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Efficacy of vision therapy among convergence Insufficiency

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Abstract
Vision therapy is like physical therapy for the visual system, including the eye part of brain that control vision. Many studies have shown that vision therapy can correct vision problems that interfere with efficient reading among schoolchildren. It can also help reduce eye strain and other symptoms of computer vision syndrome experienced by many children and adults. It helps patients to develop or improve fundamental visual skills and abilities. It is progressive program of vision procedure generally conducted in office, in once or twice weekly session of 30 minutes / or hours sometimes with homework. It improves Visual comfort, ease and efficiency. It can also be helpful with developmental disabilities, learning disability.it is common word-wide problem in young generation .our study based on convergence therapy given to up-to age of 25 yrs either gender coming in NIMS Hospital.

Keywords: AI-Accommodation insufficiency, CI-Convergence insufficiency, FV-Fusional Vergence, NPA-Near point of accommodation, NPC-Near point of convergence

Introduction
Vision therapy is like physical therapy for the visual system, including the eyes and the part of brain that control vision. Vision therapy can include the use of lenses, prisms filters, occuluders, patches, electronic targets with timing mechanism, balance-boards Metronomes, non-computerized visual instruments, customized vision-therapy program.

Vision therapy can improve the following visual skills:-
Visual acuity, convergence, focusing skills, visual processing, depth perception, visual memory, hand-eye coordination.

There are three main Categories of Vision Therapy
1. Orthoptic Vision Therapy
2. Behavioral/ Perceptual Vision Therapy
3. Vision Therapy for Prevention and correction of Myopia

Orthoptic Vision Therapy
It refers series of exercise usually weekly or several months performed in office or in home.

Beh Aviorall/Perceptual vision therapy
Eye exercise to improve visual processing and Visual perception.

Vision Therapy
Prevention and correction of low degree of myopia.

Signs
Reading below grade level, Omit small words when reading, Skips/repeats lines when reading, Poor comprehension, Difficulty maintaining handwriting, poor handwriting, avoid reading or near vision tasks, headache, lazy/learning, delayed learning disability/dyslexia.

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Convergence insufficiency
Our brain controls all your eye movements when we look nearby objects, our eyes move inward to focus on it, this coordinated movement is called convergence. It helps do close work like reading or using a phone. Convergence insufficiency is an eye disorder where our eyes don't move at the same time, this can causes eyestrain headache or vision problems like blurred or double vision. It also makes it hard to read and focus.

Fusional vergence
It is the movement of both eyes that enables the fusion of monocular images producing binocular vision. It is especially important when person is heterotopias.

Positive Fusional vergence (PFV)
PFV is the amount of convergence available to overcome temporal disparity to maintain binocular fusion at near.

Near Point of Convergence (NPC)
NPC is the point where the visual axis intersect under the maximum effort of convergence.it can measure the maximum convergence ability of a patients. Normal range of NPC is 6-10 cm.

Near Point of Accommodation (NPA)
NPA is the point in space conjugate to the retina when the eye is fully accommodated. The distance between the far point and the near point is the patient's accommodative range.

Raf Rular
RAF near point rule (RNPR) also known as Royal Air Force (RAF) rule is a routinely employed instrument in ophthalmology and optometry practices to measure near point of convergence (NPC) and Near Point of Accommodation (NPA). It is also used as a standard tool for research purpose and to provide therapeutic home based orthoptic exercises. The assessment of NPC is an important part of a routine eye examination as it serves as the primary assessment for the diagnosis and management of convergence insufficiency. After the introduction, its use has widely expanded and continues as a preferred ophthalmic tool. Apart from the UK and Ireland, it is popular in Asia, including Bhutan, India, and Nepal. The RNPR is marketed by Haag-Streit® as RAF binocular gauge.

Convergence insufficiency was defined based on for diagnostic criteria
NPC greater than 10 cm, near exophoria at least four prism diopters greater than distance exophoria, and near PFV less than twice the amount of near exophoria.

