

# EFFECTIVENESS OF A FUNCTIONAL VISION STIMULATION-BASED MOBILE APPLICATION IN HELPING CHILDREN WITH DEAFBLINDNESS

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Abstract

This study investigates the effectiveness of a functional vision stimulation-based mobile app for children with deafblindness. Deafblindness, a unique sensory impairment, poses significant challenges to cognitive and sensory development. To conduct the present study, five children with deaf-blindness were selected as a sample. Intervention in the form of a Functional Vision Stimulation-Based Mobile Application was given to examine its effect on visual perception, sensory integration, and overall functional vision skills among children facing the dual challenges of deafblindness. Assessment tools included standardized tests measuring visual acuity, contrast sensitivity, and visual tracking. In addition to this, qualitative data were collected through structured observations of the children's engagement with the mobile app, documenting changes in attention span, interest, and interaction patterns. Thus, a mixed research method was used to provide a comprehensive understanding of the outcomes. Preliminary findings suggested a positive correlation between the use of the mobile app and improvements in functional vision skills among the participants. The intervention demonstrated potential benefits in enhancing visual attention, promoting sensory exploration, and fostering a more interactive engagement with the environment. The findings provide valuable insight into the potential of mobile app interventions for children with deafblindness and shed light on the usefulness of innovative approaches to address the unique challenges associated with this equally important learning community.



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# Introduction

Deafblindness is a condition in which a person's auditory and visual senses are both impaired. However, there is not always complete deafness or blindness. It could be possible that initially, the person would retain some useful vision and hearing. These dual sensory impairments differ from person to person. The child's growth is severely hampered as a result of this failure. It has an impact on cognitive, social, and communicative progress. Since our vision and hearing are responsible for 95% of what we know about the environment. Deafblind children face specific challenges when it comes to communication, mobility, and knowledge, making it a part of one of the most marginalized groups. There is no data available regarding the size of the deafblind population in India. However, estimates based on information gathered from community-based projects, indicate that there could be more than 45,000 deafblind/ multiple disabled people in the country.

# **Definitions of Deaf blindness**

"A person is regarded as deafblind if their combined sight and hearing impairment cause difficulties with communication, access to information, and mobility. This includes people with progressive sight and hearing loss".

The Legal Definition of Deafblindness, or dual sensory impairment, refers to the associated hearing and visual impairments, the combination of which causes such severe communication and other developmental and education problems that the individual cannot be accommodated in programs for individuals who are deaf or blind (IDEA, 2004).

The term 'Deafblindness' is a condition presenting other difficulties than those caused by deafness and blindness. It is an "umbrella" term, which can include both children and adults who are:

- Blind and profoundly deaf.
- Blind and severely or partially hearing impaired.
- Partially sighted and profoundly deaf.
- Partially sighted and severely or partially hearing impaired.

Deafblind persons fall into four groups:

1. Those who were born deaf and blind, which can happen in the mother, inter alia contacted Rubella during pregnancy.

2. Those who were born deaf and then lost their sight. Often caused by the usher syndrome- deafblind followed by a decrease in sight because of retinitis pigmentosa.

3. Those who were born blind and then lost their hearing.

4. The deafblind, as a result of old age, or through an illness or accident later in life.

#### **Causes of Deafblindness**

• **Congenital Deafblindness**. Deafblindness comes from birth or before the acquisition of language.

