Neurolens Impact on Reading Speed

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Digital Vision Syndrome and its Impact on Productivity

In the US, people are spending 8-12 hours a day on average using digital technology, including phones, tablets and computers. As screen time increases, the demand on our eyes to maintain accommodation and vergence on near tasks also increase. The stress on our visual systems, known as Digital Vision Syndrome (DVS), can manifest as headaches, eye strain or tired eyes. Studies have shown that DVS has a negative impact on productivity.[1] Individuals experiencing DVS tend to require frequent breaks and possibly even increased attention or oversight; both of which could further exacerbate the productivity challenges.[2]

Among the most common causes of DVS symptoms are binocular vision disorders (BVDs) involving an issue with either the accommodative or the vergence mechanism. Typical treatment options for BVDs involve plus lenses, standard prisms (base in, out, up or down) or vision therapy. Traditionally, only symptomatic patients with considerable phoria and/or abnormally small fusion reserves were identified and treated for BVDs. There are several reasons why symptomatic patients with smaller phoria are often not treated. One of the primary reasons is the historical inability to accurately measure smaller eye misalignments. As a result, only patients with a larger phoric posture or reduced fusional reserves are diagnosed and treated, while individuals who could benefit from small prismatic corrections are overlooked.

Although it is standard practice for clinicians to measure eye misalignments such as phorias or fixation disparity, it has been difficult to accurately identify and treat phorias in small increments of 0.5 prism diopter (PD) or less until the launch of the Neurolens process in 2018.

Neurolenses and Symptom Relief

The Neurolens process is comprised of three basic steps: a symptom screener—otherwise known as a “lifestyle index” — is used to gauge a patient’s level of symptomology; the Neurolens Measurements Device (NMD) is used to accurately measure the patient’s binocular health and provide prescribing guidance that their doctor can readily use to prescribe a correction; and finally, contoured prism technology is used to treat the patient and relieve their symptoms.

The Neurolens Measurement Device (NMD) is an objective, accurate, precise, simple and efficient way to measure eye alignment and calculate a patient’s AC/A.[3] The NMD does not rely on subjective responses, thereby eliminating both clinician and patient biases or variabilities. The NMD is simple in the sense that it employs an iterative procedure, which takes the individual’s measurements into account and provides a final, outcome-based Neurolens prism correction — or Neurolens value. The Neurolens value obtained by the NMD is used to prescribe Neurolenses, which incorporate a proprietary contoured prism into the lens design. Unlike a standard prism, the Neurolens contoured prism design allows clinicians to treat their patients with a distance prism correction and additional correction base-in at near.

Commercial data collected by Neurolens from individual optometry practices across the country clearly showed that patients who received even small amounts of prism correction reported significant improvements in their DVS symptoms.[4] Given the overwhelming evidence, it is safe to say that the Neurolens process provides a comprehensive but simple way to accurately diagnose and treat DVS, allowing patients to get both clear and comfortable vision.

Neurolens and Short-Term Reading Speed Improvement

In a prior study, we tested the impact of Neurolenses on short-term reading speed improvement. In the study we used a double-masked parallel arm design with two subgroups: Treatment and Control.[5] Subjects were randomly assigned into one of the subgroups. 27 patients received the Control lenses and 28 received Treatment lenses — i.e., Neurolenses.

The Treatment group received a pair of Neurolenses with a prescription based on the practitioner's Rx using the subject's best corrected vision. The Control group received a premium single vision lens. Reading speed was assessed initially using the Wilkins Rate of Reading Test (WRRT).[6]

Every individual enrolled in the study wore the randomized study lens assigned to them for 7±2 days. Reading speed was then re-evaluated after the wear-in period. ANOVA analysis revealed a statistically significant improvement in the reading speed with Neurolenses compared to the Control lens ($F = 4.45$; $p = 0.03$).

This brings up the question of whether the effect of Neurolenses on reading speed Is maintained over time.

Procedure

This study was run as a parallel arm study with two subgroups (Neurolens group and a control group). Patients, who are Neurolens® candidates as determined by the doctor, were given an updated refractive prescription, either Neurolens or a regular single-vision with premium anti-reflective coating. The Neurolens prescription was based on the practitioner's Rx using the subject's best response to a trial lens and was prescribed within a half prism diopter of the Neurolens value output of the Neurolens Measurement Device and providing the patient's best-corrected distance and near visual acuity. The second group received a single vision control lens with no prismatic correction which yielded the best-corrected distance and near visual acuity.

Patients' reading speed was assessed using the WRRT (Wilkins Rate of Reading Test) reading speed test at baseline and 30 minutes after receiving their Neurolens or control glasses and again 7 ± 2 and 35 ± 7 days after dispensing. Each qualifying study participant was tasked with reading aloud all the words printed on a reading chart — as quickly as possible, without errors within one minute. The investigator randomly chose one of the four versions of the chart (chart A, B, C and D). An online version of the chart was also developed and programmed so that the test would automatically close one minute after initiating. As the patient read the chart, the investigator noted each error by marking the score sheet above the word that was misread. After the one-minute test was administered, the investigator marked the score sheet with an oblique line (/) to indicate how far the patient was able to read in the allotted time.

