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The Use of Auditory, Tactual, Olfactory and Kinaesthetic Senses In Developing Orientation and Mobility (O & M) Skills to Learners with Congenital Blindness (CB)

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Abstract: *This research paper attempted to study the importance of the multisensory approach in developing orientation and mobility (O&M) skills to learners with congenital blindness (CB). The research's focus was on the use of the auditory, tactual, olfactory and kinaesthetic senses. The research was made a case study, based on a qualitative and narrative inquiry approach. From the defined population consisting of learners with visual impairment, a sample size of six (6) participants was chosen. This comprised of three (3) pupils with congenital blindness (CB) and their three (3) teachers. Since this was a case study, purposive sampling was employed to get the participants. This was achieved by going straight to information-rich individuals, which Grinne (1993) describes, as those likely to be knowledgeable and informative about the use of extrasensory perceptions (as alternative to total loss of vision), in the acquisition of O&M skills. In qualitative research design, credibility, transferability, dependability and conformability are important validity issues to consider (McCleod, 1994). In this study, validity was enhanced by means of triangulation, where data generation was made through Interviews, Observations and Document Analysis, were the instruments used in the study. Research findings revealed that children with CB depend on the multisensory approach in developing O&M skills. The research has important implications for teachers and other stakeholders in the O&M skill acquisition for learners with CB. Recommendations advanced in this research remind teachers, who might not have a strong, and hence a weak knowledge base about the multisensory approach, to be cognisant of the importance of compensatory senses in O&M skill acquisition for children with CB.*

Keywords: *multisensory, orientation and mobility, congenital blindness, visual impairment, adventitious blindness, body image, compensatory sense, landmark, peripatologist, sensory training, tactual/haptic sense, spatial awareness .*

I. Introduction And Background

Studies show that throughout the course of recorded human history, people with disabilities, have often been crudely categorised. Those with visual impairment (VI) have also been denied access to a number of rights, even those considered most fundamental, like life (Barraga and Enrin, 1992). Children with VI, especially those with congenital blindness (CB), have also been major targets of prejudice, since they possess deficiencies in the awareness of things within their immediate environment, including what they even possess, like parts of their bodies. With CB blindness, these children encounter great difficulties in attempting to assimilate even what the sighted may consider simple tasks like forming correct concepts of their own bodies. Poor body image and understanding of body concepts naturally cause challenges to these children. Commands like 'Turn left', 'Turn right', or 'Lift it to chest level,' naturally remain meaningless, unless the child has a basic understanding of the terms referred to, in relation to their body parts. With no sight from birth, children will also not naturally develop good concepts and techniques of movement, yet it is movement that helps children understand their bodies, and how each part functions (Stone et al, 1990).

Apart from poor knowledge of their bodies, children with CB also experience difficulties in spatial awareness skills. These children experience tremendous challenges and/or problems in understanding the space around them, thereby limiting the extent of independent interaction with such spaces (Tooze, 1981). Since these children experience difficulties in spatial awareness skills, their mental map of the world around their own positions naturally becomes very poor (Stone and McCall, 1990). This is so since formation of concepts related to position, location, direction and distance are also not learnt naturally by children with CB, as the sighted children do by imitation through visual feedback and assimilation. Important skills in mobility, like the ability to walk in a straight line, without veering, from one's present position to a desired one, or making accurate and safe turns, are not comfortably performed by these children. Ignorance of one's spatial awareness results, not only in time expenditure, but also in great frustration, as one tries to place him/ herself within the environment. Due to frustration, teaching experience has shown that these children end giving up. Unfortunately, the majority

of mainstream teachers also end up not very sure of how to assist these learners. This leads to a sedentary pattern of life in children with congenital blindness.

Due to growing interest in the education and general welfare of those with blindness, in line with the Education for All initiatives of 1990 (WCEFA), as enacted in legislative documents like the Education for All Handicapped Children Act (EFAHCA) of 1975, every child is now mandated to receiving an appropriate education and instruction, as a fundamental human right (Ignoffo, 1996). In light of this and many other legal instruments informed by the Federal Law: Public Law (PL) 94-142, all children are given an opportunity to achieve and maintain an acceptable level of learning, regardless of their physical or mental condition. For this reason, schools are expected to accommodate all children, as a universal mandate. Like the Universal Declarations on Human Rights of 1948, which clearly mandates and directs the educational welfare for all persons, including those with VI, the Warnock Commission on Special Education Report of 1978, also has recommendations on the education for all learners. The emphasis of the report is absence of segregation, but total acceptance of all learners.

From teaching experience, coupled by this research, there is evidence that children with VI, in general, and those with CB, in particular, do not always receive appropriate education. There appears to be incongruence between the expected and reality on the ground, when it comes to curriculum implementation for children with CB. Loss of the sense of sight is naturally a catastrophic defect that can impair walking and other skills. With congenital blindness, therefore, these children have been known to always experience difficulties in a number of curriculum activities such as: geometry, writing and/or all such activities where spatial awareness concepts are involved. These learners also encounter difficulties in pursuing educational curriculum programmes with a vocational slant, where they are expected to understand concepts of distance, measurement, dimensions and/or such industry related terms (Macions, 1997). These problems are a result of poor concept development in congenitally blind children. On this note, Rosaland's (2010) observes that when a child enters school lacking the early developmental skills, which could have been more easily acquired before five or six years of age, the retarding effects are likely to be long lasting and probably permanent.