Convergence exercise should be given in following way
Pencil-push-ups, Fusion card, Red-Green-filter convergence exercise, Prism recession exercise. It is the first line of treatment for CI. During this process the patients holds an accommodative target at arm's length, focused on the image to keep it single, and slowly bring the target towards the nose until diplopia is noted. This exercise is done for a few minutes.

Home based computer orthoptic therap
It is game like interface beneficial for younger patients. It is computer orthoptic program leads the patients through exercise which includes saccades, pursuits, jump convergence exercise.

Aims and Objectives
Aims
To evaluate efficacy of vision therapy among convergence insufficiency.

Objectives
- To screen all the patients between the age up-to 25years of either gender coming to ophthalmology OPD in NIMS hospital for binocular vision anomalies
- To give home based/office based vision therapy

Material and methods
- Study-design prospective, observational study
- Study area Ophthalmology OPD of NIMS Hospital Jaipur Rajasthan.
- Study-period from sep-2020 to mar-2021

Sample size 80
Study will be conducted on all patients of refractive error with minimum of 80 patients they are taken randomly.they are divided into 3groups depending on age-
- **Group A:** Patients of 6-10 years of age.
- **Group B:** Patients of 11-20yearsofage.
- **Group C:** Patients of 21-25 years of age.

Sample Size: The sample size of a survey most typically refers to the no of units that were chosen from which data were gathered. In practice the sample size is determined based on the expense of data collection and need to have sufficient statistical power.
It may be calculated by-

$$N = (Z1-\alpha)^2(P(1-P)/D^2)$$

Survey Sampling. New York: Wiley where

$(Z_1-\alpha) = Z0.94 = 3.84$ (from the normal distribution Table α This value of 1.96 is standard for a 95%.
- P = Expected prevalence
  P = I / d (Iis incidence, dis duration)
- D = 5% = 0.05
- (*D* is the determination of absolute precision)
- N =3.84 (0.05(0.95)/ 0.0025
- =3.84 (22.56) = 73

Inclusion Criteria
1. Patients of age group 06-25 years, of either gender, coming to ophthalmology OPD in NIMS hospital diagnosed with eyestrain, headache, and Asthenopia.
2. Patients who are willing to give written informed consent for the study.

Exclusion Criteria
Any other ocular inflammations
- Ocular trauma.
- Medical systemic history like diabetes-mellitus, hypertension.
- Any Neuro-genic disorder.
- Uncooperative patients.

Collection of data

It includes methods of assessment including, study-response rate, habitation type.

Description of work

- Vision testing was measured by Snell's-chart/EDTRS.
- Collect information on the child's habit and lifestyle
- Hours of playing video games, outdoor playtime, study hours, hours of working on computer in adults.

Procedure

- Vision testing.
- Objective and Subjective Refraction.
- Basic Orthoptic Evaluation.
- Convergence insufficiency treatment trial.
- Anterior segment examination -Cornea-normal
- Conjunctiva-normal
- Iris-NCP (Normal color pattern)
- Lid -WNL (with no limit)
- Lashes-WNL
- NPC-Near point of convergence.
- RAF Ruler-Mostly convergence insufficiency) normal range 6-10 cm.
- NPA-Near-point of accommodation. (RAF ruler)

Observation and Results

Thestudydealswithanalysisandinterpretationofdatathesearere presentedintubularor graphical form.

Present study done over a period of six months from Oct 2020-March 2021. This study included 500 patients attending in department of ophthalmology, NIMS hospital.

