"A PILOT NON-RANDOMIZED TRIAL OF SMARTPHONE ANAGLYPH SYSTEM BASED VIRTUAL REALITY THERAPY FOR TREATMENT OF AMBLYOPIA: SPAA-2"

By

BHAVANA KUMARI

Batch

2018-2022

Under the guidance of

Mr Samir Sutar

Submitted in partial fulfilment of the requirement for the degree of Bachelor's of Optometry

DECLARATION

I hereby declare that the thesis entitled **"A PILOT NON-RANDOMIZED TRIAL OF SAMRT PHONE ANAGLYPH SYSTEM BASED VIRTUAL REALITY THERAPY FOR TREATMENT OF AMBLYOPIA: SPAA-2".** It is a record of *bonafide* work carried out by me. I affirm that it's entirely my effort and has not been copied. The project/dissertation has been conducted for the award of the degree of B.OPTOMETRY to Arka Jain University. The project work is carried out by me, under the guidance of Mr Samir Sutar, Head of Department at CL Gupta Eye Institute, Moradabad, UP. as the External Guide and Mr. Sarbojeet Goswami, Head of Department, School of Health and Allied Science, Arka Jain University, Jamshedpur, Jharkhand.

The above-mentioned information is authentic to the best of my understanding.

I further declare that the work reported in this thesis has not been submitted and will not be submitted either in part or in full for the award of any other degree or diploma in this institute or any other Institute or University.

Place: Jamshedpur

Date: May 18,2022

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(External Guide)

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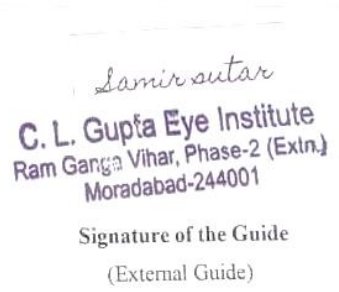
Signature of the Candidate

CERTIFICATE

This is to certify that the thesis entitled **"A PILOT NON-RANDOMIZED TRIAL OF SAMRT PHONE ANAGLYPH SYSTEM BASED VIRTUAL REALITY THERAPY FOR TREATMENT OF AMBLYOPIA: SPAA-2".**Submitted by Ms BhavanaKumari for the award of the degree of B.Optometry, is a record of *bonafide* work carried out by the student under my supervision at CL Gupta Eye Institute, Moradabad, UP, as per the academic code of the University.

The contents of this report have not been submitted and will not be submitted either in part or in full for the award of any other degree or diploma in this institute or any other Institute or University. The thesis fulfils the requirements and regulations of the University and, in my opinion, meets the necessary standards for submission.



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Place: Jamshedpur
Date: May 18, 2022

Signature of the Coordinator

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Thank you.

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ABSTRACT

Purpose:

The aim of this research is to treat all amblyogenic factors through a smart phonebased anaglyph system by virtual reality among the adult age group at a much lower cost.

Methods:

A total of 30 subjects with diagnosed anisometropic amblyopia were enrolled. BCVA(best-corrected visual acuity), Accommodation(RAF ruler), Stereo acuity(random dot graded circle test), and Contrast acuity(Pellirobson), changes were evaluated at presentation and after six months of smart phone based anaglyph video run in the VR (virtual reality). Examined the patient at presentation, 3 and 6 months of follow-up.

Results:

Mean BCVA in amblyopic eye improved significantly from a log MAR value of 0.73 ± 0.64 before VRVT to a post-training VRVT value of 0.48 ± 0.44 ($p < 0.01$). Mean stereo acuity changed from a value of 560.00±301.58 before VRVT to a value of 263.00 ± 143.58 seconds of arc after training and second of arc after training (VRVT) ($p < 0.01$).Mean accommodation changes from a value of 15.00±7.40 before training or VRVT to a value of 12.60±6.10 cm after training ($p < 0.01$). Mean contrast acuity changes from a value of 1.21±0.72 at presentation to a value of 1.52±0.49 log Unit after VRVT ($p < 0.01$).

Conclusion:

A smartphone-based anaglyph system using virtual reality vision therapy appears to be aneffective treatment option for amblyopia in adults. To the knowledge of the authors, this wouldbe the first clinical data to claim that the anaglyph method is an effective treatment approach for amblyopia in adults through virtual reality in the Indian context.

