RevitalVision Treatment in Patients Affected By Nystagmus

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ABSTRACT: *Purpose*. To evaluate the efficacy of the RevitalVision training in enhancing Best Corrected Visual Acuity (BCVA) and Contrast Sensitivity (CS) in a group of patients affected by nystagmus. *Materials and Methods*: 12 patients, ranging in age from 10 to 45 years (median age 25.9), nine males and three females with nystagmus and low vision. All patients underwent comprehensive eye examination, including measurement of visual acuity (BCVA) using Log-Mar ETDRS charts, contrast sensitivity using the FACT TEST. Moreover we carried out a reading speed test, an examination of the Extra Ocular Movement (EOM), a Cover Test at near and distance (CT), Stereopsis (arc/sec) and a biomicroscopy of the posterior segment. Each patient followed a rehabilitation protocol including the administration of two questionnaires (GH-12 and SF-36) before and after treatment in order to measure self-esteem, role limitations due to physical functioning, social functioning and mental health; 50 neurovisual rehabilitation training sessions, both individual and customized, to be administered to the patient on alternate days (at least three times a week) for a total of about 100 days, and lasting about 35 minutes each with either eyes opened in order to train the cerebral cortex by means of contrast stimulus with decreasing size (Gabor Patch). Statistical analysis used: The statistical analysis was carried out using the statistical software STATA (version 14). *Conclusions*: With the exception of three patients who became lost to follow-up, at the end of the treatment all patients reported subjective improvement in their vision. The functional training using RevitalVision, therefore, appears to be a valid method of visual enhancement also in patients with a high visual impairment.

KEYWORDS: Visual impairment, Nystagmus, RevitalVision

1 INTRODUCTION

Visual impairment is defined as a measurable functional limitation of the eye or visual system (that can manifest as reduced visual acuity and/or contrast sensitivity) resulting from an irreversible condition that is not correctable with conventional lenses, which can limit or interfere with the ability to function independently or to perform activities of daily living.

In this study we evaluated the effectiveness of the neurovisual rehabilitation in adult patients affected by nystagmus, subatrophy of the optic nerve or by a severe visual impairment, and with a follow-up of at least 3 years [1,2,3,4].

Following a short period of training aimed at teaching them how to use the programme on the basis of their clinical records, the gradual improvement was monitored through the logarithmic measurement of the visus and contrast sensitivity in the timeframes established by the protocol.

2 METHODS

Twelve patients (24 eyes) of which nine males and three females over nine years of age (median age 25.9 years) affected by nystagmus: five cases with congenital nystagmus, three with albinism, three with congenital cataract (treated surgically) and one case with multiple sclerosis.

Each patient underwent a comprehensive ophthalmic examination, including: measurement of visual acuity (BCVA) using LogMar ETDRS charts, contrast sensitivity using the FACT TEST. Moreover we carried out: a reading speed test, an examination of the Extra Ocular Movement (EOM), a Cover Test at near and distance (CT), Stereopsis (arc/sec) and a biomicroscopy of the posterior segment.

Subjects were excluded from the study if any of the following criteria applied:

- Subjects suffering from any other eye disease(s) or other causes for the reduced visual acuity, aside from myopia and/or astigmatism;
- Subjects suffering from myopia-related visual complications resulting in visual loss, including myopic macular degeneration, myopic cataract and previous or pre-existing myopic retinal detachment;
- Subjects suffering from Diabetes Mellitus;
- Subjects having undergone a refractive surgery procedure in either eye;
- Pregnant women or women of childbearing potential;
- Subjects having an activity limitation due to medical disorders (including migraines, seizure disorders, etc.), medications, or emotional status that might potentially impair the subject's ability to perform the treatment

The rehabilitation protocol included: the administration of a questionnaire consisting of 12 questions to assess the quality of life (GHQ-12) and a questionnaire to measure the patient's self-esteem and body awareness (SF-36), neurovisual rehabilitation training sessions, both individual and customized, lasting about 35 minutes each with either eyes opened in order to train the cerebral cortex by means of a contrast stimulus with decreasing size (Gabor Patch).

The treatment programme consisted of 50 sessions to be administered to the patient on alternate days (at least three times a week) for a total of about 100 days.