Unlike the sighted children who attain good concept development through visual assimilation, those with no sight, especially from birth, expect all specific concepts to be directly taught to them. For this reason, one way teachers can assist such learners to gain an access to a concept formulation curriculum, is through the introducing and involving them in Orientation and Mobility (O&M) training programmes. Although teaching of O&M is cardinal and hence fundamental, to learners with CB, teaching experience has shown that regular class teachers are not knowledgeable about the concerns of O&M programmes. Experiential contact with learners with VI has shown that having children with CB creates a feeling of great discomfort with the majority of regular class teachers, as Stakes and Hornby (1997) observe. These teachers always fail to organise the much needed O&M training programmes, resulting in learners with CB not getting involved in O&M, an important curriculum training programme.

For lack of visual function, which already deprives these children of more than 80% of sensory information, if Davidson and Simmons (1984) statistical observation is anything to go-by, most regular school teachers believe that children with CB are unable to learn skills, especially those which define independence and personal competence, as may be gained through O&M. Since learners with CB are known to strictly use Braille for their learning reading and writing, these teachers think that the educational experiences and concept formulation for children with CB, only boarders around the haptic sense (touch). Teachers, therefore, take this haptic sense as the only sensory function used by children with CB for concept formulation. Teachers generally fail to come up with appropriate O&M training, a curriculum programme that has been known to offer independence and an informed life style in learners with CB. Teachers also have fears, especially when it comes to the navigation of these learners. For lack of informed knowledge, regular class teachers believe that the movement of learners with CB within the school and classroom environments, entails having these learners being guided by hand through and through, $^{24}/_{7}$. These teachers then develop fears that it remains their responsibility to always offer sighted human guide to learners with CB.

Although there is some literature about education and some skill acquisition for learners with VI, in areas such as Braille, as an integral component in the curriculum for children with VI, teaching of O&M programmes to children with CB has always been problematic (Dunn, 1973). It is, in this context, that it became apparent to undertake a study that aims at illuminating the teaching of O&M skills to those learners who never had sight from birth - the congenitally blind. This, therefore, constitutes the context and justification of this paper.

Main Research Question

How do compensatory sensorial channels, (as alternative to total loss of vision), help in the teaching of Orientation and Mobility to children with Congenital Blindness?

Research Questions.
It was hoped that the research problem would be addressed by answering the following research questions, which constitute the main themes of the study:

a) Is the auditory sense of any help in the acquisition of O&M skills to children with CB?
b) How does the use of the tactual/ haptic sense help in O&M skill acquisition to children with CB?
c) How does the olfactory sense help in O & M skill acquisition to children with CB?
d) Is the kinesthetic sense of any help in O & M skill acquisition to children with CB?

Objectives of the study
In line with the research problem, this study seeks to:

- illuminate the use of extrasensory perceptions (as alternative to total loss of vision), in the teaching of O&M skills to children with Congenital Blindness.

Conceptual Framework for the use of Auditory, Tactual, Olfactory and Kinaesthetic Senses (Multisensory Approach) in developing Orientation and Mobility (O&M) Skills to children with Congenital Blindness (CB).

Vision plays an important part in a child's development. With sight, children typically learn what to do and how to act by watching others and then imitate what they observe. Through the sense of vision, they imitate manners, eating habits, dressing up, posture and movement patterns and behaviours, etc. Loss of the sense of sight, therefore, becomes a catastrophic defect in that it militates against skill acquisition by natural means. With no vision from birth, a characteristic of congenital blindness, such children do not have the much needed visual referements and visual memory that should assist them in day to day learning. Stuart (1995) observes that one of the greatest limitations imposed by congenital blindness is on the ability to get along (mobility). Such children should, therefore, rely on direct learning experiences based on the use of their extrasensory perceptions (as alternative to total loss of vision), for all their learning techniques, beginning with the acquisition of O&M skills. For proper conceptualisation of the different teaching methods, the study shall be organised and reviewed around the following themes:

Teaching method
Compensatory Sensorial Channels

At perceptual level, deficiency in the visual channel should be compensated with information gained and/or perceived via alternative channels, which Bledsoe (1980) refers to as Compensatory Sensorial Channels, as an alternative to impaired visual channel or total lack of same from birth. Deficiency in the visual channel should, therefore, be compensated through information gained via the auditory sense, the haptic/tactual sense, the kinesthetic sense and the olfactory sense.

1. Is the Auditory Sense of any help in the acquisition of Orientation and Mobility skills to children with Congenital Blindness?