Keywords: Amblyopia, VRVT, Anaglyph System

INTRODUCTION

Amblyopia is a reduction of the best-corrected visual acuity of the eye without organic cause.[1] It prevalence has been estimated to be 1% to 5%.[2] Amblyopia is an important preventable cause of blindness.[3] Currently, the treatments of amblyopia are mainly patching/occlusion, atropine penalization, and pharmacological method.[4] With the advancement in technology, VR is becoming a safe, effective, and very appealing tool in the area of visual training that promotes adherence to amblyopia therapy. VR consists of the presentation of computer-generated 3D environments that enable the user to immerse them fully in a simulated world in which they can interact through multiple sensory channels. The treatment of amblyopia with a combination of different serious games based on perceptual learning environments for different VR interfaces has been validated to be an advantageous therapeutic approach for improving visual disturbancesthat occur with amblyopia, even after the critical phase of visual advancement.[5]

Conventional occlusion therapy, in which the dominant eye is patched to encourage stimulation of the amblyopic eye, has traditionally been the primary treatment for amblyopia[6]. Although this simple intervention is effective, it leads to varied and unsatisfactory results, long treatment time, high costs, negative psychological and emotional impacts, and poor compliance that can even render the treatment completely ineffective[7]

Like the development of virtual reality (VR)-based treatment systems such as the Interactive Binocular Treatment (I-BiT™) system by Eastgate et al. and the Viston-VR™ system by Qiu et al. have demonstrated VR technology has shown promising results during treating of amblyopia. In the context of vision, these systems are proved to be highly effective, but it does not focus on all amblyogenic factors development [8,9,10]

Peter et al. did a study on amblyopia treatment through virtual reality with vivid vision software only on anisometropic amblyopia, and they have speculated that virtual reality with vivid vision software is very effective in improving the visual acuity of anisometropic amblyopia, but the limitation was that they were unable to measure other parameters, which supports in developing amblyopia[11]

As far as we know, the viability of adopting virtual reality as part of amblyopia treatment is yet to be proven in the Indian context. This motivates the current research, which we see as a first step toward the development of a novel smartphone-based anaglyph system for amblyopiatreatment using virtual reality, which can be utilized as a starting point for treatment.

VR-based treatment is helpful in overcoming several problems. VR-based treatment is interactive and age adaptable, making it fun for the patient and leading to excellent patient compliance. On the other hand, VR requires expensive and highly developed equipment. It is also not accessible to all children as well as older cohorts. Keeping in this mind, the aim of this investigation was to treat all the amblyogenic factors by smart phone based anaglyph system through Virtual reality in an older cohort of 10 to 25 years of age. The software or anaglyph video of this system could be installed on a personal Smartphone and conveniently operated along with a pair of special glasses at a much lower cost.

REVIEW OF LITERATURE

Year/Place of publication	Author/s	Title	Methodology	Summary/Result
15 April 2005 Journal of Ophthalmic Inflammation and Infection	PE Waddingham et, al	Modified Virtual Reality technology for the treatment of amblyopia	Laboratory study used to develop a prototype research system design -A pilot study conducted over the years, a team of ophthalmologists and orthoptics developed the I-BiT™ system.	This study shows the development of a prototype research system design for the treatment of amblyopia in children.

Year/Place of publication	Author/s	Title	Methodology	Summary/Result
15 April 2005 Journal of Ophthalmic Inflammation and Infection	PE Waddingham et, al	Preliminary results from the use of the novel Interactive Binocular Treatment(I-BiT^{TM})system in the treatment of strabismic and anisometropic amblyopia	~Questionnaire-based study. -A pilot study was conducted with the 7patients where patients responded to a structured self-administered questionnaire.	Total 7 patients participated in this tolerability study. The participants included 4 -(60%) females and 3-(40%) males with a mean age of 6.25 (ranges 5.42-7.75) years. -Children and their parents expressed their interest in the new method of treatment. -This study's results showed that there are improvements in vision within a short period of time, and there were no dude effects of the treatment with the I-BiT^{TM} system. -Limitation of the study was small samples were drawn.

