The White Cane. Its Effectiveness, Challenges and Suggestions for Effective Use: The Case of Akropong School for the Blind

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Authors’ contributions

This work was carried out in equal collaboration between both authors. The authors designed the study, managed the literature search, performed the analysis, wrote the protocol and wrote the first draft of the manuscript. Both authors read and approved the final manuscript.

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ABSTRACT

The article analyses the effectiveness and challenges of the use of the white cane and makes suggestions for its effective use. We explain that the white cane is one of the widely used and famous orientation and mobility (O&M) tools designed for pupils with visual impairment to move independently in their environment. By employing the descriptive qualitative design, we draw our findings from 12 participants who were pupils of the Akropong School for the Blind in Ghana. We make implications and conclude on the findings for policy formulation on the white cane, and make suggestions for future research work.

Keywords: White cane; visual impairment; orientation and mobility (O&M); basic school pupils.

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1. INTRODUCTION

“If typical peers can walk down the block to visit a friend's house, a blind child should be able to do the same. When typical peers walk to school with their friends instead of their parents, a blind child should be able to do the same. When typical peers drive to school or after-school jobs, a blind teenager should be able to take public transportation or arrange a ride with others. All too often, these skills are developed later or not at all, and they can sentence a child with visual impairment to a lifetime of dependency” [1].

Life independency and educational achievement for pupils with visual impairment concern the whole concept of special education. The aim of special education is to narrow the gap between inability and ability, so that educational achievement can be measured through examining the output; if pupils with disability who attend regular schools can achieve well and competitively, then teachers can adopt an assistive technology [2]. To facilitate O&M training for children with visual impairment, assistive technologies such as the white cane is quintessential. Due to the relevance of O&M, [3] suggest the need for creating awareness of the importance of O&M intervention, and ensuring sufficient numbers of qualified O&M personnel. Qualified O&M personnel are important because, they are more likely to help students with visual impairment to live independently and progress academically [4]. In the midst of O&M services, [4] state that instructors need to ensure continuous provision of assistance that is required to improve the condition of the pupils. It should be acknowledged that O&M services have become a component of the curriculum of special education in many countries including Ghana. Previously in Ghana, persons with visual impairment were viewed as liabilities in their communities. They were killed, overprotected or misdiagnosed such that they lived a life that was isolated and degraded [5]. In 1945, an organized effort was made regarding the establishment of the first school for the Blind at Akropong-Akuapem and in 1958, Wa school for the Blind was also established. The aim was to educate all children with visual impairment by giving them knowledge of the realities around them, the confidence to cope with those realities, and the feeling that they are recognized and accepted as individuals. Owing to this, the curriculum of schools for children with visual impairment follows a similar pattern as the curriculum for schools of regular education [6]. The syllabus, however, was modified and adapted to suit the educational needs of pupils who are visually impaired. As part of it, O&M services are made a core component of the curriculum. Therefore, the need to uncover the effectiveness of O&M services to acknowledge its indispensable role among persons with visual impairment.

2. LITERATURE REVIEW

2.1 Concept of Visual Impairment

Visual impairment has been used to denote persons whose visual capacities extend from having a limited vision to total blindness. Three definitions are reported in literature: the medical, legal and educational definitions. Medically, a child is depicted as having a visual impairment if the retina or other associated structures cannot transmit light impulses to the brain. Legally, an individual with low vision has a visual acuity of 20/70, implying that he or she can see an object at 20 feet, though an individual with normal vision can see at 70 feet [7]. Goldstein as cited in [6] further defines legal blindness as central visual acuity of 20/200 or less in the better eye with corrective glasses or central visual of more than 20/200 if there is a visual field defect in which the peripheral field is contracted to the extent that the widest diameter of the visual field subtends an angular distance not greater than an angle of 20 degrees. This implies that, an individual with visual impairment can see an object at 20 feet while a normal eye can see at 200 feet. For educational purposes, an individual is blind if his or her vision is defective to the extent that modification in curriculum content and adaptation is required [6].