The auditory channel supplies complementary information about events, the presence of hazards, materials which objects are made of or estimates of distances within a space (Hill, Rieset, Hill and Halpin 1993). Stuart (1995) further reminds that individuals who are congenitally blind (CB) learn to rely on audition to compensate for their lack of vision. To them, hearing is evidently more important for school learning than seeing (Hallahan et al, 1997:365). This sounds plausible since the less a child is able to rely on sight for gaining information form the environment, the more crucial it is that he or she becomes a good listener. Some professionals still believe that good listening skills will develop automatically in children with CB. This belief is unfortunate, as Bledscoe (1980) argues, for it is now evident that children do not spontaneously compensate for poor vision by magically developing superior powers of concentration. In most cases, children with CB have to be taught how to listen. Effective listening skills, appropriate for spatial navigation, however, require considerable time and effort for both the orientation and mobility trainer (paripatologist) and the learner. For one to navigate a given environment safely, gracefully, efficiently and independently, as Hollyfield and Foulke (1983) contend, s/he needs to become more proficient than seeing children in listening skills.

Through the audio sense, one should be able to identify his/her position in space and establish one's relationship to other significant objects around. This is so, since any interaction with people, things and/or any form of learning is dependent on one's ability to know of his/her surroundings. Since special teachers have developed techniques for developing listening skills, it is, therefore, incumbent upon the teacher of children with blindness to ensure that the student is assisted to experience and learn through these other sensory channels (Kaputa et al, 2010:31). Through stimulation of the auditory sense, one with CB will come to know and understand their surroundings for easy O&M skill acquisition. In teaching these skills, Amnions (2001)

emphasises on simulation of environments, where focus has to be put on sound identification, localisation and tracking skills, which are requisite to effective O&M in real world settings.

Localisation and Proximate Activities

Since any given environment has its multitude of physical variables, attempt to move can, therefore, expose individuals to significant hazards. Through extensive training, audition can provide a highly sensitive warning and alerting, to maintain constant awareness of potential dangers present in navigation activities, such as crossing streets (Berner, 1999). Although slow to develop, audition is significant in the development of a sense of spatial orientation and distance, as well as obstacle detection and avoidance by the child.

With CB, one must have certain skills first prior to formal O&M training. In order to prepare children with CB for different physical variables present in real world navigation activities, risks and dangers therein, O&M skills teaching should begin with simulated acoustic spaces, where children with CB learn to identify locations of nearby objects and obstacles. Using their audio sense, emphasis is put on sound localisation and proximity learning (Chew, 1984). This training is done through the use of single or multiple sound sources. By means of localisation and proximity activities, the child is asked to identify, point toward, avoid or locate sounds positioned around him/her. On this note, Pogrund, Healy, Jones, Levack, et al (2000) further explain by saying that, a student begins in an environment containing only one sound source. Later, as skills improve, the student is given the opportunity to discriminate specific foreground and background sounds by timbre, amplitude, spatial location or any other pertinent acoustic properties.

In the teaching of O&M, the teacher can begin by modelling sound events after real world events. On this note, Inman, Loge and Leavens (1997) attest that a sound environment modelled after a real space or environment has many advantages for effectively teaching an individual blinded from birth O&M skills, the least of which concerns safety. By creating a street crossing scenario, for example, the O&M student can begin by safely learning how to locate a street crossing area by the sound of traffic flow. It has to be emphasised that any physical acoustic property of the environment the child with CB may have problems in discriminating, should start by being modelled. "Inclement weather conditions, like rain or physical surface characteristics such as dry leaves, can also be incorporated into the simulation, to help the student navigate effectively in the real space after which the simulation is modelled" (Cotzin and Dallenbach, 2004).

Studies have also proved that augmented auditory activities can be used to suit O&M skill acquisition of one with CB. Auditory games, the likes of jingle and goalball, can be in-cooperated into the simulation environment for one bereft of vision. Such auditory games, also termed sonic games, help learners with CB in functional mobility tasks like auditory discrimination abilities, sound localisation and tracking including directional and positional conceptualisation within various environments (Berner, 1999). Continued orientation and practice, through these augmented auditory activities, can help learners with CB to follow say a straight line along a sidewalk.

In addition to the auditory games explained above, Kohler (2006) recommends the use of Artificial Intelligence (AI) algorithms, as a sonic device, that may also be in-cooperated into the teaching of this navigation skill needed by learners with CB. This O&M training device helps in auditory discrimination sound tracking and directional conceptualisation within various environments. The AI sonic guide can accompany a person with CB on a walk from one's present environment to the desired one, in the other part of the environment, like a virtual walk to school, to the grocery shop, in the home, work and/or any community settings, as safely efficiently, gracefully and independently as possible (Pogrud, 1995). As the child with CB becomes more and more familiar with the route, the guide is made to assist less and less, until such a time that the student can find his or her own way on the real trek, in which the simulation is based.

While humans are arguably visual creatures, evidence from Basset and Eastmond's (2006) work has shown that substantial non-visual spatial perception is possible by the use of echo cues, as bats and several other animals experience in air or underwater. Strelow (1985) claims that audition was the principal means of such perception, since it provided the most reliable, accurate and universal cues. In a similar vein, but not disputing the auditory basis of this skill, Bledsoe (1980) notes that some persons with congenital blindness do not themselves describe this skill in auditory terms, but instead refer to it as a general body 'feeling'. In one of his research findings about the shift of echoes during locomotion, Bassett and Eastmond (2006) state that with proper teaching and training, those with CB frequently indicated that they could 'feel' the presence of big obstacles, as opposed to hearing.