Year/Place of publication	Author/s	Title	Methodology	Summary/Result
2007, 1st International Conference on Bioinformatics and Biomedical Engineering	FeiyueQiu et,al	Interactive binocular amblyopia treatment system with a full-field vision based on virtual reality	It is an experimental study that is used to develop the Viston-VR™ System.	This study shows encouraging results as compared to traditional occlusion therapy. -This new method is easily accepted by the children's parents. -Study shows the positive results earlier than the occlusion method.

Year/Place of publication	Author/s	Title	Methodology	Summary/Result
28 June 2017, BMC Ophthalmology	Peter Ziak et, al	Amblyopia treatment of adults with dichoptic training using the virtual reality oculus rift head-mounted display: preliminary results	Perspective study. -Best-corrected visual acuity (BCVA) evaluated after the 8sessions of the training.	A total of 17 amblyopic patients participated in this visual training. The participants included 10 (60%) males and 7 (40%) females with a mean age of 31.2 (ranges, 17-69) years. This study shows the outcomes of the dichoptic visual training using a virtual reality head-mounted display where it is observed that there is an improvement in visual acuity.

METHODOLOGY

A Pilot, Non-randomized Prospective Interventional study was conducted at the Department of Paediatric Ophthalmology and Strabismus, C.L. Gupta Eye Institute. Patients were enrolled from September 2021 to April 2022. Institutional Review Board approval and in accordance with the guidelines of the declaration of Helsinki, written informed consent was obtained from all the participants and/or parents prior to study enrolment.

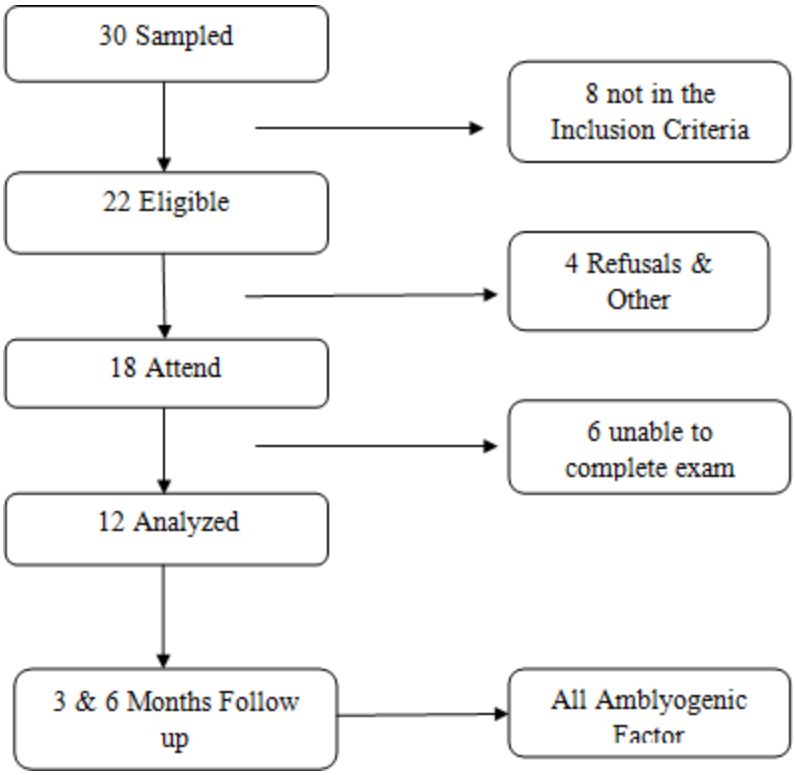
Thirty subjects diagnosed with amblyopic anisometropic were enrolled in the study. Eligibility criteria for this study are Anisometropic and Ametropic Amblyopia, Post Cataract and Strabismus surgery, and Failed patching therapy. The pediatric age group and patients havingany ocular pathology are excluded.

All subjects underwent a comprehensive eye examination, including monocular distance unaided visual acuity, retinoscopy with and without cycloplegia, followed by subjective refraction, Ocular alignment was assessed using the Hirschberg light reflex test, alternate cover test, and cover-uncover test. Cover tests were performed with fixation targets at both distances (6 m) and near (33 cm). Other eye examinations included stereopsis screening, ocular dominance, Accommodation (RAF Ruler), and Contrast acuity (Pelli-Robson) were taken at presentation, 3months & 6 months.

