

Multisensory Integration Activities to Improve White Cane Usage for Orientation & Mobility Among Pupils with Congenital Total Blindness (CTB) in Primary School

Esther J. Dawson

University Malaya
estherjoandawson@gmail.com

ABSTRACT

The best practice of Multisensory Integration Activities (MIA) aims to improve white cane usage for Orientation and Mobility (O&M) for pupils with Congenital Total Blindness (CTB). Pupils with CTB face challenges in developing their spatial awareness skills as it is difficult for them to identify the space around them, limiting the possibility of independent interactions with the environment. This action research focuses on the use of compensatory senses which are auditory, haptic, olfactory and kinaesthetic in 10 MIA to develop pupils with CTB's O&M skills. The aim is to encourage independent white cane travel and exploration that provides direct contact with natural features of the environment through guided experiences utilising all their senses. The findings show a positive relationship between the implementation of MIA and white cane usage of pupils with CTB. The research has important implications for teachers and other stakeholders in the O&M skill acquisition for pupils with CTB. Recommendations advanced in this research remind teachers, who might lack knowledge base about the multisensory approach, to be cognisant of the importance of compensatory senses in O&M skill acquisition for children with CTB.

Keywords: Multisensory Integration Activities, Orientation and Mobility, Improve White Cane Usage

Introduction of Best Practices

This best practice, Multisensory Integration Activities (MIA), provides direct contact with natural features of the environment through guided experiences while utilising all of the sense which compensates the deficiencies of the visual channel. MIA is a play-based learning media that gives travel experiences through different locations and obstacles where pupils with CTB can apply the use of auditory, haptic, olfactory and kinaesthetic sense in mobility. MIA provides hands-on experiences, problem-solving opportunities within natural settings and opportunity for personal reflection through teachable moments to develop physical and mental mapping skills which can be utilised post instruction.

As such, MIA is created to provide training for pupils with CTB in using the white cane to navigate spaces independently, safely, and efficiently through a combined product of motor, compensatory senses and cognitive skills. According to Attia and Asamoah (2020), pupils with visual impairments do not use the white cane efficiently, and this deficit can be traced back to the white cane training they get. The introduction of MIA as an Individual Education Programme (IEP) of training sessions is intended to supplement the existing syllabus, offering intensive and additional training to pupils with CTB that have difficulties navigating with the white cane and to equip them with O&M skills needed to travel independently, safely and confidently.

Justification of Best Practices Implementation

Based on the researcher's personal experiences and observations, pupils with CTB have problems with learning routes in unfamiliar environments. These pupils need to learn landmarks and clues that will help in knowing their whereabouts along a particular route which include understanding tactual markers on doorways in order to identify a classroom or the restroom. Important mobility skills like walking in a straight line from one's current position to another position without veering and making correct and safe turns are not well performed by these pupils with CTB. According to Kaiser et al., (2018) a vital component of O&M is for instruction to take place within natural environments because they offer consumers the ideal settings to develop problem-solving skills, develop functional O&M techniques and promote skill generalization. Ignorance of one's spatial awareness results not only in time expenditure, but also in great frustration, as one tries to navigate him or herself within the environment. Due to frustration, these pupils would give up independent mobility which then leads to a sedentary pattern of life among pupils with CTB.

Objectives of Implementation

The objectives of best practice implementation are as follows:

1. To identify the outcome of MIA in improving white cane use for O&M among pupils with Congenital Total Blindness (CTB).
2. To identify the effect of MIA on the auditory, haptic, olfactory and kinaesthetic senses of pupils with Congenital Total Blindness (CTB).

Best Practices Implemented

Action research was used to achieve the research objectives to improve white cane used for O&M among pupils with CTB. Three pupils were chosen to participate in the study. Their demographic and clinical information are reported as Table 1:

Table 1
Clinical details of subjects

Sample	Gender	Age	Age at diagnosis (Months)	Main diagnosis	Visual Status	Visual Acuity
S1	F	12	Since birth	Secondary glaucoma	Early Blind	Light perception
S2	M	12	108 months	Optic atrophy	Early Blind	*NPL
S3	F	12	48 months	Bilateral retinoblastomas	Early Blind	*NPL

**NPL (no perception of light).*

There were ten Multisensory activities implemented in the lesson plans where observations were done during the intervention, a pre-test and post-test conducted, and a semi-structure interview with the teacher and Student Management Assistant after the intervention. Reflection was an ongoing process throughout the study after every lesson.