The training concluded at the end of a series of stabilization sessions after the patient had reached a plateau stage, determined by the system based on the patient's execution and performance of the task with increasing difficulty as the sessions progressed. The programme, indeed, was totally customized according to the patient's visual ability. At the end of each session - starting form the first two calibration phases - the same is connected to the central server using the Internet. Follow-up monitoring visits were carried out based on the following schedule: T0 (baseline/enrollment) - T1 (after 10-15 sessions) – T2 (after 20) – T3 (end of treatment 40-50 sessions: reaching and stabilization of the plateau), T final follow-up visit after 36 months from the end of treatment.

3 RESULTS

The final results refer to the follow-up visit after 36 months from the end of treatment.

Stereo Test: pretreatment mean 308.5"; post treatment mean 290.2", absent in five patients. No statistically significant difference was found. Cover Test: 10 exodeviations and 2 esodeviations.

The statistical analysis provided descriptive statistics, at the beginning and at the end of the observations, for the mean and the median scores. The corresponding spreading of the statistics

has been characterized calculating standard deviations (SD) and interquartile range (IQR). The descriptive summaries have been carried out in the two surveyed experimental situations, i.e. contrast sensitivity and visus. The comparisons have been performed using non parametric statistics because of the sample size. The Sign Test has been used instead of the Wilcoxon signed-ranks test , thus avoiding distributional assumptions, required in the Wilcoxon matched-pairs test, focusing on the differences between median values [5]. The tests performed, which addressed matched comparisons according to the eyes symmetries (right, left, both), have been 6. As a result, setting a type I error α=0.05, we got a Bonferroni's adjusted familywise error rate α_j =0.008. The statistical analysis has been carried out using the statistical software STATA (version 14).

Table 1 below reports the statistical significance of the variations obtained after comparing the pre and post treatment. In particular, with regard to the contrast sensitivity, the difference appears to be statistically significant both for the right and left eye; on the other hand, when the contrast sensitivity is tested with both eyes open, although appearing highly improved, the sensitivity has not obtained a statistical significance.

With regard to the visual acuity measured in LogMar, the improvement obtained is statistically significant for the right eye and for both the eyes open; whereas such difference (though still evident and remarkable) is not statistically significant in the left eye.

Table 1.

Statistical Analysis Summary Table

		Right eye		**Left eye**		**Both eyes**	
		Time 1 (N=12)	Time 2 (N=9)	Time 1 (N=12)	Time 2 (N=9)	Time 1 (N=12)	Time 2 (N=9)
Contrast sensitivity	Mean±SD	1.05±0.64	1.57±0.56	1.04±0.68	1.63±0.53	1.12±0.61	1.68±0.52
	Sign test	p=0.004		p=0.004		p=0.04 ns*	
	Median (IQR)	1.13 (1.08)	1.80 (0.20)	0.98 (1.18)	1.80 (0.30)	1.13 (1.03)	1.80 (0.15)
LogMar Scores	Mean±SD	0.47±0.24	0.28±0.25	0.78±0.56	0.36±0.26	0.51±0.25	0.40±0.25
	Sign test p	p=0.007		p=0.06 ns*		p=0.004	
	Median (IQR)	0.40 (0.35)	0.20 (0.20)	0.65 (0.65)	0.30 (0.20)	0.50 (0.40)	0.30 (0.30)

* Familywise error α_j=0.008 (Bonferroni's correction), ns=not statistically significant.

Three patients became lost to follow-up. Patients were administered two questionnaires (GH-12 and SF-36) before and after treatment in order to measure self-esteem, role limitations due to physical functioning, social functioning and mental health. Results show an improvement in the psychophysical functions, as reported by each patient after the administration of the neurovisual rehabilitation treatment. Patients reported a subjective improvement both in distress and in their

body awareness after treatment; although the patients more satisfied with the results achieved were those who at the onset of treatment reported a very low visual acuity.

4 CONCLUSIONS

Results show that the use of the neurovisual treatment in the rehabilitation of patients with low vision results in a significant improvement in the quality of the images reaching the cortical areas [6,7,8,9]. This neurovisual technique helps the brain to remember the acquired contrast, and its efficacy is not just limited to the training period, but it continues in the everyday application of what the patient has learned during the rehabilitation sessions. On the other hand, the disadvantages reported by the patients were the length of each training session and the total duration of the treatment.

Whilst more studies are needed to thoroughly document and extend these findings, vision rehabilitation by means of RevitalVision appears to be a promising therapy for the functional improvement of patients affected by nystagmus and visual impairment.

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