The stereo acuity was measured using the Stereo Random dot graded circle test (Stereo Optical, IL, USA). Participants underwent CSF assessment using a Pelli–Robson chart. Tests were performed in the contact lens clinic with standard room illumination with the recommended 1 m test distance for all subjects. Scores were recorded for all three optotypes identified by the participant with the least contrast.[13]The flow chart is shown in figure 1.

Smart phone based anaglyph system of the prototypes model consists simple VR box and any smartphone which was supports 4G. The system consists of a smartphone with preloaded anaglyph video (downloaded from YouTube), a VR box, and a pair of anaglyph glasses made of two colour filters (red and blue). All components, especially the mobile or background elements, would be seen by both eyes to encourage fusion, such that the patients can use both their eyes.

Figure 1: Flow Chart of VRVT Study sampling



DATA ANALYSIS

All statistical analyses were performed using SPSS statiscal software (version 25) and two-sided $p<0.001$ was considered statistically significant. Values were presented as mean ±standard deviation for continuous variables and percentage for categorical variables. All the amblyogenic factors include Steropsis, Accommodation, and Contrast Sensitivity compared using Friedman two-way analysis of variance. Box plot was made to present distribution of individual values.

RESULTS

Table 1 summarizes the main clinical data of patients included in the study, including BCVA, Accommodation, Contrast acuity, and Stereopsis of the amblyopic eye data before and after the treatment of Smart phone based anaglyph system through virtual reality. As shown, BCVA improved significantly from a mean LogMAR BCVA value of 0.73 ± 0.64 before training to a mean post-training value of 0.44 ± 0.44 ($p< 0.01$, Friedman two-way analysis of variance). Most of the patients gained lines (0.3 LogMAR line on average) of BCVA except those two patients with the lowest BCVA (1.30 and 1.2 LogMAR) very minimal changes change in BCVA was observed.