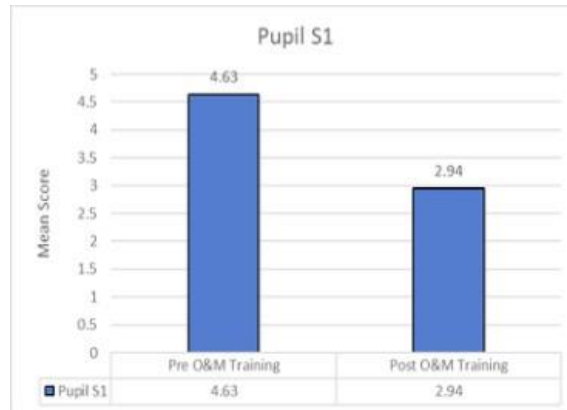
Pre-test and post test

The pre-test and post-test were answered by the parents of pupils of CTB chosen for this study. The researcher adopted the DMQ-16. Originally, La Grow et al (2014) proposed the survey instrument of Difficulty with Mobility Questionnaire (DMQ-23) with the objective to measure participants' perceived ability to get around. However, in 2015, La Grow and colleagues shortened the original DMQ from 23 items to 16 items as the researcher found a number of apparent redundant items (La Grow, Towers, Kim & Haneline, 2015). Hence, the researcher adopted the latest DMQ-16. The Difficulty with Mobility Questionnaire (DMQ-16) focused on the white cane techniques of the pupils with CTB for O&M. The parents evaluated the pupils based on the DMQ-16 pre-test and post-test at Week 0 and Week 11 respectively. Both pre-test and post-test evaluation measured the pupils' perceived ability to get around. The DMQ-16 presented the root question 'How much difficulty would you say you have in completing the following tasks?'.

Pupil S1

Figure 1 shows a DMQ-16 mean score of 4.63 in the pre-test and 2.94 in the post-test which is a decrease in DMQ-16 scores. This indicates that Pupil S1 demonstrates lesser difficulty in completing the tasks stated in DMQ-16 after participating in the MIA. In other words, there is an indication of slight improvement in terms of mobility and getting around after the implementation of the MIA

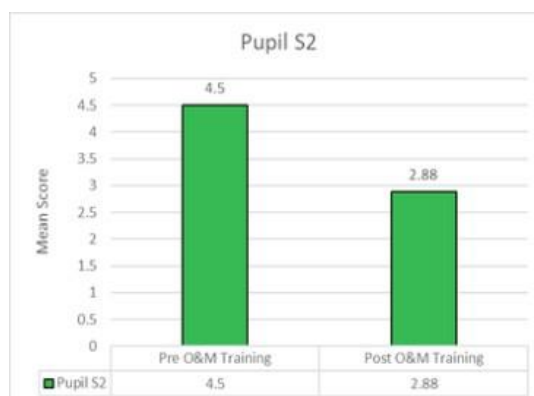
Figure 1
Pupil S1 (Pre-Test and Post-Test) Average DMQ-16



Pupil S2

Figure 2 shows a DMQ-16 mean score of 4.5 in the pre-test and 2.88 in the post-test. The decrease in the DMQ-16 score proves that the pupil with CTB's O&M skills showed signs of significant improvement. Pupil S2 showed no improvement on getting around in shopping malls as the pupil was spatially disoriented without any assistance in the mall. This could be due to the noise distraction in the surrounding area.

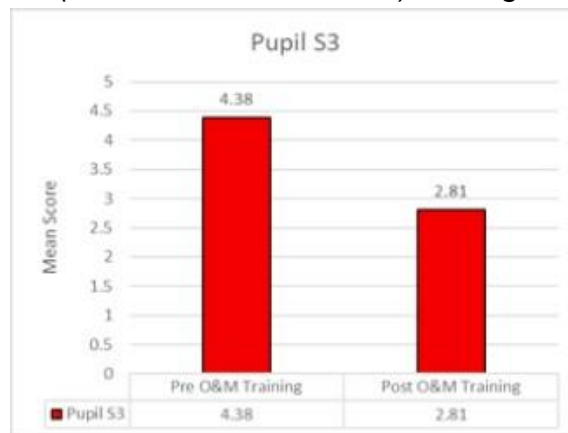
Figure 2
Pupil S2 (Pre-Test and Post-Test) Average DMQ-16



Pupil S3

Figure 3 shows a DMQ-16 mean score of 4.38 in the pre-test and 2.81 in the post-test. Out of the three pupils, Pupil S3 showed the least improvement with a 1.56 difference from the pre-test and post-test. Pupil S3 had more difficulties in unfamiliar environments. Regardless there is a drop in the DMQ-16 scores which indicate a reduction in difficulty with independent travel gained through the participation in the MIA.