• Acquired Deafblindness, a person with acquired Deafblindness has a certain knowledge of the world, more or less depending on the age of appearance, which means that, in principle, it can adapt to the environment

#### **Effects of Deafblindness**

Deafblindness affects a person in different ways, the extent to which it affects your daily living depends on many things, including the nature of sight and hearing loss, what has caused you to become deafblind, other medical conditions, and also your own attitude, personality, and life history. Few deafblind people retain some useful vision and hearing, which can be enhanced by wearing glasses or using hearing aids. Deafblind people who were born deaf can rely on sign language rather than spoken language to communicate. For those who have any vision, sign language at close range can be used. Other deafblind people who either have very limited sight or have no sight or hearing at all, need the speaker to communicate with them. They can use multiple methods. One way is to trace out the letter in their palm in block capitals, one on top of the other. Living with Deafblindness does not always have a significant impact on your independence. Some people live their daily lives with just a few minor adjustments or using some well-planned technology. However, others may face multiple sensory difficulties. The term multi-sensory impairment is used to describe a group of people, who have a number of different sensory difficulties. This can include any of the senses and includes the processing issues that people experience. This means that, although there are no issues with the sensory organs, the brain struggles to decode and organize the messages sent from them. Many children also face other challenges, such as medical conditions or physical disabilities. Children and young people with MSI need to get as much information as possible from any useful sight and hearing they have and from their other senses.

#### **Challenges in teaching Deafblinded children**

Deafblind people can have a wide range of needs in all areas of development, including, cognitive, motor, speech, and perceptual development, resulting in significant educational needs that cannot be met by special education programmes designed specifically for deaf or blind children. Since learning happens through vision and hearing, deaf and blind students need services from a team of trained practitioners and paraprofessionals who can provide them with meaningful communication and learning opportunities. It is critical to provide deaf-blind students with adequate communication and learning opportunities. Multiple communication techniques should be incorporated in both the home and the school setting to help them overcome communication difficulties. In addition to this, various non-profit organizations are

providing services to support such individuals. Sense International (India) was established in 1997 as the first national NGO in India to support the development of comprehensive services for deafblind people. Sense International (India) supports local organizations to develop sustainable services for deafblind people. Today SI works with 39 partners in 19 states providing services to over 32000 deafblind people. It is working in partnership with SSA. The main purpose of this proposed training module is to assist resource teachers, and block resource coordinators of SSA with basic skills to identify, assess, and strengthen services for deafblind children in the districts within their states.

#### Vision and Visual Stimulation

Vision is the master of all senses. The variety of information that we get through this sense is unparalleled. The ability to use vision is very important for independent functioning and for better performance within each developmental area. Vision is continuous whereas the other sensory stimuli are fleeting and unpredictable. Vision acts as a tutor for all the other senses. When the child is born, the visual capacity of the child is very limited. The visual sense is the least developed sense is the developed sense at birth although this sense organ is the first to be formed in fetal life. Holding objects, looking at and smiling at the caregiver, manipulating toys, searching for hidden toys and objects, playing with peers, etc are affected by visual impairment. Vision loss that cannot be corrected with glasses, contacts, or surgery is known as low vision. This is not complete blindness. The term "totally blind" refers to someone who has completely lost their sight. Low vision is an extreme visual disability in which the better-seeing eye's visual acuity is 20/70 or worse and cannot be improved with glasses or contacts. Blind spots, poor night vision, and fuzzy vision are all symptoms of low vision. Age-related macular degeneration, glaucoma, and diabetes are the most common causes. Visual fixation is the practice of keeping one eye fixed on a single point. If an animal's eye structure includes a fovea, it may show visual fixation. The fovea is the clearest part of the retina it is found in the middle. The fixation means either the point of emphasis in time and space or the act of fixating. The stage between any two saccades, at which the eye is relatively stationary and nearly all visual information exists, is known as fixation. Fixation eye movement is a nervous system process that continuously activates neurons in the early visual areas of the brain reacting to transient stimuli in order to preserve vision. The importance of visual tracking:

- It aids the child's development of synchronized eye movement on both sides.
- It aids the child in judging and anticipating what is going on around him.
- It aids the child in comprehending the significant of self-movement and spatial objects.