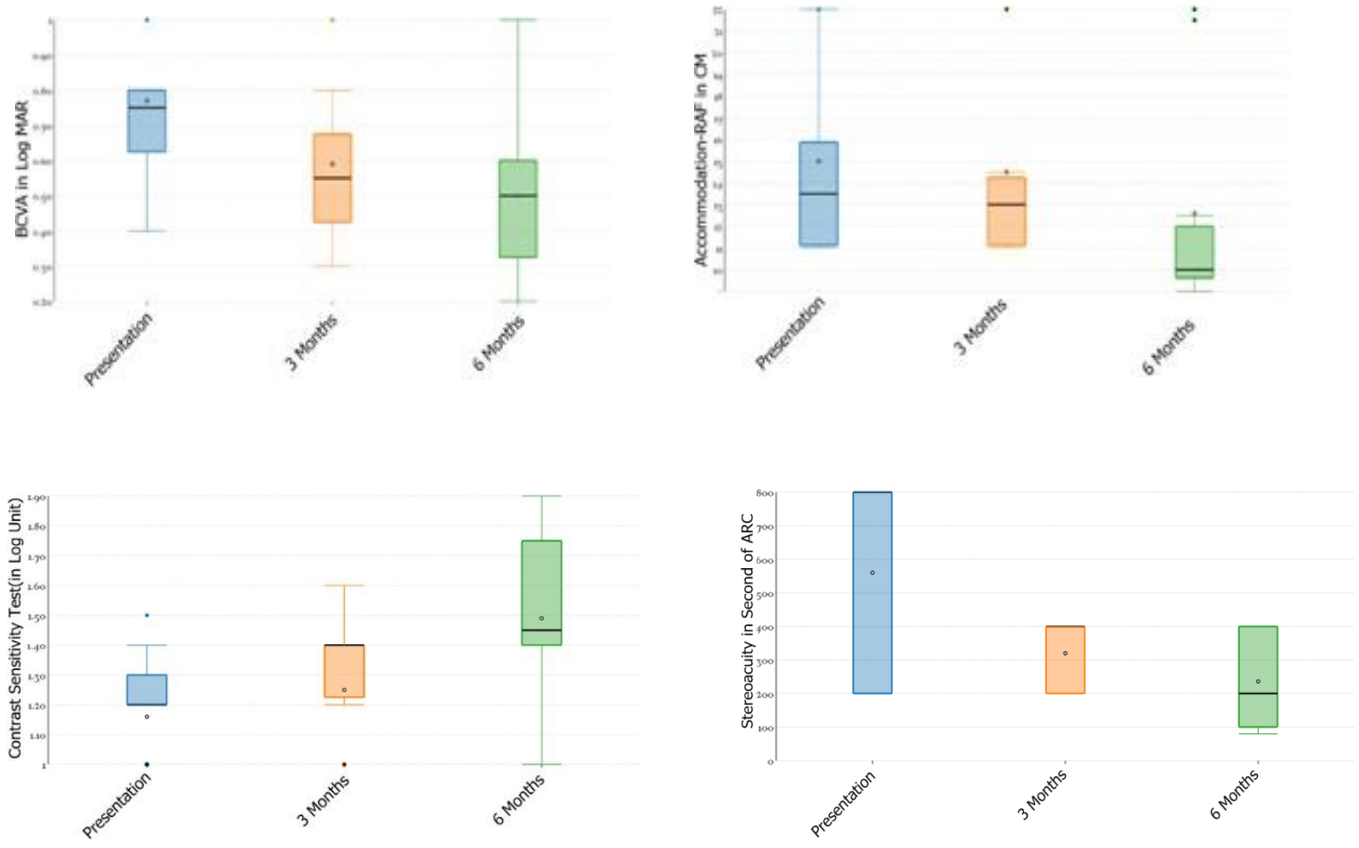
Stereo acuity was measured using the Stereo Random dot graded circle test. Mean stereo acuity changed from a value of 560.00±301.58 before VRVT to a value of 263.00 ± 143.58 seconds of arc after training (Table 1). This change was statistically significant ($p< 0.01$, Friedman two way analysis of variance). The near point of accommodation was measured using an RAF ruler. Mean NPA changes from a value of 15.00±7.40 before training or VRVT to a value of 12.60±6.10 cm after training (Table 1). This change was statistically significant ($p< 0.01$, Friedman two way analysis of variance). Contrast acuity was measured using the PellirobsonCSF chart. Mean contrast acuity changes from a value of 1.21±0.72 at presentation to a value of 1.52±0.49 log Unit after VRVT.

Visual inspection, along with all amblyogenic of measurement distributions, may be used for assessing normality. The box plot (or box and whisker plot) in Figure 1 indicates the distributions of all amblyogenic factors pre and post VRVT. The horizontal bold line in the middle of the plot represents the median or the 50th percentile of each distribution (see Figure 1).A Small dot just above or below to bold horizontal line represents the mean value of each follow-up. The box itself represents the middlemost 50% of the distribution. The box has'whiskers' (i.e. the vertical lines), one below the first and one above the third quartiles. The whiskers indicate the smallest and largest measurement in each distribution. The push-up and minus lens methods had the longest whiskers above the third quartile.

Table 1: Baseline characteristics and results of the sample of patients that performed thesmart phone based anaglyph system through Virtual reality

Amblyogenic Parameters	Presentation	3 months	6 Months	p-Value
	Mean±SD	Mean±SD	Mean±SD	
BCVA (Best corrected Visual acuity in Log MAR)	0.73±0.64	0.56±0.51	0.480±0.44	<0.001
ACC (Accommodation in CM)	15.00±7.40	14.50±6.86	12.60±6.10	<0.001
Contrast Acuity (Pellirobson in Log Unit)	1.21±0.72	1.30±0.60	1.52±0.49	0.002
Stereopsis (In seconds of ARC)	560.00±301.58	320.00±100.54	236.00±143.58	<0.001

Figure 1: Box plots of the all amblyogenic factors presentation, 3 months and 6 months of VRVT training. The box plots display the distributions of the amblyogenic factors measurements based on the minima, first quartile, second quartile, third quartile, and the maxima per sample. Horizontal bold lines inside the boxes show the medians and whiskers above and below theboxes showing the location of the minima and maxima.