Obstacle sense

The ability to detect physical obstructions in the environment is a large part of one's mobility skills (Hallahan and Kauffman, 1997). Unfortunately, senses of children with CB naturally remain dormant, unless specially trained to circumvent environmental hazards. According to Tooze (1981), the Doppler Effect, an

obstacle detecting ability through distant pitch sounds, can be used by children with CB to detect hazards as one goes along. Such obstacle detection will not suggest an additional sense on the part of one with CB, but a careful attention to the distant pitch sounds.

In a way to develop a sense of obstacle perception in children with CB, if the Doppler Effect is anything to go by, children with CB are made to walk towards a large object, such as a wall, and indicate when they first perceived its presence and immediately stop facing the wall, before hitting against it. As a physical principle based on the intensity of pitch and variation of echoes, the Doppler Effect says that pitch of a sound rises as a person moves towards its source (Welsh, 1985). In agreement with Tooze (1981), the above authority contends that the Doppler Effect becomes an important stimulus in the acquisition of O&M skills by one with CB. This idea is also further clarified by Hallahan and Kauffman (1997) when they explain that people with blindness are able to detect subtle changes in the pitches of high frequency echoes, as they move towards objects. In their findings, the above authorities say that an individual's footsteps would produce a broad spectrum of sound frequencies, all of which would be reflected by a wall.

With thorough teaching and auditory training in echo locations, children with CB have been known to show some independent travel skills, as they effectively perform some obstacle avoidance tasks, by even detecting small targets.

While the above may be viewed as a plausible observation, Bassett et al (2006) argue that considerable error exists in these echo cue perceptual judgments, especially in the face of smaller objects or targets. In his research study Bledsoe (1980) submits that echo skills provide a level of loco-motor control, especially with large targets. With thorough training, however, children with CB end up becoming generally confident when travelling/navigating different environments, with both small and large targets, where they will also benefit through footstep sounds and finger snaps. Ultimately sufficient audible information about the location of hazards results in individuals with CB to move about safely, efficiently, comfortably and independently.

II. Discussion Of Findings

Interview findings on the use of auditory sense in the acquisition of O&M skills to children with CB:

From interviewing teachers and pupils, a lot was learnt. All the three teachers were agreeable that the auditory sense helps in the acquisition of O&M skills to children with CB. The three teachers pointed out that without the sense of hearing, these children cannot know what surrounds them, as always characterised by these children 'walking' into danger. For that reason, these teachers find it prudent to help these children sharpen their auditory sense.

Probed further to cite practical examples where the child uses the auditory sense, the teachers said that all children with VI should not bump into others in incidences when they will be moving around, inside or outside the classroom. These teachers seem to be in agreement that the auditory sense contributes to spatial awareness. The teachers believed that with well-developed auditory sense, the child's self-image and confidence is enhanced. Follow up questioning as a way of probing yielded further reactions from the teachers, with one teacher going on to say that sharpened auditory sense has a carry-over value, as one with VI will continue making use of same in adult life. To further validate this point, the teacher went on to reminding this researcher of the proficient use of the auditory sense by persons with VI who walk in town, most of whom without even the services of sighted human or dog guides.

Since there are quite some similarities among the teachers' claims, as described above, one important assumption may be evident. It may be learnt that some teachers were aware, while others were not very sure of how the auditory sense helps in the acquisition of O&M skills to children with CB. With specific wording details varying as they responded, some of the teachers made comments like: We should not be bothered much about making pupils with VI participate in O&M after all, the majority of working age adults, with CB will always use someone to pull them around (seemingly referring to a sighted human guide). Because of the work it entails, coupled by ignorance of O&M programmes, these teachers claim that they avoided all kinds of work and 'actively' discourage pupils with CB from participating in such lessons.

Documentary evidence on the use of auditory sense in the acquisition of O&M skills to children with CB:

Schemes of work, lesson plans and related documents analysed, like charts, time-tables, pupils' progress record books and pupils' writing sheets, have also confirmed the teachers' ignorant practices about the importance of O&M to learners with CB. The analysed documents did not reveal that teachers prepared for O&M lessons. This can be viewed as a manifestation of ignorance on the part of the teachers. One teacher, however, sounded apologetic for not having the needed documents. Although this teacher apologized, he did not, however, proffer an explanation for this non availability of the documentary entries.

Overview conceptions on the use of auditory sense in the acquisition of O&M skills to children with CB:

What could be gleaned from interview findings, documents analysed and lesson observed was that teachers were uncomfortably aware of blindness, and hence develop negative attitudes towards the participation of pupils with CB in O&M programmes. Such negative attitudes were expressed, and hence illuminated through the teachers' practices of not adequately preparing and properly executing O&M lessons. To a larger extent, it would seem that these negative attitudes emanate from lack of knowledge on their part.