The investigator calculated the number of words correctly read per minute for the passage. This procedure was then repeated using a different version of the test and the final reading speed measurement was ascertained by taking the average of the two measurements. Errors typically impact the overall measured words-per-minute, either by reducing the number of words correctly read, or by increasing the time taken to read them. So, an improvement in the reading speed would indicate that the patient had more comfortable vision while reading the chart and made less errors when reading.

Results

Of the 45 young adults enrolled into the study, 22 patients received Control lenses and 23 received Treatment lenses — i.e., Neurolenses. One patient in the Control group was lost to follow-up; therefore, 21 Control and 23 Neurolens patients completed the 30-minute, 7-day and 35-day follow-ups. The two measurements taken at each visit were averaged and were compared between the three visits for all participants that completed all four visits. ANOVA was used to assess the difference in the reading speed with the type of lens used (Control vs Neurolens) and baseline reading speed as the two variables. The results are shown in Figure 1.

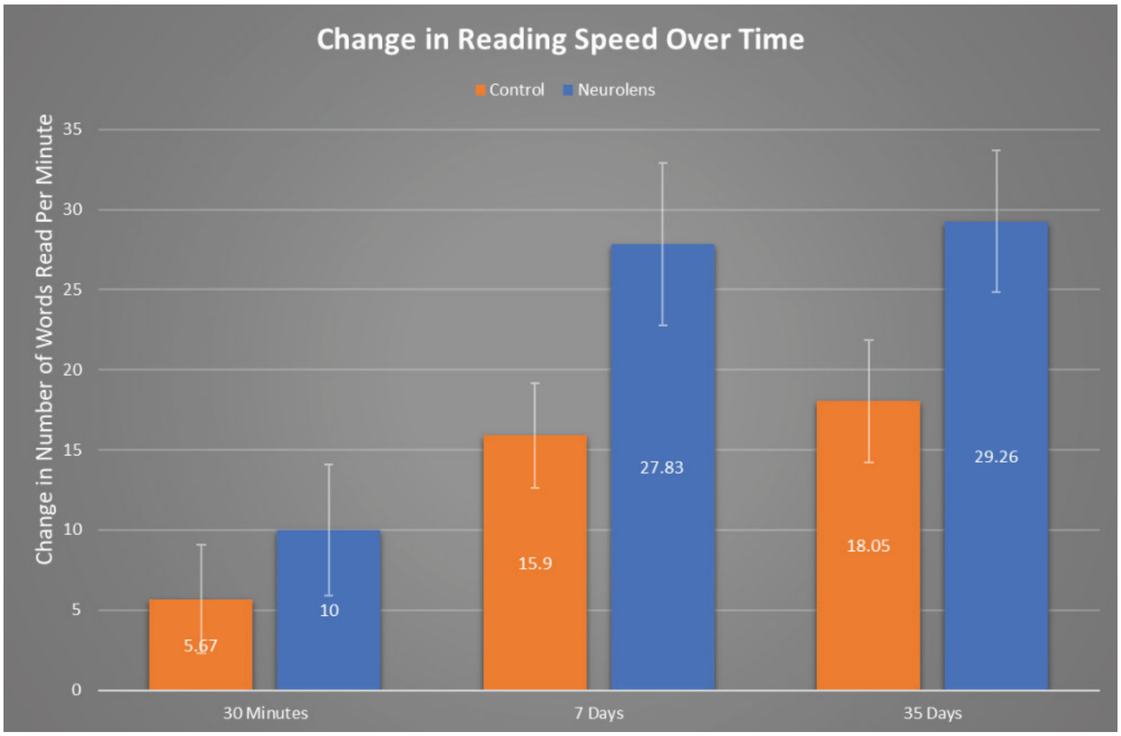

Figure 1: Comparison between *Control* and *Neurolens* wear in the change in mean reading speed (±standard error) at 30 minutes, 7 days and 35 days

The mean (±standard error) improvement in the reading speed with the Control and Neurolens lenses were analyzed. The initial measurement 30 minutes after dispensing showed a slight improvement in both groups; the Control group improved 5.67 ± 3.38 words over baseline, while the Neurolens group improved 10.00 ± 4.09 words. After one week of wear, the results showed an improvement in the reading speed with Control lens (15.90 ± 3.28), but a greater improvement with Neurolenses (27.83 ± 5.07). The improvement with Neurolenses was statistically significantly greater than the improvement with Control lenses (p=0.0441; Mann-Whitney U statistic 168.5). Further, the results show that the effect achieved after 1 week was maintained after one month of wear; Control (18.05 ± 3.81) versus Neurolens (29.26 ± 4.44). The difference between the improvement with Neurolens and Control lens was statistically significant at this later interval, as well (p = 0.0292; Mann-Whitney U statistic 160.5).

Conclusion

In the previous study, after 7 days subjects had a greater increase in reading speed with Neurolens than control lens wear. This study showed that an increase in reading speed is already realized after 30 minutes of wear and was more significant at 7 days and maintained beyond 7 days. Although there was an increase seen in reading speed with control lens wear, the effect with Neurolens wear was almost double over all the study visits from 30 minutes to 35 days.

Reading speed is a good indicator of how well the eyes are working together and relates to improved function on computer and near tasks. This has significant economic implications, due to improvement in the time needed to complete tasks and the decrease in oversight required to keep productivity at acceptable levels.

Full digital well-being is only possible when an individual has both clear and comfortable vision. The Neurolens process helps clinicians accurately identify, measure and treat patients with DVS by not just relieving their symptoms but also by enhancing their productivity.

References

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