DISCUSSION

In our co-hort, apart from visual acuity, stereo acuity improved in 10 out of 12 patients, whereas other studies evaluating other modalities of binocular treatment have reported improvement rates of 50% to 60% [22,23]. Possibly, the use of virtual reality may play a major role in this enhanced stereo acuity after smart phone based anaglyph system through virtual reality. Fulvio and colleagues[23] demonstrated that Head tracking in virtual reality display reduces the misperception of 3D motion. More research on this issue is needed in order to evaluate the potential use of virtual reality training for the improvement of stereopsis in amblyopia.

In the current preliminary clinical study on Smart phone based Anaglyph systems throughVirtual reality, we have used a protocol of treatment of 4 hours per day. The reason for the selection of this protocol is based on the consideration that the compliance may be better if the treatment is shorter, and also the previous experiences demonstrated that the greatest improvement with perceptual training is achieved in the first eight sessions of the treatment [24,25]. Future studies must be conducted to investigate the best protocol of treatment using smart phone based anaglyph system for treatment of amblyopia through virtual reality

Eastage&Waddingham PE et al.explored the use of VR in amblyopia, the I-BiT system group, who developed an interactive VR-based binocular system to treat amblyopia via participation in interactive computer games or viewing 3D DVD footage with 3D shutter glasses. With this system, specially configured software is used to preferentially stimulate the amblyopic eyewithout compromising the vision of the unaffected (dichoptic stimulation). The potential of this technology to improve visual acuity in amblyopia has been proven in different age groups, ranging both when the therapy was applied in isolation and in combination with patching.[8,9]

Herbison et al. did a randomized clinical trial to validate this technology with a sample of 75 amblyopic children aged 4–8 years, obtaining a visual acuity improvement of the amblyopic eye of approximately 0.07 log MAR at 6 weeks of treatment. These authors confirmed that the treatment did not induce any adverse effects among the participants, so dichoptic stimulation using 3D shutter glasses technology can be considered a safe alternative to provide immersive sensory feedback to amblyopic patients.[18,20]

In 2017, a pilot study was conducted to evaluate the effectiveness of dichoptic visual training (Diplopia game, Vivid Vision) using a VR HMD (Oculus Rift OC DK2) in a sample of 17 anisometropic amblyopic adults. Visual acuity and stereopsis changes were evaluated after eight sessions of 40 minutes each, showing a significant visual improvement and change in stereopsis. Specifically, a total of eight patients (47.1%) had immeasurable stereo acuity before dichoptic treatment, while this only occurred in two patients (11.8%) after training. Similar results have been noticed in this study apart from the improvement in Stereopsis and all amblyogenic factors. However, in the study conducted in the year 2017, specific software or dichoptic video game was used with predefined treatment, but in our study, we have used an anaglyph system through VR for the treatment of adult amblyopia[11]

It is still necessary to perform a controlled clinical trial evaluating this potential treatment option for amblyopia, not only in adults but also in children. Our results suggest that all amblyogenic factors include (Including visual acuity, Stereopsis, Contrast acuity, and accommodation) of the amblyopic eye gates improved with an anaglyph system through virtual reality.

This preliminary clinical data have some limitations, including sample size long term stability of all amblyogenic factors, after the treatment, although we have 6 months of data post-treatment. Future robust clinical studies are needed to confirm the testability, reliability, and outcomes of this test in a population of clinical patients. Future studies also need significant data from a large population regarding all clinical patients suffering from all amblyogenic Factors.