Figure 3
Pupil S3 (Pre-Test and Post-Test) Average DMQ-16



Observation Checklist

The Observation Checklist consists of 10 items focuses on how pupils with CTB use their white cane skills and integrate the use of four compensatory senses – auditory, haptic, olfactory, and kinaesthetic. The findings were collected and analysed by the researcher based on every lesson in the MIA observation checklist and the performance of respondent S1, S2 and pupil S3.

Pupil S1

Figure 4 shows the performance of respondent S1. Overall, the bar chart shows consistency of performance in the auditory, haptic, olfactory and kinaesthetic senses from (lesson 1 =30%) till (lesson 10 = 90%). Pupil was seen using wrong white cane techniques at the beginning, but progressively improved to use proper cane techniques. The information gained from the environment through the white cane and her experience from MIA has more likely made a memorable impact and was internalised in her daily routine.

Figure 4
Pupil S1 (Observation Checklist) Percentage

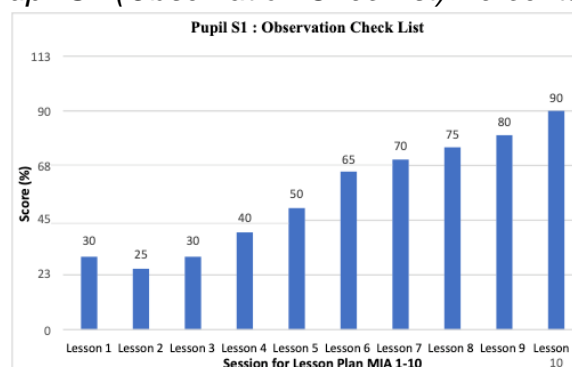


Figure 4.1

Exhibit in pre-lesson 1 and post-lesson 10 for pupil S1



Pupil S2

Figure 5 shows the performance results of respondent S2. At the beginning of the lesson, pupil S2 was very slow in walking as he was hesitant in taking every step. However, the pupil was able to experience a lesson through multiple pathways that stimulated his compensatory senses and was able to engage more deeply in MIA. Pupil S2 showed improvement and was more confident in using the white cane.

Figure 5

Pupil S2 (Observation Checklist) Percentage

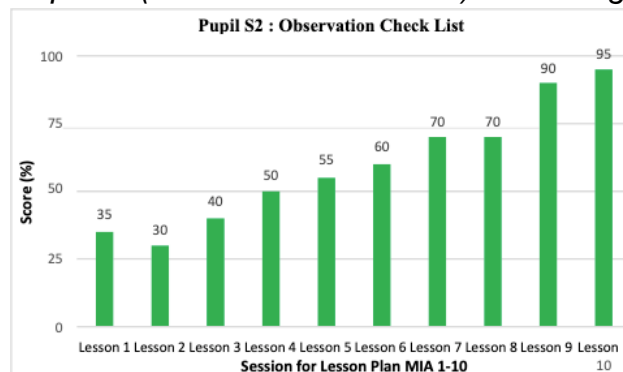
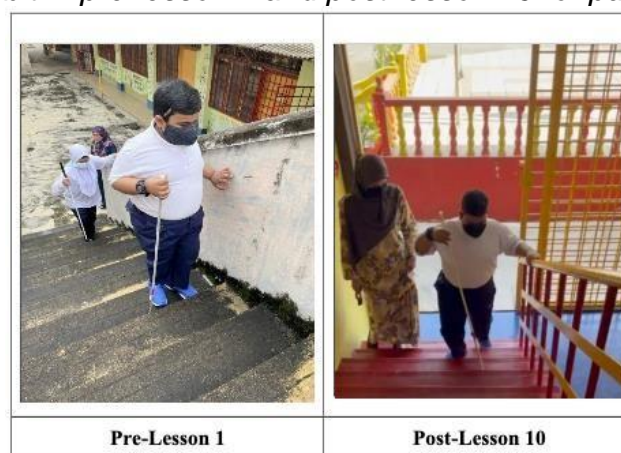