Total observe patients=80

Table 1: Age wise distribution

AGEGR (In Yrs.)	No of patients	Percentage
06-10	10	12.50%
11-20	53	66.25%
21-25	17	21.25%
Total	80	100%

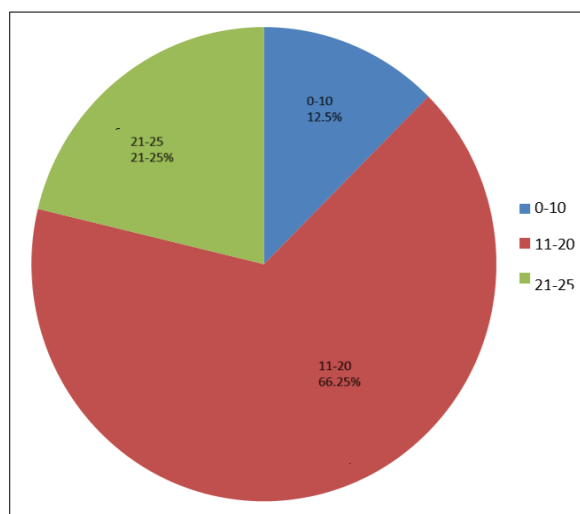**Fig 1:** Number of patients

Prevalence

The amount of disease at one particular time. Prevalence=no of people with diseases/disorder\No of people in population.
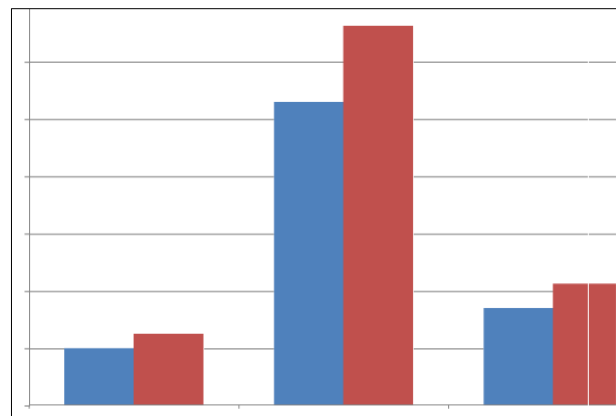

Fig 2: Prevalence of convergence insufficiency (16%) among OPD patients

Prevalence in percentage

- No of disease/disorders in population×100\No of people in population
- Total no of patients in OPD=500
- Total Overall prevalence=80/500=0.16
- No of convergence insufficiency patients=80

Discussion

Convergence insufficiency affects 2.25-8.3% of the population and is characterized by an inability to converge the eyes smoothly as the object of regard moves from distance to nearby. This causes loss of proper binocular alignment and results either in exophoria or intermittent exophoria at nearby. The increase accommodative and convergence efforts to maintain convergence at near leads to symptoms of asthenopia with near work, blurred vision, horizontal diplopia .the diagnosis of CI is based upon a combination of symptoms and physical exam finding .

There are two types of incidences of convergence insufficiency:-

- High school or college age where there is an increased demand for near work
- Early middle age when the initiation of bifocal use leads to deceased accommodative convergence.

During a routine eye examination, convergence weakness may be diagnosed above mention symptoms. Some patients test in the office as having poor convergence; however, they are asymptomatic. This may be the result of true convergence weakness.

Patients with convergence insufficiency usually have a normal range of refractive errors and good visual functions. Testing for accommodative amplitude (the ability to focus each eye individually at near) is always performed by the specialist evaluating convergence. If both convergence and accommodation are weak, reading glasses, sometimes with prism added maybe best option.

The prevalence of convergence insufficiency in school-children ranges from2-13%. Most common figure around 5%.

The prevalence of CI in older age groups defined by those over the age of 19, was found to be approximately 1 in 6. - Goering M, Drennan KB (Book-convergence insufficiency). In children, the prevalence of convergence insufficiency is estimated (4.2-6%). The incidence increases with additional

near work demand. Convergence insufficiency is reported to be rare in children younger than 10 yrs.

- **Race:** Convergence insufficiency has no racial predilection.
- **Sex:** Convergence insufficiency has no sex predication
- **Age:** The frequency of convergence insufficiency symptoms may increase with age as patients ability to compensate for their relative divergent binocular alignment decrease with time

Conclusion

The present study was observational in nature and done over a period of six-months at the department of ophthalmology NIMS hospital.

This study assessed convergence-insufficiency and vision-therapy in different age group. From the present study it can be concluded that:-

- Convergence-insufficiency had no relationship with gender.
- Prevalence of convergence-insufficiency is higher in school and college going students.

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