While it is arguably true that the individuals who are CB learn to rely on audition to compensate for their lack of vision in O&M skill acquisition, studies have it that travel skills for one with CB, as Watson (2010) puts it, is not exclusively based on echoes, nor is it all auditory, in many normal settings. To augment, Kohler (2006) attest that the auditory sense is not the only compensatory sense to be used by individuals with CB to acquire the much needed O&M skills. This is so since auditory cues deteriorate markedly when smaller targets are used to define a given path, as also observed by Basset and Eastmond (2006). This research has also shown that apart from the sense of hearing, persons with congenital blindness will also rely on Tactile senses (Haptic), for the development of their O&M techniques skills.

2. How does the use of the Tactual/ Haptic Sense help in Orientation and Mobility skill acquisition to children with Congenital Blindness?

This question sought to illuminate the use of the tactual/ haptic sense helps in O&M skill acquisition to children with CB. Data were captured by means of a qualitative approach, using interviews, observation and document analysis as techniques. All findings were 'verbally' discussed.

Since sight seems to be highly integral in cognitive development, as cognitive therapists, the likes of Ungar, Espinosa, Blades, Ochaita and Spencer (1996) put it, it should then, stand to reason that total blindness occurring prior the development of different cognitive patterns, would adversely impact on an individual's cognitive development. Through the teacher's stimulation of one's tactile sense, the child with CB comes to know about places in the environment. Like hearing, touch has been known to be a powerful information supplier of known as well as unknown environments. To children with CB, haptic information appears to be essential for appropriate spatial performance.

The sense of touch or haptics, is described by Fritz, Way and Barner (1996), as

> …the skin sense or haptic information, which commonly relates to include recognition of objects by any part of the legs, palms and fingers. This is the sense used for fine recognition of objects' form, texture, location, and any surface information.

While the sense of touch is often associated with the hands, as Davidson and Simmons (1984) put it, the sensory receptors are under the skin of the whole body, that's why it is also known as the Skin Sense, as Fritz, Way and Barner (1996) explain.

It may be observed that the skin that has not acquired a hardened layer, is the one most receptive. For this reason, a child should be able to use the most convenient part of the body for 'touch' purposes in the O&M process. Such parts include: the back of his heels for squaring off, the back of his hand as one walks parallel to a wall, etc. (Everett and Ponder, (1976). Haptics, as (Ungar et al 1996) contends, has been known to support congenitally blinded individuals' cognitive mapping of spaces. Through the tactile/ haptic sense, the child's environment can be revealed through tactile discrimination (Cratty and Sams 2009).

Since the tactual/ haptic sense is an important source of information to one with CB, studies have shown that many individuals with CB can orient themselves, most appropriately, when they perceive a tactile map that shows the unknown environment before walking in the natural environment (Brambring and Weber, 1981; Ungar et al, 1996). With CB, one has to perceive relationship, between, say two objects represented on a tactile map. Such an activity has to be repeatedly done for several times, for conceptualisation. For proper conceptualisation, as Hollyfield and Foulke (1983) suggest, "…one has to verbalize the routes that take them from one point to the other, then combine the routes later." One with CB has to continuously repeat and over learn such an activity. This has to be done over and over until one feels comfortable with his/ her understanding of the environment, in theory, before practically walking through it. Verbalization helps one to mentally retrace tracks from the very beginning to the end.

Peripatologists (orientors or mobility teachers) have understood that routes become subconscious after one travels them a lot. To consolidate on the mental tracking, one with CB has to try to infer the necessary mobility actions from their crude 'tactile' map. Literature has it that the use of tactile mapping to one with early blindness makes him/her develop superior abilities to navigate new routes on their own (Ungar et al 1996). When this is achieved, they would have known to orient themselves independently, especially starting with those routes with few directional changes.

While teaching cane skills is important in the curriculum for learners with CB, teaching experience has shown that it is not the most important task of the paripatologist. With good spatial orientation skills, children with CB can travel independently, even with those sloppy cane skills, as long as they perfectly develop mental

'tactile' mapping first. On this note, Ungar et al (1996) further attest that children with CB must first and foremost build mental maps of layouts and routes. Such will help these children wake future projections of routes in any given environment, making them become efficient travelers.

Further commenting on mental mapping, as initiated by the tactile sense, one with CB develops frames of reference, important components for orientation and navigation. To consolidate, Bassett et al (2006) further explain that for one with total blindness, these reference points are simply non-visual, but are used in the same manner to anchor the body for spatial coordination. Knowledge of reference points, which are also known as landmarks, [or cues, if they are intermittent (occurring at irregular intervals)], consolidate the spatial relationships into a permanent memory store that may be expanded to include more complex routes. This can be achieved by making children with CB walking tactually presented routes or shapes in virtual environment. Before one gets involved into actual/ practical navigation of the environment, tactual understanding of these landmarks is both significant and critical to one with CB. For this reason, teaching of tactual mapping can never be left to chance for O&M skill acquisition.

Probably one question that may need attention is: How do children with CB create mental map and movement patterns? To create these mental maps, as Ungar et al (1996) explain, children need a territory or environment that is staked out with boundaries, which children with CB have to physically explore. Since small differences of the ground surface are easily perceived when one works barefoot, peripatologists should encourage children to walk barefooted, in order to become aware of those small, but important differences found in the environment. During the training sessions, the child with CB has to be encouraged to walk barefootet in the house, the garden and/or other surfaces. Such an exercise helps children with CB to effectively identify clues and landmarks, during O&M training (Rosaland, 2010). By tactually 'feeling' the artificial boundaries first, these children can further relate to other unfamiliar areas.