#### How it affects?

With so many children playing mobile games for long periods of time, it's easy to believe that there are only detrimental effects on their eyes; nevertheless, what's dangerous in abundance is actually helpful in moderation. Person action games help enhance spatial resolution, implying that mobile games can even be used as recovery therapy for conditions such as lazy eye and even cataracts. Action games will help us develop contrast sensitivity, which allows us to distinguish between various shades of colour on a uniform backdrop. Visual focus and visual response time will also benefit from action-oriented games. You're training your eyes to concentrate on subtle information when facing fast-moving obstacles by moving your eye quickly across the screen. There's also proof that any mobile game, not just first-person shooters, can be beneficial to the eyes. An arousal is elicited by light, which causes a reaction in the retina's receptor cells. VISUAL STIMULATION: "In mental and cognitive therapy, positive visual stimulation images such as waterfalls, sunsets, and animals are widely used. The eye receives physical stimuli in the form of light and transmits those stimuli to the brain as electrical signals, which the brain interprets as images. The growth of the optic nerves is stimulated by old black-and-white videos. Using certain visual stimuli to train newborns' vision, the eye muscles and brain learn to coordinate and work properly.

#### **Statement of the Problem**

Evaluation of the effectiveness of functional vision stimulation-based mobile application in helping children with deafblindness.

#### **Objective of the study**

The objectives of the study are as follows:

i) To understand the importance of functional visual stimulation for children with Deafblindness.

ii) To analyze the relevance of using a functional vision stimulation-based mobile application for children with Deafblindness.

iii) To examine the effect of mobile Application in improving functional visual stimulation among children with Deafblindness.

iv) To investigate the effect of mobile application in improving functional visual stimulation among children with Deafblindness with respect to their gender, age and severity of disability.

#### Hypotheses of the study

The hypotheses are as follows:

- 1. There is no significant difference between pre-test and post-test in reference with using mobile app for improving functional visual stimulation in children with deafblindness.
- 2. There is no significant difference in improving functional visual stimulation by using mobile app in children with deafblindness on the basis of severity of disabilities.
- 3. There is no significant difference in improving functional visual stimulation by using mobile app in children with deafblindness based on gender.
- 4. There is no significant difference in improving functional visual stimulation by using mobile app in children with deafblindness based on age groups.

#### Limitations of the study

Every study has its own limitations, but limitations pave to way to open discussions on how it makes an impact on this study. Some of the limitations of the present study are given below:

- 1) **Time constraint:** This experimental study was conducted only for a period of three months.
- 2) Language Barrier: The subjects chosen are from different ethnic backgrounds and they do follow their regional languages practicing at home for communication. Though the study was conducted successfully, the investigator also felt that the parents and the children might had difficulty of making communication directions. They might have come across difficulties in responding to stimuli.
- **3)** Less number of studies conducted: When the Investigator was exploring the possibility of finding enough information from the research, journals, and reference books, very few studies were found. The researcher was not able to find enough reference books and journals available related to this study. Therefore, the researcher finalized the tools and the methodology of conducting the research with limited reference to the materials.
- 4) Financial Resources: The study would have been conducted with the input of multiple materials with different properties to teach children the concepts on positioning the concepts and special awareness. However, the researcher was able to provide with similar experiences in connection with the objectives of the study with the limited resources.

# **Delimitations of the Study**

The delimitations of the study are as follows:

 Sample: Since there are very few institutions working for children with Deafblindness. The sample of the study was selected only from NIEPMD which is a National Level Institute working for Persons with Multiple Disabilities, Chennai, and different special schools (SSA) in Ranipet district (Arakkonam). Children with Deafblindness with various combinations of disabling conditions attending Special School of NIEPMD, Chennai, and different special schools (SSA) in the Ranipet district (Arakkonam) alone were selected for this research study.

**2)** Age group and disability: Children having deafblindness and in the age group of 6-14 years were selected for the present study.

