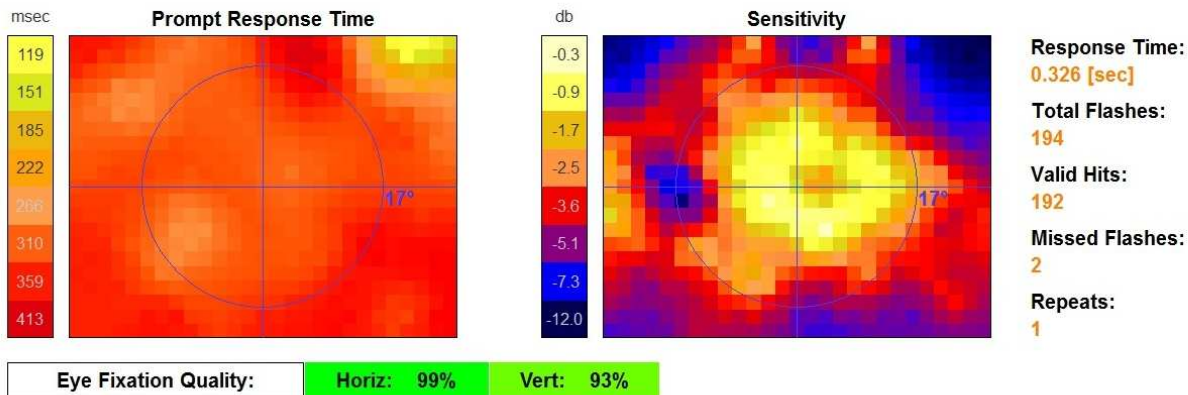


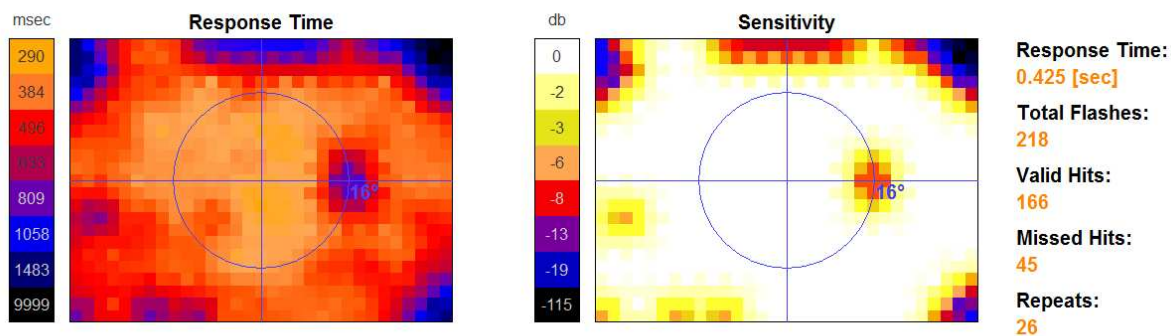
for the Application of the EyesCream© Visual Field Analyzer

EyesCream-II © VISUAL FIELD ANALYZER



Scan of the left eye with EyesCream-II dynamic flash ramp mode shows a small macular defect in the center part.

EyesCream© VISUAL FIELD ANALYZER



Scan of the right eye in 3 min in short flash mode. The blind spot at 16° was resolved.

Warnings:

- **Don't use this program for measurements if you are ill or tired!**
- **If you feel a sensation of cold or deadness or darkness around the eye of investigation during the test then stop the test immediately!**
- **This is a game! It cannot and shall not dispense you from a visit of your eye doctor! You will use it on your own responsibility and risk!**

I. Performing a Measurement:

Stay close to the screen and keep the eye for testing in the center and perpendicular to the screen. The best is to remove glasses and occasionally use a large monitor. Cover the other eye with a sort of a black eye protector or use the alternate hand to cover it.

Note: It is important that the non-tested eye is completely shielded and cannot detect anything. It would immediately compensate any blind area of the tested eye.