Table 1. ***Key findings from virtual reality studies***

AUTHOR (YEAR)	N	AGE (YEARS)	TYPE OF AMBLYOPIA	TECHNOLOGY USED	RESULTS	FOLLOW-UP
Waddingham et al. (2006)	7 children	3–7	Residual amblyopia (AAmb or SAmb with previous failed treatments)	I-BiT system: dichoptic games and movie clips	VA improvement from pre 6/12-6/120 to post 6/7.5-6/24; Total treatment time: 4.4 hours; VA improvement in 5 out of 7 patients	7–15 sessions
Cleary et al. (2009)	12 children	6.1–11.4	5 SAmb or MAmb; 7 AAmb	I-BiT system: dichoptic driving game and video clip; 8 sessions, 25 min/session	Sustained improvements in HCVA: 58%; Improvement in LCVA: 67%; Amblyopia elimination: 2 patients; VA 6/12 or better at 6 months after stopping treatment: 5 children; HCVA improvement: 4 sessions; LCVA improvement: 7 sessions	18 weeks
Herbison et al. (2013)	10 children	Mean 5.4	3 SAmb; 4 AAmb; 3 MAmb	I-BiT system: dichoptic Nux game and video clip; 6 weekly sessions, 30 min/session	VA improvement: 78%; Clinically significant increase in VA of ≥0.125: 67%; Mean change from baseline to follow-up 0.13 ± 0.14 logMAR	10 weeks
Herbison et al. (2016)	75 children	4–8	67 residual amblyopes; 70 SAmb	RCT with 3 arms: • DVD footage shown to the AE and common background to both (I-BiT DVD); • Modified shooter game, Nux, with sprite and targets presented to the AE (I-BiT game); • Both background and foreground presented to both eyes (non-I-BiT games)	VA improvement in all three arms by approx 0.07 logMAR; No difference between I-BiT DVD and non-I-BiT games compared with I-BiT games in terms of gain in vision	10 weeks
Ziak et al. (2017)	17 adults	17–69	Anisometropic	Diplopia Game + Oculus Rift OC DK2 head mounted display; 8 sessions, 40 min/session, twice per week	Mean BCVA in AE improved from 0.58 ± 0.35 pre to 0.43 ± 0.38 post (P <0.01); Mean stereoacuity changed from 263.3 ± 135.1 seconds of arc pre to 176.7 ± 152.4 seconds of arc post (P <0.01); 47.1% before dichoptic treatment had unmeasurable stereoacuity while this only occurred in 11.8% after training	1 month

AAmb: anisometropic amblyopia; SAmb: strabismic amblyopia; MAmb: mixed amblyopia; VA: visual acuity; BCVA: best corrected visual acuity; HCVA: high contrast visual acuity; LCVA: low contrast visual acuity; RCT: randomised clinical trial; AE: amblyopic eye

CONCLUSION

A smart phone-based anaglyph system using virtual reality vision therapy appears to be an effective treatment option for amblyopia in adults. To the knowledge of the authors, this would be the first clinical data to claim that the anaglyph method is an effective treatment approach for amblyopia in adults through virtual reality in the Indian context. However, VR with special software-based treatment is costly and inaccessible to most children. This paper introduces a method that includes the benefits of the smart phone-based anaglyph system for treating adult amblyopia through VR at a lower cost.

CONFLICT OF THE INTEREST

There is no conflict of the interest in this study.

APPENDICES

Appendix 1: CONSENT FOR RESEARCH (Participant copy)

I have read this information brochure carefully/ this form has been read to me. I understand the consequences involved in participation in this research study that is explained to me. I have had an opportunity to ask questions, and I am satisfied with the answers I have been given. I, mother/father/guardian of ---------- (please write the name), hereby voluntarily consent to participate my (son/daughter)---------- in the study on **"A PILOT NON-RANDOMIZED TRIAL OF SMART PHONE ANAGLYPH SYSTEM BASED VIRTUAL REALITY THERAPY FOR TREATMENT OF AMBLYOPIA: SPAA-2"** as described in the information brochure.

In making my candidate participate, I understand that:

- The data will remain confidential and will not be released within legal limits.
- There will be neither cost nor financial benefit to my candidate for participating in this study. If the data leads to the development of a commercial project in the future, we will not receive payment for this.
- I may at any time withdraw my candidature from participating in this study. This will not affect future medical treatment.
- I may be approached again to participate in future studies but am under no compulsion to do so.
- My signature below acknowledges the voluntary participation of my candidate in this study but in no way releases the staff from their professional and ethical responsibility to me.