3. How does the Olfactory Sense help in Orientation and Mobility skill acquisition to children with Congenital Blindness?

Lack of vision, especially from the moment of birth, interferes with one's encoding for assimilation process, to enable proper understanding and interaction with the environment (Bledsoe, 1980). Kaputa et al (2010) agree with the above by saying that lack of vision narrows the child's exploratory experiences, yet to acquire O&M skills, one has to make every deliberate effort to procure and organise elements of the outside world. Apart from the sensory outlets discussed above, one with CB has to also explore the environment by smelling, a sensory channel also known by Hill and Ponder (1985) as the Olfactory Sense. At perceptual level, as the above authority further explains, any deficiency and dysfunction of the visual channel should be compensated with information perceived via other sensory outlets like smell.

While auditory and tactile/ haptic functions have been discussed as important factors for the teaching of O&M skills to children with CB, Bledsoe (1980) observes that very little is yet known about the benefits of Olfactory processing, in the teaching of O&M. The little evidence literature has, however, suggests that persons with CB, hypothetically develop superior orientation abilities through the Olfactory sense (Stuart, 1995). This idea is echoed by Landau, Spelke and Gleitman (1984) who say that humans, especially with total blindness, make extensive use Olfactory information in their daily life. In order for one to locate a target place like: the kitchen, fish and chips shop, blair toilet or such locations, which concretely relate to some odour, the child should demonstrate a high sense and ability of odour perception and discrimination. For this reason, the olfactory sense (smell) is among a variety of sensory clues, which are normally subordinate to vision, thereby also assuming such a great importance to one with congenital blindness (Gullford, 1979). Further to this notion is Strewl (1985) who admits that odour cues, could, in some circumstances, also play a role in identifying intended targets, especially if such emit a significant odour.

While the olfactory sense has been known to also have quite a positive effect on O&M performance, Stuart (1995) argue to the contrary, suggesting that this sense plays a very small part in the teaching of O&M skills to children with CB. The above authority has been known as arguing that although the sense of smell may be completely superseded by the sense of hearing and/or touch, it continues to play a significantly unrecognised and often unconscious role to the mental life of persons with CB (Stuart, ibid).

To argument the above view, Semwal, and Evans-Kamp (2000) (Internet source) claim that it is not clear whether one's best performance in mobility was entirely based on the use of auditory and tactual cues, since cues of temperature (haptic) and smell (olfactory) may also affect mobility performance for one with congenital blindness. Probably what may be left of us, for now, is getting in the field and establish the truth about the use of olfactory sense in the teaching of O&M skills to children with congenital blindness.

4. Is the Kinesthetic sense of any help in Orientation and Mobility skill Acquisition to children with Congenital Blindness?

After understanding one's environment and establishing the surroundings and their relation to self, one has to be able to move from place to place, along those mentally built or created routes of the environment, using non-visual memories. Analogously relating to the science of navigation vehicles, Worchel, Mauney and Andrew (2004) see O&M like getting ships and trucks to their various destinations, making them find their way, avoiding collision, conserving energy and meeting schedules, likewise, O&M borrows the same principle using human navigation: Teaching individuals with blindness to find their way and move about safely, efficiently, comfortably, accurately and independently, with reasonable degree of balance. It is from this perspective that the sense of Kinesthetics has to be stimulated and taught to enhance efficient mobility in an individual with CB.

Since the kinesthetic sense is understood as an avenue to do with body control and distance judgment system, one with an O&M dysfunction, because of congenital blindness, is known by Hill et al (1985) as having a navigational impairments and or travel disabilities. With these navigational impairments, children with CB have been known to exhibit some veering tendencies, a dysfunctional anomaly that is undesirable in mobility. These veering tendencies consequently make one face great difficulties in navigating effectively, safely, gracefully and independently, even within well oriented spaces and/or environments. A result of this deficit in mobility or navigational capability, as Welshard et al (1985) prefer to term it, many children with CB have been seen exhibiting awkwardness in motor skills and unstable balance when walking, all because of leading a sedentary life style. A similar observation has been advanced by Worchel, et al (2004) who also say that due to visual deficiency or congenital blindness, a child develops poor motoric coordination and diminished kinesthetic perception, making one become both timid and passive, thereby depending on others for continued aid.

Apart from leading a life of inactivity, Welshard and Blash (1985) also observe that these children tend to wander in circles due to absent orientation influences. Such veering is very common in children with CB, especially when their kinesthetic sense is not well developed. This view is augmented by Hollyfield (2010) who says that the veering in children with blindness is a natural consequence due to loss of orienting cues and lack of properly developed kinesthetic sense. For non-development of kinesthetic sense, as Landau et al (1984) also observe, that more than 30% of children with CB do not ambulate independently outdoors. If the above observations and statistical data is anything to go by, sharpening one's kinesthetic sense cannot, therefore, be left to chance in the teaching of O & M to children with congenital blindness.