Figure 5.1

Exhibit in pre-lesson 1 and post-lesson 10 for pupil S2



Pupil S3

Figure 5 shows the performance results of respondent S2. At the beginning of the lesson, pupil S2 was very slow in walking as he was hesitant in taking every step. However, the pupil was able to experience a lesson through multiple pathways that stimulated his compensatory senses and was able to engage more deeply in MIA. Pupil S2 showed improvement and was more confident in using the white cane

Figure 6
Pupil S3 (Observation Checklist) Percentage

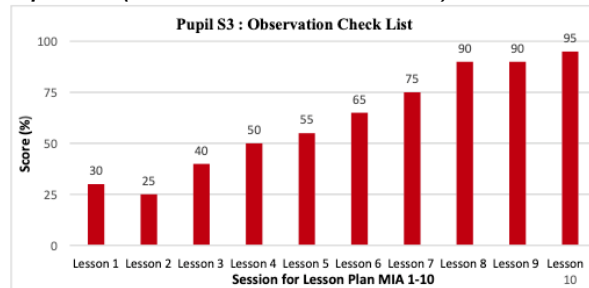


Figure 6.1
Exhibit in pre-lesson 1 and post-lesson 10 for pupil S3



In the earlier stages of the MIA lessons, the observation was on the pupil's ability to perceptually recognize their surroundings (spatial awareness). Pupils could be observed bumping into each other failing to follow the teacher's directions and/or instructions. Pupils were observed as incapable of using their compensatory senses to gain information for their surroundings. For fear of accidents and hurt, the pupils with CTB, were observed as restraining themselves from taking part or participating in different physical activities, especially where high mobility was called for. As observed, three of these pupils with CTB had low obstacle perception, an important skill in O&M. Throughout the ten lessons of MIA observed, it emerged that pupils showed a significant improvement in exploring given environments confidently without assistance.

Summary and recommendations

The findings in this study showed a positive effect on the implementation of the MIA and had improved the white cane usage of pupils with CTB. The white cane provided them a new sense of freedom, independence, confidence, and competence, and it proved useful in navigating and avoiding many slips, bumps, falls, and interactions for the pupils with CTB. Pupils in the study became more confident in walking without a sighted guide.

MIA which is a 'play-based' intervention, has proved effective. Researchers conclude that 'play' is foundationally in the development of a child's skill set through their life. Ali and colleagues suggest that children have an innate ability to learn 'naturally' through play. The teacher then is the facilitator to create these opportunities of play to expose the child for their greater development (Ali et al., 2018). MIA contributes in a way that it allows pupils with CTB to actively be involved in the lesson to improve their white cane skills.

Individuals with visual impairment use tactile, kinaesthetic, visual, auditory, olfactory, or tactile cues when they are first exposed to a new environment. They use these cues to collect information about their surrounding environment (Arslantekin et al., 2021). After establishing the pupil's surroundings and the relationship to oneself, they can go from 'point a' to 'point b', utilising non-visual memories which were mentally formed or constructed of routes in the environment. The research confirms that acquiring these compensatory cues greatly assists in enhancing pupils with CTB's competencies.

O&M uses the same approach with human navigation to educate the child with CTB to navigate safely, effectively, conveniently, correctly, and independently while maintaining a decent level of balance. Khalil & El Keshky (2022) revealed that O&M training model is effective in enhancing psychological well-being, interpersonal openness, and meaning of life. This can only be achieved when auditory, haptic, olfactory, and kinaesthetic senses are encouraged and taught in order to improve effective movement in a person with CTB. In other words, there should be a balance between the interplay of senses (multi-sensory approach) when teaching O&M skills to pupils with CTB. Hence, when a pupil with CTB develops and applies O&M skills, they achieve greater independence in entering a new environment, improving understanding of concepts and even growing in personal confidence (Vanderpuye, Attia, Amoako, Fofie, and Asamoah, 2020). Thus, the researcher had included these 4 senses in MIA which pupils with CTB can rely on for their development of O&M skills.

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