Name:
Signature:
Date:

Appendix 2: Collected data for the study

MRNO.	AGE	GENDER	UCVA _OD	UCVA_OS	SE_OD	SE_OS	BCVA_OD	BCVA_OS	DIAGNOSIS_OD	DIAGNOSIS_OS	TYPE OF RE
P177903	21	1	1.2	0.00	6.00	0.00	0.48	0.00	Aniso.Amblyopia	Emmetropic	High Hypermetropia
P162011	12	1	1.4	1.5	-4.75	-7.75	0.18	0.48	High Myopia	Aniso. Amblyopia	C.M.A
P172288	9	2	1.2	0.48	-4.50	-0.75	0.4	0.3	Aniso.Amblyopia	Simple Myopic Astigmatism	Myopia
P118304	14	2	1.8	0.00	-5.00	0.00	2	0.00	Aniso.Amblyopia	Emmetropic	High Myopia
P165817	21	1	0.00	1.2	0.75	7.00	0.00	0.6	Emmetropic	Aniso. Amblyopia	High Hypermetropia
P154334	21	2	1.2	0.00	5.25	0.00	0.8	0.00	Aniso.Amblyopia	Emmetropic	Hypermetropia
P180326	15	1	1.4	1.6	-6.50	-15.25	0.00	0.48	High Myopia	Aniso. Amblyopia	C.M.A
P184635	17	2	0.00	0.48	0.00	3.75	0.00	0.4	Emmetropic	Aniso. Amblyopia	Hypermetropia
P182382	10	2	1.00	0.1	0.25	0.50	0.6	0.00	Aniso.Amblyopia	Simple Hypermetropia	C.H.A
P156924	21	1	0.18	0.48	-0.25	-1.25	0.00	0.4	C.M.A	Meridnal Amblyopia	C.M.A
P173029	12	2	0.48	0.6	5.25	5.75	0.1	0.3	High Hypermetropia	Aniso. Amblyopia	High Hypermetropia
P169155	6	1	1.5	0.1	-9.75	0.00	1	0.00	Aniso.Amblyopia	Emmetropic	Myopia
P187063	20	2	1.00	0.00	4.50	0.00	0.48	0.00	Aniso.Amblyopia	Emmetropic	Hypermetropia
P180295	14	1	1.2	0.00	-3.50	0.00	0.00	0.1	Aniso.Amblyopia	Emmetropic	Myopia
PN111265	10	2	0.00	0.7	4.00	5.50	0.00	0.3	Emmetropic	Aniso. Amblyopia	Hypermetropia
N20105	14	1	0.1	0.6	5.00	7.50	0.00	0.4	Emmetropic	Aniso. Amblyopia	High Hypermetropia
P188068	19	2	0.00	0.48	0.00	4.00	0.00	0.6	Emmetropic	Aniso. Amblyopia	C.H.A
P080716	11	1	1.2	0.00	-2.50	0.00	1.2	0.00	Depri. Amblyopia	Emmetropic	High Myopia
P136375	9	2	0.6	1.2	6.00	8.00	0.1	0.48	Emmetropic	Aniso. Amblyopia	C.H.A
P189819	23	1	CF CF	0.00	4.75	3.25	CF CF	0.00	Aniso. Amblyopia	Emmetropic	C.H.A
P178809	12	1	0.00	1.2	0.00	5.00	0.00	0.7	Emmetropic	Aniso. Amblyopia	Hypermetropia
P189815	13	2	0.00	1.2	0.00	2.50	0.00	0.6	Emmetropic	Aniso. Amblyopia	Hypermetropia
P190494	10	1	0.00	1.2	2.00	5.00	0.00	0.48	Emmetropic	Aniso. Amblyopia	Hypermetropia
P017812	21	1	0.30	1.5	-1.00	2.00	0.00	1.4	Simple Myopia	Aniso. Amblyopia	Antimetropia
P180841	8	1	CF CF	0.18	4.25	3.25	1	0.1	Strab.Amblyopia	C.H.A	C.H.A
P193150	18	2	0.3	1.4	6.50	7.50	0.18	1.2	High Hypermetropia	Aniso. Amblyopia	High Hypermetropia
P193620	27	2	CF 1M	0.00	0.00	0.00	CF 1M	0.00	Aniso.Amblyopia	Emmetropic	Amblyopia
P192308	15	1	0.00	1.3	0.00	0.00	0.00	1.3	Emmetropic	Strab.Amblyopia	Amblyopia
P173852	10	1	0.00	1.3	0.00	-6.50	0.00	0.8	Emmetropic	Aniso. Amblyopia	High Myopia
P181361	19	1	CF 1M	0.00	5.25	0.00	CF 1M	0.00	Aniso. Amblyopia	Emmetropic	High Hypermetropia

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