To curtail chances of accidents in one with CB, Hollyfield (2010) points out that the veering tendency should be kept to the minimal or totally zero. With proper teaching and training, the child with CB shows an accurate subconscious travel, even in unfamiliar spaces. With reduced veering tendencies, one with total blindness will then navigate spaces independently, safely, effectively and gracefully, characteristics which are believed to be a combined product of motor body control and cognitive skills. Independent space navigation can, therefore, only be achieved by sharpening one's kinesthetic sense. On this note, Hill and Ponder (1985) remind by saying that while the kinesthetic sense is subconscious, it can still be taught to one CB. Without teaching and training, the kinesthetic sense remains imprecise resulting in veering, exposing one to all kinds of environmental dangers and hazards during the navigation process. With careful teaching and training, however, the kinesthetic sense can be used for navigation in familiar and unfamiliar environments (Hollyfield, 2010).

It has to be remembered that in teaching O&M skills, instructions begin with the utilisation of a sighted human guide, an individual who assists the congenitally blinded child with balancing techniques, which is the basis of the kinesthetic sense. The human guide has to train the child with CB to preferably move in a straight line, at a comfortably high speed as opposed to amble one, for the reason forwarded by Hupp (2003) who notes, "It is widely believed that veering decreases as one's walking speed increases." (However, this assertion still stands to be substantiated in the field). As the child walks, one's footsteps have to be carefully attended, to in order to help the individual with CB to determine how fast s/he is moving, and what surface materials they are walking on. This exercise has to be carried out over various terrains and weather conditions. On this note, Hill and Ponder (1985) note that inclement weather conditions like rain, unpleasantly cold, snow or other unfriendly physical surface characteristics, can be incorporated in an attempt to sharpen one's kinesthetic sense. To prepare for effective all weather navigation of children congenitally blinded, the O&M instructor has to create a virtual environment with modelled objects first before one proceeds to real or natural spaces (Twersky, 2005).

A pilot study conducted by Bassett et al (2006) has an excerpt which shows that if the kinesthetic sense is well developed, children with CB can demonstrate a measurable ability to maintain a course of travel, under different weather conditions. Since repetition is the brain's best way to retain learning, documented evidence show that such children's mobility remains both commendable and plausible, even when modelled environment and spaces are replaced by a row of other objects in a natural environment. Hollyfield (2010) notes that gross errors in the kinesthetic sense indicate relatively serious problems of balance and/or body control, in an individual with CB, which could result in an accident in natural setting. Chances of such hazards occurring can only be reduced by teaching children with CB to always travel in straight lines with no deviation (Hill and

Ponder, 1985). Development of the kinesthetic sense acts as a measure of straightness of travel, an important component in the orientation and mobility teaching of children with CB.

Interview findings on the use of the use of auditory, tactual, olfactory and kinaesthetic senses in developing orientation and mobility (O&M) skills to learners with CB.

In response to Interview Schedules, all the four respondents interviewed, generally confessed that orientation and mobility contribute to spatial awareness and kinesthetic skills for pupils with CB. Teachers explained that pupils' coping levels in physical activities depend, to a greater extent, on how these pupils are able to move about. During interviews, teachers frequently pointed out that good orientation and mobility programmes enhance pupils' self image and confidence as they take up any physical activities.

Responding to role played by the use of compensatory senses to pupils with CB, some teachers showed that they were not very sure. While one teacher acknowledged the importance of using compensatory senses through orientation and mobility training programmes, this teacher, however, readily confessed the difficulties she encountered in trying to instruct pupils with CB through the other sense functions. Such inadequate knowledge, results in pupils being denied the chance to participate in O&M programmes.

Follow up questioning, as a way of probing, yielded further reactions with one teacher making a confession, which was verbatimly quoted as saying: Although I am aware of the need for O&M to pupils with CD, I am challenged by the task of instructing and orienting these pupils to make use of their other sense functions. I would rather fill in the O&M periods with other lessons like music. I cannot endure the burden of instructing pupils with poor coordination, or with no kinaesthetic perception. Probed to elaborate further on this point, the interviewee was quick to say that music was an area in which pupils with VI have been known to; at least achieve more success than in any other subject in the education curriculum. To further validate his point, the teacher reminded this researcher of a number of professional musicians with VI.

On the same issue of the use of the haptic/ tactual sense as one of the compensatory senses, one other teacher also indicated that she was not comfortable with how to simulate the other senses in order to engage pupils with VI in mental orientation of physical skills, through say, the haptic/ tactual sensory information which is important in various curriculum activities.

From the foregoing, therefore, it may be noted that tactile maps have both immediate and long term benefits in helping children with CB to find their way in given environments. Proper understanding of tactile maps makes children improve their acquisition and performance in O&M skills. Such are important requisites for real life spaces, which these children need, in order to navigate different environments, now and later in life, as they go to school, shops, work places, towns, accessing public buildings, etc.

Although interview findings showed that some teachers were aware of orientation and mobility benefits, the above testimonies seem to reflect that the challenges teachers endure in orientation and mobility training programmes, translate to these teachers not taking orientation and mobility as a learning process, but an extra burden in the teaching learning efforts. It became apparent, from the interviews that, teachers end up not availing pupils of the opportunity to participate in O&M, a practice that one may interpret as negative on the part of the teachers.