To start simply activate a smiley window (or open New Document) and hit spacebar. Whenever you recognize a white cross flashing on the screen simply immediately hit the space bar (or left mouse button - less recommended). About 100-300 flashes will appear sequentially and randomly in time and location on the screen. To abort (especially during the first attempts to get familiar) simply hit the escape key and restart again after a short break for relaxation. (You can interrupt a long measurement by the enter key and also continue the measurement. In this case one should as best as possible resume the same distance and angle to the screen as before.) After you are familiar with the program you may start a real measurement by focusing your eye to the center of the rotating circle in the center of the screen. Don't try to follow the flashes with your eye because these will occur randomly on various different locations on the screen. At the end of the measurement the result will automatically be calculated and displayed. Note, that for the best measurements one should be relaxed all the time in order to ensure an reproducible reaction time of your psyche (vide infra). If you fully concentrate yourself on the rotating circle then you may achieve already after 3 min a spatial resolution which is sufficient to resolve the blind spot as is shown in the example in the figure above. In the right eye this spot may come up at an angle of about 16 degree. The focusing circle during the measurement can also be configured in shape and size in >Configuration>Focus Parameter. After the measurement one can for example increase the contrast in the map (**Response Map**) by setting the Timing Discriminator to smaller values e.g. to 0.7 (instead of 0.95). **In the new dynamic flash ramp mode in EyesCream-II you can adapt the contrast of the Sensitivity Map by setting the "Flash Cross Size Reference" manually to some appropriate value of e.g. 0.001 (Menu Configuration->Data Analysis).** **Any value larger than a certain minimum positive value will switch off the autoscaling mode!** In autoscaling mode this value is calculated and you can read it in the right text field. This value is internally used as reference value inside the dezibel formula for the sensitivity:

$$db = 10 * \lg(\text{reference value}/\text{actual value})$$

and it describes the minimal size of the flash cross in percent on the screen, at which the signal is safely recognized (provided the additional brightness ramp is switched off i.e. in

Menu Configuration->Acquisition right input field "Min. Brightness" was set to 1.0).

The following is not related to the new dynamic flash ramp mode in EyesCream-II:

{If you have collected some experience values after a sequence of measurements then it is recommended to switch of the automatic mode (>Configuration >Acquisition >Measurement >Auto Mode off) and set manually the flash separation time (>Configuration >Acquisition >Measurement >Average Flash Separation e.g. to 800 or 1000 msec) and their size (>Configuration >Acquisition >Flash Visibility >rel. Cross Size e.g. to 0.01 to 0.03). You will find the required values, which have been determined by the automatic mode, easily in the print-out as "Measurement Parameter".}

Helpful Hot Keys after the measurement:

"f"- or "o"-Flash Grid,

"p"-Print Preview,

"c"-Color Table.

II. Principle of Measurement:

The innovative dynamic gradient method employing growing and increasingly brighter flash crosses (cross stimuli) allows for a much more sensitive detection of the threshold values of the recognition while it simultaneously improves the spatial coverage of the visual field analysis at short measuring times. In combination with the data analysis at an integration von 1 and a specifically developed interpolation we achieve already after 5 min an informative test.

NEW in EyesCream-II V2.3: The color of the flashes and of the background as well as the line thickness can now be varied freely in **Menu Configuration->Acquisition->Flash Visibility->Flash/Background Colors/Linewidth**. This allows for a color selective test. 4 sets of parameter settings can be defined and the actual set of choice has to be selected. 2 color schemes are predefined already as examples, but can also be changed. (Note: The last 2 sets can be utilized for private settings and will NEVER be overwritten by the program even not on reset of all parameters!)

The old method of the measurement is based on the observation that the reaction time of the test person on the flashes may indeed be individual and dependent upon it's age (for young people down to 150 msec and for older ones above 300 msec), but it is also depends upon their subjective impression of flash brightness and size. In turn this relationship if applied inversely allows a precise determination of their visual ability on the basis of the deconvoluted reaction times. The visual ability decreases even for fully intact healthy eyes from the center to the periphery. The reaction times become exponentially slower for decreasing ability. This method of the measurement however is much less powerful than the new gradient method

(starting from V2.1 on, Copyright by the EyesAge MGM Group) and is just still implemented for comparison purposes only.