# Methodology

# Sample

The sample selected for the present study was five children having Deafblindness in the age group of 6 to 14 years. The purposive sampling method was used to select the sample. The assessment and diagnosis of children with Deafblindness was done by rehabilitation professionals working in the National Institute for Empowerment of Persons with Multiple Disabilities and SSA Special Educators in Ranipet district (Arakkonam).

# **Inclusion criteria**

1. Only Children diagnosed with Deafblindness

2. Age group between 6-14 years.

3. Children attending primary and secondary classes at NIEPMD School Chennai and different special school (SSA) Ranipet district (Arakkonam).

# **Exclusion Criteria**

- 1. Children diagnosed with Cerebral Palsy along with Intellectual Impairments
- 2. Children diagnosed with Multiple Disability
- 3. Children diagnosed with single disabilities
- 4. Children diagnosed with sensory disabilities

# **Distribution of the sample**

S.no	Name of the school	No. of	Disability	Additional
		sample		Disabilities
1.	NIEPMD (Chennai)	03	Low vision +	Cerebral palsy
			Hearing impaired	
2.	Govt. Sec. school (SSA)	02	Low vision +	Intellectual
	Arakkonam		Hearing impaired	disability

# Variables of the Tool

In this research study, the independent treatment variable is a functional vision stimulationbased mobile application. The dependent variable is Visual Stimulation. Mobile app creates an impact on developing visual stimulation among children with Deafblindness along with development of attention and different aspects of visual stimulation.

# **Tool for the Study**

Self-constructed tool was used by the researcher to assess the visual level among children with Deafblind. The checklist consists of 13 domains namely; Behavior, Visual Awareness, Visual Attention, Fixation, Visual scanning, Visual Discrimination, Visual Figure, Visual Memory, Tracking, Gaze shift, Localization, Eye contact Eye hand coordination. Each domain consists of three to five items with a total of 51 questions.

# **Intervention Procedure**

The investigator referred to the different games for teaching the use of mobile app (Game) to improve the vision of children with deafblindness. For the first four sessions, the observer gave intervention through a light ball, and a sound ball, and tracking the light. The objectives were to identify the different colours of lights, and peg board activity, so it helps the child to get adapt for further intervention which includes mobile app (Games). The intervention was given for 30 sessions and all the activities were designed as per the understanding and performance level of every child. The intervention was given individually. During the intervention, if any child needs any prompts, verbal physical prompts along with the use of sign language were given appropriately.

S.No	Sample	The app used for intervention
1.	Subject 1	Mommy saver, Extreme balancer.
2.	Subject 2	Colour adventure, visual stimulation
3.	Subject 3	Visstim, mommy saver
4.	Subject 4	Colour adventure, visual stimulation
5.	Subject 5	Visstim, visual stimulation

# Games used for the Intervention

# Analysis and Interpretation of Data

1. There is no significant difference between pre-test and post-test in reference with using mobile app for improving functional visual stimulation in children with deafblindness

Table 1 Significance of Difference between means of pre-test and post-test in reference
with using mobile app for improving functional visual stimulation in children with

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Domain	Mean	Ν	Std.	t-value	p-value
Pre-test	26.40	5	8.112	17.928	0.000
Post- test	41.40	5	7.301		

It was inferred from the table 1 that the pre-test mean is 26.40 and post-test mean is 41.40. t value is 17.928 and p value is 0.000 which is significant at 0.01 level of significance. Therefore, the hypothesis1: "There is no significant difference between mean scores on pre-test and post-test in reference with using mobile app for improving functional visual stimulation in children" is rejected. The higher mean on the post-test indicates the significant improvement in functional visual stimulation in children with deafblindness after intervention. Hence, it is concluded that using mobile app improves the functional visual stimulation in children with deafblindness.



2. There is no significant difference in improving functional visual stimulation by using mobile app in children with Deafblindness on the basis of severity of disabilities.

