Diagnostic Testing for Pupillary and Cognitive Responses

Converus provides two optional, diagnostic tests as part of the EyeDetect testing process. These two tests can help ensure an examinee has normal pupillary responses and demonstrates changes in cognitive load while testing. If not, the examinee may have had a traumatic brain injury or is using medications or eye drops to affect eye behavior. There is scientific research to validate both tests.

Pupillary Light Reflex Diagnostic

This test is used to assess brain stem function. If reactions are abnormal, that suggests optic nerve injury, oculomotor nerve damage, brain stem lesions, such as tumors, or use of medications like barbiturates.
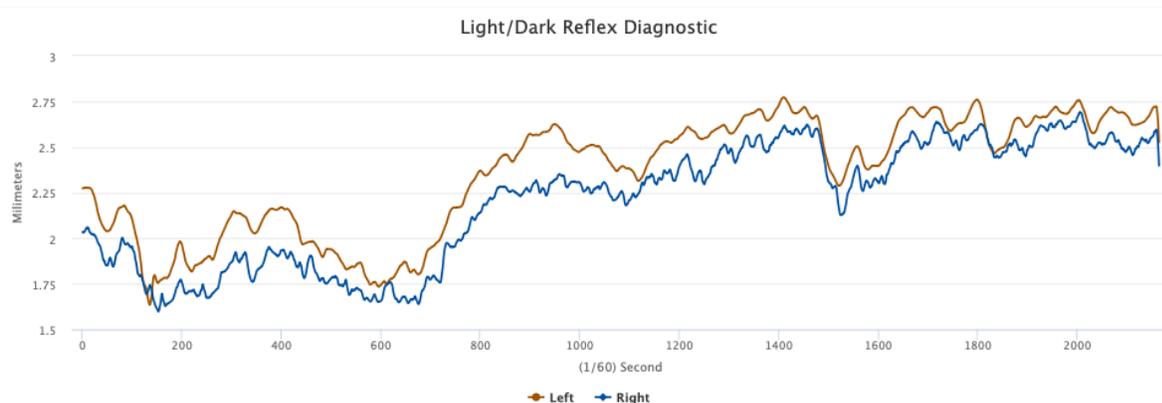
When enabled prior to an EyeDetect test, the examinee will watch a computer screen which slowly changes color from white to black over the period of a few seconds.

The "normal" examinee's pupils should constrict when the screen is light and dilate when the screen goes dark. If that doesn't happen, other than the conditions previously mentioned, the likely culprit is that the examinee has used eye drops such as tropicamide, an antimuscarinic drug, to produce short-acting pupil dilation. See a list of similar drugs here: https://www.drugs.com/condition/pupillary-dilation.html.

These drugs normally require a prescription and their intended use prior to an EyeDetect test would be considered a countermeasure. Also note, if a person were to use a drug that abnormally dilates or constricts the pupil, the software will note the abnormal pupil size in the test report.

The following image shows the test results of a previous examinee. The brown and blue lines represent the dilation of the left and right eye respectively. The Y-axis is pupil diameter (mm) and the X-axis is time (seconds). Both lines closely follow each other indicating the pupils are dilating in sync. Both lines descend and then ascend indicating the pupils constricted (screen was bright) and dilated (screen goes dark) which is an appropriate pupil reaction to the changing screen brightness/color.

Summary: both pupils reacted normally.

Light/Dark Reflex Diagnostic

Digit Span Diagnostic

This test is used to measure working memory, mental manipulation, rote memory and learning, attention, and encoding.

When enabled prior to an EyeDetect test, the examinee will briefly be presented a sequence of 4, 5, 6, and 7-digit numbers, one at a time. The examinee must recall each number individually after seeing it for a few seconds onscreen by typing the number after it disappears. There are a total of 10 numbers presented during this test.

The "normal" examinee's pupils should dilate similarly when recalling the number and pupil dilation should slightly increase as the length (complexity) of the number presented increases. Essentially, gradual increases in pupil dilation indicate the task has become more cognitively demanding.

The following graphs show a previous examinee's reaction. They are normal. The two lines represent the dilation of the left and right eye. The Y-axis is pupil diameter (mm) and the X-axis is time (seconds). The small green and red boxes show the number presented. If green, the examinee correctly recalled the number. If red, the examinee incorrectly recalled the number.

Both lines closely follow each other indicating the pupils reacted/dilated in sync. Both lines slightly ascend as the number of digits increases indicating the pupils dilated as the task became more cognitively demanding (which is the expected reaction).