Observation findings on the use of auditory, tactual, olfactory and kinaesthetic senses in developing orientation and mobility (O&M) skills to learners with CB.

The lessons observed did not show pupils' ability to perceptually recognize their surroundings (spatial awareness). Pupils could be observed bumping into each other failing to adhere to teachers' directions and/or instructions. Pupils were observed as incapable of using their compensatory senses, information which was solicited through observation.

For fear of accidents and hurt, the pupils with congenital blindness, for example, were observed as restraining themselves from taking part or participating in different physical activities, especially where high mobility was called for. As observed, pupils could not motorically explore given environments, as they take up physical activities. Throughout the four lessons observed, it emerged that pupils were not taken through the paces of obstacle perception, an important skill in O&M. By observation, teachers were also not focusing on Doppler background awareness, to prevent or reduce accidents during pupils' participation in physical activities.

Documentary findings on the use of auditory, tactual, olfactory and kinaesthetic senses in developing orientation and mobility (O&M) skills to learners with CB.

While teachers talked highly about the importance of orientation and mobility training programmes to enhance participation of pupils with CB in different physical activities, such interview responses were seen as suspect in the light of documentary evidence. This was so interpreted since the analysis of O&M skills and progress record books, schemes and lesson plans, did not have entries to signify the importance of the use of compensatory senses through orientation and mobility training programmes.

While teachers would have explanations to attach to non availability of written proof, mere absence or lack of O&M documentation or progress records seems evident enough to explain the teachers' negligent attitudes to take these O&M programmes seriously.

Overview of study findings on the use of auditory, tactual, olfactory and kinaesthetic senses in developing orientation and mobility (O&M) skills to learners with CB.

Several pertinent issues that emerged from this study received 'thick' discussions. Data were captured by means of interviews, observation and document analysis. Findings, which confirm that all compensatory senses are of help in the acquisition of Orientation and Mobility skills to children with congenital blindness, were presented and predominantly interpreted. While teachers talked highly about the importance of orientation and mobility training programmes, to enhance participation of pupils with CB in various indoor and outdoor curriculum activities, some interview responses were seen as suspect in the light of this research observations and documentary evidence. This was so interpreted since the analysis of O&M progress record books, schemes and lesson plans, did not have entries to signify the importance of orientation and mobility skills as acquired by the use of compensatory senses.

Some interview responses were found to be quite at great variance with what was discovered through document analysis and lesson observations. Practices like falsification of entries and lack of related documentary data, with lesson observations not showing anything related to conceptualisation of compensatory senses, were indicators explain some teachers' knowledge base of how to involve learners with CB in O&M programmes. It would appear that some teachers do not favour the participation of pupils with CB in O&M programmes because of their ignorance of the demands of the subject. It would appear that the findings confirm the view advanced by Cady (1989), who makes the observation that if you have difficulties in a certain discipline, you may be inclined to discourage others from participating in activities related to that discipline.

III. Conclusion

The teaching of O&M skills to children with CB represented the central concerns of this research. Several works have been referred to, with research findings carefully analysed, in an attempt to establish and crystalise the use of auditory, tactual, olfactory and kinaesthetic senses in developing orientation and mobility (O&M) skills to learners with CB. Although findings varied, at times, there also emerged some agreements on certain common principles. In theory, the major position illuminated by review of literature seems to suggest that O&M is a key and central skill to independent functioning of one with CB. Children's deficiency in the visual channel should always be compensated through information gained via the auditory sense, the tactual sense, the olfactory sense and the kinaesthetic sense, in order gain a safe, efficient, accurate and independent travel. In other words, the research showed that there should always be a balanced interplay of senses (multi-sensory approach) in the teaching of O&M skills to learners with CB.

IV. Recommendations

Children have to be specially trained to circumvent environmental hazards by means of well sharpened compensatory sensorial channels, as alternative to total loss of vision. Basing on the finding of this research, the following suggestions were made and passed as recommendations:

- Teachers should always teach children with CB to rely and pay particular attention to auditory sense, whenever taking up O&M programmes, to compensate for their lack of vision. Teachers should, therefore, train children with CB to become good listeners.
- Teachers have to help in the stimulation of the olfactory sense for children with CB, to enable these children to always explore any given environment by smelling.
- Children's deficiency in the visual channel should also be compensated through information gained through the tactual sense in order gain proper orientation. Teachers should, therefore, expose children with CB to tactile maps, in order to first orient themselves to artificial and unknown environments, before walking in natural environments.
- Teachers have to develop techniques for sharpening kinaesthetic skills, in order for children with CB not to be exposed to, and become aware of all kinds of navigational dangers and hazards in day to day life.
- Both pre-service and in-service orientation and mobility training programmes should be accorded to would be teachers and qualified teachers, in order to prepare them for inclusive education system, in line with the EFA initiative.
- Teachers should, therefore, receive relevant information from knowledgeable personnel, connoisseurs so to speak, in the area of O&M for people with CB.

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