 Table 2 Significance of Difference between means of pre-test and post-test in reference

 with using mobile app for improving functional visual stimulation in children with

	category	Ν	Mean	t- value	p- value
Pre- test	Mild	3	24.67	.53	.633
	moderate	2	29.00		
Post-	Mild	3	40.67	.241	.825
test	Moderate	2	42.50		

deafblindness with reference to severity of disability.

It was inferred from the table 2 that the pre-test mean scores of children with mild deafblindness is 24.67 and pre-test mean of children with moderate deafblindness is 29.00. t value is 0.53 and p value is 0.633 which is not significant at 0.05 level of significance. Post-test mean scores of children with mild deafblindness is 40.67 and post-test mean scores of children with moderate deafblindness is 42.50. t value is 0.241 and p value is 0.825 which is not significant at 0.05

level of significance. Therefore, the hypothesis 2: "There is no significant difference in improving functional visual stimulation by using mobile app in children with Deafblindness on the basis of severity of disabilities" is not rejected.

3. There is no significant difference in improving functional visual stimulation by using mobile app in children with deafblindness based on gender.

# Table 3 Mean, Standard Deviation t- value, p-value of improving functional visual stimulation by using mobile app in children with deafblindness based on gender

Domain	Mean	N	Std.	t-value	p-value
Male	2.00	3	1.000	3.000	0.05
Female	4.50	2	0.707		

From the above table 3, it is found that the mean score of male and female values are 2.00 and 4.50 respectively. The t-value is 3.000 and p value is 0.05 which is significant at 0.05 level. Therefore, the hypothesis 3, "There is no significant difference in improving functional visual stimulation by using mobile app in children based on gender" is rejected. The mean scores of the female students are more than male students, thus improvement is more in female students in comparison to male students.



4. There is no significant difference in improving functional visual stimulation by using mobile app in children with deafblindness based on age groups.

	Mean	Ν	Std.	t-value	p-value
Below 10	2.67	3	1.528	0.522	0.638
Above 10	3.50	2	2.121		

 Table 4 Mean, Standard Deviation, t- value of pre-test and post-tests performance in

 improving functional visual stimulation by using mobile app with reference to Age

From the above table 4, it is found that the mean score of children below the age group 10 and above age group 10 are 2.67 and 3.50 respectively. The t-value is 0.522 and the 'p' value is 0.638 which is non-significant at 0.05 level of significance. Therefore, the hypothesis 4, "There is no significant difference improving functional visual stimulation by using mobile app with reference to age" is not rejected.

# **Discussion on findings:**

The study was conducted with the objective to find out the effectiveness of using mobile app for visual stimulation among children with Deafblindness. The researcher statistically analysed the data to find out its effectiveness on dependent variable and other quantitative variables. Major findings found by the researcher in this study are explained below-

1.Findings of the study revealed that the use of mobile app/game to improve the functional visual stimulation for children with Deafblindness is an effective intervention as there is a significant difference in the pre-test and post-test of the group.

**2.**The finding of the study revealed that there is no significant difference in improving functional visual stimulation by using mobile app in children with deafblindness on the basis of severity of disabilities. Thus, the intervention is effective for both mild and moderate level children with deafblindness.

3. The finding of the study showed that there is a significant difference in improving functional visual stimulation by using mobile app in children with deafblindness based on gender. The intervention is more effective for female children with deafblindness in comparison tot their male children.

4. In addition to above, no significant difference was found in children with respect to their age groups. The mobile app does not influence age because all the game selected for intervention was age appropriate.

# Conclusion

Children with deafblind face remarkable difficulties in seeing and hearing. There is strong evidence that mobile app facility is user friendly for children with deafblindness. Visual

stimulation using the mobile app for children who has residual vision will enhance the vision skills in early stage that would help in turn in later stage. Teachers and special educators can provide visual stimulation activities through mobile app, depending on the nature and type of disability. Playing mobile games is considered feasible nowadays because of the availability in use. Therefore, it is concluded that functional vison stimulation for children with deafblindness for increasing the independent living skills, education and employment.

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