These are the first 4 numbers presented (4-digit and 5-digit) to the examinee.
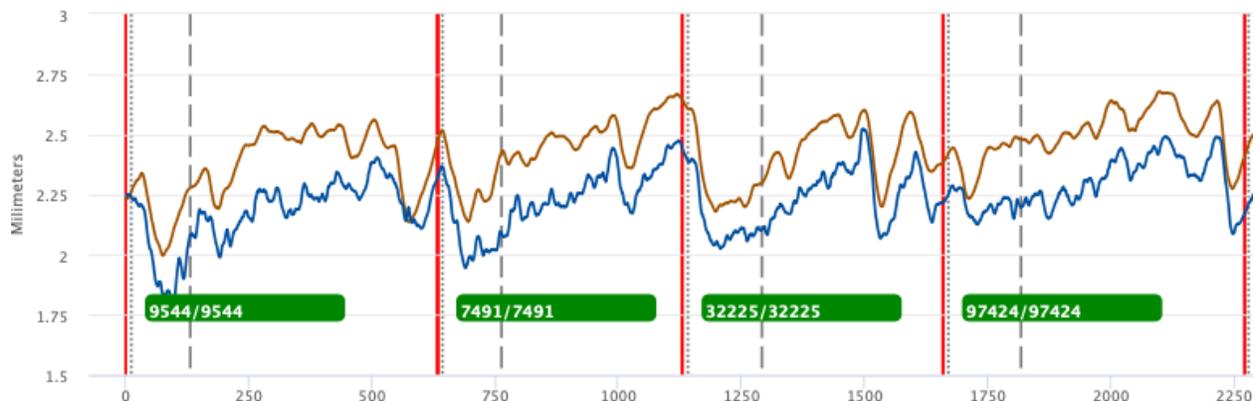
Cont.

Subsequently, three more numbers were presented (6-digit). The red box indicates the examinee incorrectly recalled the number presented.

088708/08808   684828/684828   242509/242509

(1/60) Second

◆ Left   ◆ Right
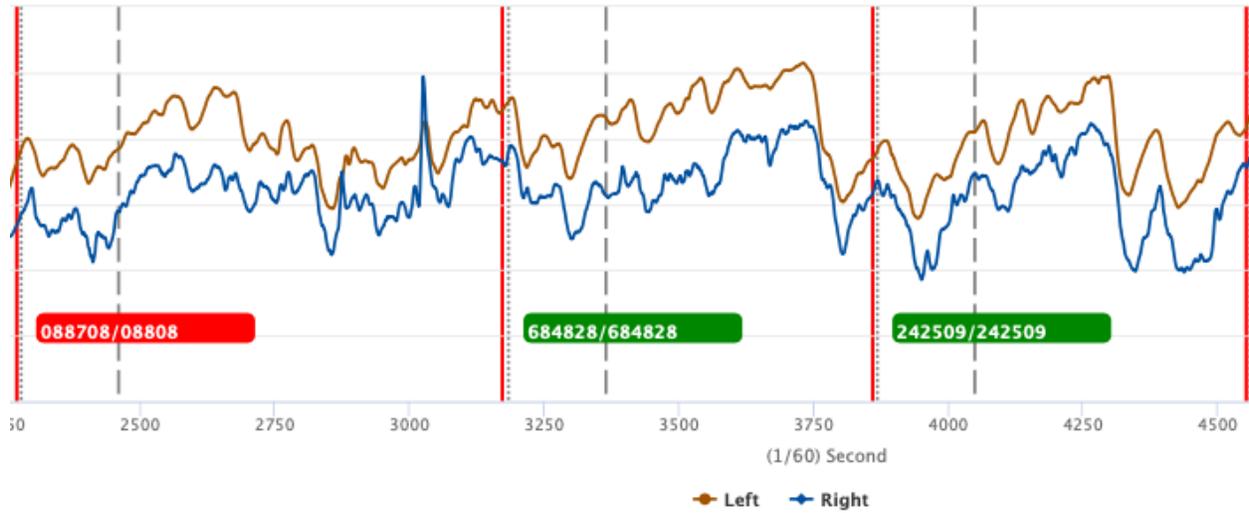
Finally, the last three numbers were presented (7-digit). The red boxes indicate the examinee incorrectly recalled the numbers presented.

5280448/528098   1289634/1289634   9721755/972955