2.2 Concept of O&M

O&M is concerned with the abilities that empower an individual to safely and effectively get about through the environment. Lowenfeld, as cited in [8] states that O&M describes the competency which enables the child to achieve safe, efficient and graceful movement through the environment. An individual needs to be effectively oriented before he or she could achieve purposeful mobility. The key objective of O&M services is for persons with visual impairment to go in any condition as freely as could reasonably be expected. To achieve this objective, people with visual impairment must be trained from the earliest age [9]. It should be acknowledged that the ability of a child with a visual impairment to learn can be influenced by
the interrelated domains of development. This is due to the absence of visual sensory information and conflicting encounters with the environment. Without the use of O&M services, the cognitive, social, emotional, daily living, career and vocational, sensory and motor skills of the child are affected [10]. This makes O&M relevant.

2.3 O&M Techniques: The White Cane

O&M technique is the ability to identify and use nonvisual environmental clues and landmarks, knowledge of indoor and outdoor numbering systems, measurement and compass directions, the ability to access a range of maps (audio or tactile), and the development of self-familiarisation skills and strategies [11]. Effective use of these techniques requires the use of cognitive processes such as decision making, problem-solving, and an understanding of the body, spatial, and environmental concepts [11]. Although there are numerous O&M techniques, the study covers the white cane.

The white cane is the most frequently used device for persons with visual impairment who travel by themselves. It is a lightweight metal or a fiberglass tube. It may be one piece, or collapsed into one small section or several sections. The length is determined by the individual's preference and it may be white or metallic in colour with a few with a red tip. The amount of red showing on a cane, or the colour of the handle, has nothing at all to do with the skill nor have anything to do with the amount of vision of it user. While each technique is designed for a specific purpose or use in a specific travel environment, the techniques as a whole provide the foundation that enables the user to travel safely and effectively in most environments. The white cane is used for detection, negotiating doors and stairs, negotiating obstacles and shore-lining [12]. In furtherance, seven ways to use the white cane effectively as identified by [13] and [14] are explained below:

Position of the cane: When holding the long cane, the arms should be relaxed with the grip of the cane held at waist height or above with the cane held in the centre of the palm. Arms relaxed but slightly bent at the elbow [13].

The index finger: The index finger is positioned to extend along the flat edge of the long cane grip, pointing towards the tip when placed on the ground. The remaining fingers cup under the grip with the thumb hooked over the top of the grip [13,14].

Wrist action: The cane is positioned at the midline of the body and held forward of the body. Using flexion, extension, and hyperextension, the wrist is flexed to move the cane from left to right [14].

Arc height: As the cane, the tip is moved from side to side (left to right) at the apex of the arc, the tip should be 1 inch (or not more than 1.5 inches) [14], or 1.5 to 2 inches [13] off the ground.

Arc width: The tip of the cane should touch the ground on either side of the traveller, either slightly beyond [13] or at a distance of approximately 1 inch [14] beyond the widest part of the cane user.

Rhythm: The tip of the cane touches the ground ahead of the traveller in time with the heel strike [13,14].

Step: As the cane touches the ground on the left, the right heel lands and as the cane touches the ground on the right, the left heel lands [14].

2.4 Challenges of White Cane Usage

Environmental factors cause serious orientation problems for persons with visual impairment. In Ghana, [5] observed that the layouts of school environments for the blind do not facilitate the easy mobility of pupils. Again, environmental concepts such as traffic do not come to pupils who are visually impaired as easy as it comes to the sighted pupil which makes traffic concepts vital for such pupils to safely utilise the surroundings [15]. Moreover, when persons with visual impairment move around in the environment, they may encounter risky situations, such as crossing the road where the possibility of death or injury is very high. The street crossing is easily learned by sighted pupils, but not pupils who are visually impaired [16]. It is therefore not uncommon to see pupils falling into gutters bruising the sheens of their legs. This impinges on their confidence and desire to go on independent travel or indulge in mobility training lessons.

From the foregoing, the relevance of O&M techniques and particularly the white cane cannot be lowballed. O&M tools such as the white cane are critical for the well-being of
persons with visual impairment. It has been found in China that 10 weeks of blind baseball training for the students showed significant improvement in O&M skills [17]. Studies conducted in Australia, the United Kingdom, and the United States, have reported that O&M interventions aid young children to demonstrate competent and responsible white cane mobility techniques [18]. In Ghana, studies such as [19,20] have been done on O&M. However, there appears to be no information on the effectiveness of O&M techniques particularly the white cane among pupils with visual impairment at the basic school level as well as the challenges they face in the use of the white cane. For instance, [19] focused on the competency of students in using the white cane at the senior high school level whereas [20] considered the support services available for students with visual impairment. We argue that, currently, no information can be found particularly on the effectiveness of the use of the white cane, the challenges and obstacles regarding the use of the white cane as well as the suggestions to the effective usage of it. The ultimate questions to ask are: how effective is the use of the white cane among basic school pupils? What challenges and obstacles do pupils face in the use of the white cane? What are the suggestions for the effective use of the white cane? These questions are critical because pupils with visual impairment are expected to leave independent lives in and after school. For pupils with visual impairment to successfully master control of the environment, we argue that proficiency and effectiveness of the white cane are required with limited or no practical challenges or obstacles.