NEW in EyesCream-II V2.2: From V2.2 on there will be an internal consistency check for its usefulness performed on the measurement. Part of the results are displayed as **Eye Fixation Quality Control** underneath of the maps showing percent values which describe the spatial vertical and horizontal deviations as well as for a tilt of the head relative to the monitor. This is calculated for the measurement as a whole but also partially within the measurement e.g. with movements of the head or eye. In order to avoid patent conflicts a new method was developed that does not rely on the blind spot. (The latter method is sometimes also not sufficient.) At value much less than 80% it is recommended to repeat the measurement occasionally on the next day with higher precision.

Furthermore, in V2.2 the FLASH data and RAMP data will be analyzed separately to receive a map for the pure **Prompt Response Time**. In this way deficits in visual fields can be distinguished from problems with the signal transduction toward and inside the brain because the different sensitivity in the visual fields are compensated. This option can also be applied to data files from V2.1 as long as they were measured by the dynamic flash ramp method (Menu Data Analysis > Integration Response Map). However, these values are thought to assist you and may differ to some extent in case of large visual field deficits.

NEW in EyesCream-II V2.1: By default (or after you applied "Reset Parameter") the measurement will now measure also the size and brightness at which you are able to see the white crosses. An automatic determination period for these values right in front of the real measurement is not needed any longer. Furthermore, there are ultrashort flashes scattered randomly in between the ordinary flash ramps. So don't worry about very short and bright large flashes in between the flash ramps. These short flashes help to recalculate the true cross size and brightness at the time when you really recognized the white cross stimuli event. Based on all these data sets EyesCream-II in general is able to resolve gradual deficits with higher precision than before. This type of deficits may occur e.g. in laser-radiation-related or age-related macular degeneration.

III. Requirements:

Personal computer with operating system Windows2000 Professional or Windows XP with 500 MB, Vista or Windows7 with at least 1 GB. Processor at least Pentium4 with 2 GHz. Despite I employed absolute timer and CPU clocks in the program one should reduce the overall work load of the PC to minimum as far as possible in order to ensure a harmonic run of the measurements. In tests on an almost empty computer I observed a timing jitter of less than 100 microseconds (0.1 msec). In case of tests with Glaucoma problems it is

recommended to connect a very large flat screen television or monitor to your notebook/laptop or PC and keep a short distance of about half of the size of the monitor in order to cover the entire visual field angle of the eye (the closer the better). To check for laser impacts on the retina in laser safety applications a distance of the full screen width and a cross size of only 0.01 could be more reasonable as long as the injuries are localized closer to the center of the eye than to the periphery.

Note: Always enter the size of the screen and the distance of the eye for calibration in >Data Analysis >Calibration in order to be able to compare any changes in further measurements and to monitor and measure a possible progress of a Glaucoma problem. The calibration can also be done after a measurement. *For comparison of different measurements (e.g. over a period of time) it is strongly recommended to use fixed flash cross size and brightness and duration and distance*, otherwise the measurements are not sufficiently constant because of the flexibility of the parameter in the automatic mode (not needed in the new dynamic flash ramp mode in EyesCream-II). For full comparability you would also need to switch off the autogrid mode for the flash grid (>Configuration >Acquisition >Grid Structure) and manually set the grid size to e.g. 10 y-axis test points (the number of x-axis points will be determined depending upon the monitor format of 16:9 or 4:3). The autogrid mode is by default set to 5 minutes measurement time and calculates a test point grid accordingly.

IV. Method of Measurement:

Because of the enormous differences in the visual abilities of a wide range of people and screens an adaptation of the brightness and size of the flashes is a prerequisite. To accomplish this adaptation already in EyesCream V1 an automatic mode was implemented which determines the optimal parameter over the first ca. 1/2 to 1 min prior to the real measurement. It is not needed anymore in the new dynamic flash ramp mode in EyesCream-II, in which it is done implicitly. Almost any parameter can be configured in the program. Thus, also the automatic mode can be switched off and you can by yourself estimate suitable parameter. Furthermore, you can change color and form as well as depth modulation of the focusing circle. The flashes (crosses), however, are always white but size and brightness can be varied (not needed in the new dynamic flash ramp mode in EyesCream-II). (As to whether or not later on a color-resolved tomographic measurement method to distinguish red-green destructions of the retina will be developed and implemented depends upon the success of this program.) In case you lost parameter settings you can reset them to the original values in >Configuration >Reset.

