm Stability among the Respondents

| Tests | Dependent variables | People with albinism (visually impairment group) N= 24 | Pigmented individuals (6/6 vision group) N = 24 |
|---|-----------------------------------|---|--|
| | | Age | Mean (years) |
| Skill and dexterity of finger movements test | Mean number of sticks | 51.45 | 60.58 |
| | Mean score | 8.27 | 9.31 |
| | Mean grade | 2.2 (F) | 4.1 (D) |
| Arm stability test | Mean speed (seconds) | 6.92 | 4.19 |
| | Mean grade for speed (seconds) | 5.29 (C) | 7.07 (A) |
| | Mean touches | 8.44 (B) | 5.52 (A) |
| | Mean touches grade | 5.71 (C) | 6.99 (A) |

Results demonstrated in this study showed that people with albinism whom has been regard as individuals with visual-impairment (Mai Shihah, 2009; Mai Shihah & Yogeswaran, 2009) were less proficient – by two grades in motor skills in both the fingers movements and arm stability compared to those who are normal-vision pigmented individuals. Such results are expected as previously described in several studies by Brambring (2006) and Warren (1994) conducted on visual impairment individuals. However, to the best of our knowledge, no study has described their degree of deficiencies. Our study has estimated the degree of severity for people with albinism to perform tasks which require motor skills. It has also proven that PWAs are less precise in their ability to place things accurately. For a high degree of motor skills it requires a good coordination between vision and hands/arms movements. A plausible explanation could be due the presence of nystagmus among them. Consequences, PWA with visual impairment are partly or completely deficient in the input of one of the vital sensory organs. If the visual information is incomplete or impoverish, the information necessary for action becomes more dependent on the remaining senses, and, as a result, behaviour often becomes less effective and efficient.

Our study also support that visual information plays an essential and guiding role in the planning and execution of voluntary goal-directed movements, especially during development and learning as described by Reimer, Cox, Boonstra & Smits-Engelsman (2008), Cox & Smithsman (2006) and von Hofsten (2002). Furthermore it also showed that qualitatively and quantitatively, the motor development of the two groups, pigmented normal vision and visually impaired people with albinism are different and cohesive with both fine-motor and gross-motor skills abilities as demonstrated in fingers dexterity and arm stability. Report by Reimer *et al.* (2008) could be applied as an explanation because they have shown that there are specific differences in sensory

motor control between children with visual impairment and children with normal vision. What makes their findings more interesting is that, the differences were not all caused directly by the poor vision per se, but seemed to result from poorer calibration of the sensory information necessary for task performance.

On one hand, among the normal pigmented individuals, there was equal competence between those from the two nations but on the other hand, Australian PWAs were found to be more skilful compared Malaysian's. This could be due to probably the emotion factor as described by Troster, (1993) as one of the aspects to consider in justifying the differences of the two groups. In our observation, Australian PWAs are more active, lively and very sociable and these are some of the social and emotional descriptors which contributed to the differences.

Another point to seriously consider among the PWAs in Malaysia is the fact that "white-skinned" individual is more "obvious" and become centre of attraction among the "darker" members of his/her community. This would inevitably cause the low esteem and consequently bring down the self confidence in them.

An added factor could be the obvious differences in the culture of the two communities. Other contributing factors could be parents of Australian PWAs are more knowledgeable, willingness and openly discuss on matters regarding the PWA's in competencies but strongly encourage their PWA children to lead their life as normal as possible regardless of their visual impairments. In Malaysia, Mai Shihah and Julismah (2005) reported that those PWAs from high and medium social economic status are observed with high confidence, better academic qualification and good career. They were also observed to be more skilled as demonstrated in this study.

We hope that this study contribute to an additional information specifically on people with albinism as Houwen *et al.* (2008, 2009) in their review reported that data concerning the motor skill performance of school-age children and adolescents with visual impairment are scarce. The different motor skill ability between the two nations implicates that further research to develop norm among both the normal pigmented individuals and people with albinism in their own context. Subsequently, to justify alternative mean of interventions such as low visual aid and extra time are to be given to help them especially those who are in careers deal with minute parts assembly, repair, and machining and etc.

CONCLUSION

In conclusion, the motor skills such as manual and dexterity of finger movements and arm stability among PWAs are lower compared to the pigmented individuals. Australian PWAs are more skilled compared to Malaysian PWAs.

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