3. METHODS

3.1 Research Design

The study uses a descriptive qualitative design. Qualitative research obtains data in the natural setting of the phenomenon in question [21]. The qualitative strategy is effective because it relates to cases that are mostly of a social phenomenon, like in this case, the effectiveness of the white cane among pupils with visual impairment.

3.2 Population and Sample

The study area was the Akropong School for the Blind. The school was chosen because it is the first of the two schools for the Blind in Ghana. The population of the study consisted of 40 final year pupils (24 males and 16 females) who had varying degrees of impairment. Out of the 40 pupils, purposive sampling was used to select 12 participants. We used 12 participants when we observed that the level of saturation and adequacy have been reached [22] and that selecting a large sample for the interviews will result in a superficial information [21]. The inclusion criteria were pupils who have and can use the white cane.

3.3 Instruments

Semi-structured interview and observation guides were used to collect data for the study. The content validity of the instruments were assessed by expert judgments. Reliability was achieved through pilot testing where four (4) pupils (10% of the population) from the Bechem School for the Deaf in Ghana were used. Four (4) cane users consisting of two male and two female who were in their final year were interviewed and observed. Again, critical elements in the reliability of qualitative research such as credibility, transferability, dependability and confirmability were strictly adhered to.

3.4 Ethical Issues

Ethical issues such as informed consent, confidentiality, and anonymity were followed. In particular, participant were told not to indicate their names to reveal their identity. Again, the information they provided were kept confidential and they indicated their agreement to be part of the study. Besides, photographs that were taken during the observations did not show the faces of pupils and this was done by masking.

3.5 Data Analysis

After the transcription, thematic analysis was used in analyzing data gathered from the interview. In the thematic analysis, major issues were put in main themes. Core principles of the thematic approach to qualitative data analysis by [23] were adapted for use in this study. We analysed the data based on themes namely "motor vehicle movement and use of traffic", "challenges/obstacles" and "suggestions on the use of the white cane". In the analysis, we present a vivid and compelling extract of examples. We also use verbatim extracts chosen from the pool of responses. The observation data was used to support the interview data.

4. FINDINGS AND DISCUSSION

We sought to determine how effective pupils with visual impairment use the white cane, the
challenges and obstacles they face in using the white cane, and make suggestions to overcome the challenges.

4.1 Effectiveness of the Use of White Cane

Pupils were asked to describe how they use the white cane while they were been observed. We compared their responses with [13] and [14] criteria for the use of the white cane. The pupils reported on the diagonal position swing of the white cane, wrist action, and the steps. They also mentioned the position of the forefinger. In assessing the effective use of the white cane, the following were reported:

"I use my white cane by holding the handle with my index finger, and then as I move my right leg, the white can goes left, and when I move my left leg, the white cane goes right". (Participant C, see Fig. 1).

When holding the white cane, the arms should be relaxed with the grip of the cane held at waist height or above, with the cane held in the center of the palm, arms relaxed but slightly bent at the elbow [13]. Participant C performs the wrist and step action appropriately. He also bends the elbow slightly and stretches the forefinger out in the most appropriate way. Participant C uses the white well. However, we observe that he firmly grips the cane contrary to what is described in the literature.

Another pupil also had this to say about how she uses the technique:

“As my brother just said you hold it in such a way that you let your palm be on top of where the rope is, then you let your forefinger be on the flat part. As you are walking when, you are taking the right step, the white cane should go to the left-hand side. And as you are taking your left leg too, it should go to your right side. You are to hold it in a way so that if getting to a pit or gutter, you will be able to know” (Participant B, see Fig. 2).

From Fig. 2, participant B is unable to perform the wrist and step action appropriately. We observe that the participant holds the cane below waist level. The positions of the forefinger are all contrary to what literature posits as standards.