This program comprises a repeat mode, who repeats a flash and corrects it if you accidentally have forgotten to confirm a flash by hitting the space bar. People who are skillful in using a PC

e.g. in video PC games might not need repeats and can switch it off (set Repeats of non-seen Flashes in >Configuration >Acquisition to 0).

V. Structure of the Program:

The program system consists of a data acquisition module and a data analysis module. While on the one hand side the data acquisition module can be configured exclusively before the measurement in menu >Configuration >Acquisition and not anymore afterwards the data acquisition module parameter on the other hand side can still be changed afterward as well as the graphics parameter.

The comfortable handling of the program which protects currently measured data is based on a 3-state buffer. The top-level buffer of all parameter can be accessed if no measurement window is open. It is used as template for all new measurement windows and will be saved on exit of the program. The second buffer allows for configuring the parameter for the next coming measurement in the smiley window. The third buffer ensures that there will be no inconsistency between the displayed results in the window and the data which will be stored (break down of data integrity).

VI. Data Privacy:

Especially when applied inside private companies it is a good advice to encrypt the data and eventually also to do the print out with flag anonymous set (in >Cryptography) since occasionally the employer may draw some conclusions on your physical fitness for work out of this test. There are two options; the first one allows to set one single password for the whole session and the other to set a password for each file separately. In any case the password will never be stored in the system nor on hard disc, so please remember your password well. Note, the encryption is only as good as the length of your password. Therefore one should use at least 6 characters. However, this is not mandatory. You can use any printable characters and symbols. The algorithm by itself is quite safe. It is based on an independent random number generator and encoding algorithm, which is exclusively used in this program and blows up an almost infinite number of possibilities. The weakness is the short length of **your password**.

VII. Special Applications:

In case of laser impacts the setting High Resolution (>Configuration >Acquisition >Grid Structure) and a measurement time of at least 5 min is recommended if also smaller blind

spots should be detected close to the visual center. In this particular case it might also be required to adapt the flash size manually to be smaller than usual (not needed in the new dynamic flash ramp mode in EyesCream-II). On suspicion of Glaucoma problems the default setting is recommended. Only for academic purposes there is a spherical transformation to spherical coordinates needed. In general for all measurements the standard (default) grid is a good advice. Anyway the flash positions are varied randomly, that never the same positions on the screen are used in subsequent measurements in order to avoid that the test person can predict it. It might be helpful in case of Glaucoma problems to enhance the dynamic range toward the borders of the monitor by a quadratic increase of the flashes (can be configured in >Configuration >Acquisition >Flash Visibility >Quadratic Enhancement) (not needed in the new dynamic flash ramp mode in EyesCream-II). Furthermore, the flash duration towards the periphery can be additionally or exclusively enlarged again either by a linear or quadratic function. However, there is no experience yet which setting occurs to be optimal (not needed in the new dynamic flash ramp mode in EyesCream-II). With respect to other eye problems like age-related Macular Degeneration (wet and dry AMD) or Retinal Detachment there is also no information available as to whether or not this program is useful as diagnostic tool.

VIII. License:

The license agreements shown in >Help >Show License are valid for all companies (e.g. laser companies) and other mostly commercial institutes as well as for public and private persons. The agreements written in English. In case you do not understand the contents or you do not accept you are not authorized to apply this software. The software program in any case should be kept free for everybody and for this purpose it is protected by copyright. In summary these license agreements mean that nobody is allowed to sell this program. Rather they should give it for free to others. Furthermore, the author disclaims all warranties and will not be liable for damages to persons or materials including any loss of profits. Software is always subjected to continual improvement. Also software bugs will be fixed. Therefore check regularly for update versions on www.EyesAge.org.

IX. Lifetime:

Due to the possibility of software bugs the lifetime of previous versions of this program was limited until the middle of 2012. Version 2.2 is now the first unlimited version. In case the author will get knowledge about a severe bug then you eventually will be informed via a small emergency info box at the start of the program. However, watch regularly the home page www.EyesAge.org on which corresponding errors will most likely be discussed.

Author:

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