A male participant (F) also had this to say:

“I always make sure I hold the white cane where the rope is located and place my forefinger on the flat part. As I am walking, when I move my left leg first, I make sure that the white cane moves to the left side and when I move the right leg, I make sure that the white cane is moved to the right.” (See Fig. 3).

Fig. 1. Demonstration of the white cane technique by participant C

Fig. 2. Demonstration of the white cane technique by participant B
As the cane touches the ground on the left, the right heel lands and as the cane touches the ground on the right, the left heel lands [14]. From Fig. 3, participant F is unable to perform the wrist and step action appropriately. The forefinger is not properly placed and the grip on the handle of the white cane seems very rigid.

Another participant (H) also said:

"I hold the handle with my palm and attach my forefinger to the middle part of the cane and then I swing from left to right" (Participant H, See Fig. 4).

The participant can show the left step action but is unable to position the forefinger and the white cane appropriately. The grip of the cane should be held at waist height or above, with the cane held in the centre of the palm and arms relaxed but slightly bent at the elbow [13]. Generally, we noticed that most of the participants were only able to fairly describe the wrist action and the step action. Other aspects of the cane technique such as the position of the cane, the position of the forefinger, arch height and arc width were not mentioned or not appropriately described. The findings suggest that the pupils did not use the white cane effectively. The descriptions given by the pupils, their demonstrations of the white cane and our observations were found not to be consistent with the standard descriptions given by [14,13].

4.2 Challenges in using the White Cane

On challenges pupils encountered while using the white cane, we found that they mostly encounter motor vehicular movement and use of traffic challenges.

For example, a male participant (F) said:

"I will just go straight to the point. People are not educated on the white cane. Drivers like John Mahamagamboo riders, (the motor passenger tricycle riders) do not respect the white cane; excuse me to add that I was nearly knocked down by a car by John Mahamagamboo driver (motor passenger tricycle rider). Later on, the man told me he was sorry for the crash. We face a lot of challenges" (Participant F).

Other participants remarked:

"Drivers do make mistake and crash blind person", (Participant I).
"Drivers do not stop to traffic for a blind person to cross" (Participant J).

Literature has established that environmental concepts such as traffic do not come to pupils
who are visually impaired as easy as it comes to the sighted pupils. Traffic concepts are vital to safely utilise the surroundings [15]. This implies that, when persons with visual impairment move around, they may encounter risky situations, such as crossing the road where the possibility of death or injury is very high. The street crossing is easily learned by sighted pupils, but not to pupils who are visually impaired [16] and this tends to be a major problem for pupils who are visually impaired.

"There is the need to educate the general public on the importance (significance) of the white cane".

This was confirmed by another participant (J) who said:

"The traffic light people should be made aware that if they come across an individual with a white cane, it means that he or she is a blind person and that the cane is his or her eyes".

By implication, it appears that some Ghanaians especially drivers do not know what the white cane stands for. They may be unaware that an individual holding the white cane deserves to be treated differently from all sighted people because they cannot see. This means the public should be educated about the significance of the white cane.

5. SUMMARY, CONCLUSION, AND RECOMMENDATIONS

We found that pupils in the Akropong School for the Blind did not use the white cane effectively. We also found that motor vehicular movement, use of traffic and environmental unfriendliness are the challenges/obstacles pupils face in white cane usage. Again, we found that in mitigating the challenges, public education on the use of the white cane matters. We conclude that the challenges/obstacles in the use of the white cane might have led to the ineffective use of it. We recommend that the Ministry of Education, through the central government, should ensure that the environmental conditions in the schools for the blind are improved to enable easy orientation and mobility of pupils. We also recommend that education should be given by the government of Ghana to motor users such as drivers and the rest of the community on how to handle individuals with visual impairment and especially those with white canes. Strict rules should be made for motor users and community members in traffic situations when they meet persons with visual impairment. Besides, future researchers should consider other O&M techniques such as the independent travelling technique and the sighted guide technique to assess their effectiveness and the challenges pupils face. We also recommend that future researchers interested in O&M should focus on the factors that obstruct the effective O&M training programs for pupils with visual impairment in the basic schools in Ghana.
CONSENT
As per international standard or university standard guideline participant consent has been collected and preserved by the authors.

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COMPETING INTERESTS
Authors have declared that no competing interests exist.

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