Pupil Shape Variations

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Abstract- In recent studies, we showed how pupil size variations had assisted us to distinguished between two distinct human visual awareness that are produced by the retinal centralis versus the retinal peripheries. In the present proposal, however, we would like to discuss how pupil shape variations could affect the mammals' visual awareness. It had been suggested that, animals with vertical pupils such as cats are hunters; but those with horizontal ones such as horses are emotional animals, see reference 1. Humans however have rounded pupils, meaning, they had been standing in the gray region. Few humans, however, had been suffering from cat-eye syndrome, a syndrome that can negatively affects not only their visual awareness, but also their cardiac health and their respiration, see reference 2. We therefore suggested that the aforementioned syndrome should be simulatingly investigated in healthy human subjects and factually in affected human subjects. Namely, healthy human subjects should wear a specialized bio-compatible lens contact that should be convey the geometry of cat's pupils, namely, it will restrict significant number of light rays to interact with the retinal peripheries. Both healthy and affected human subjects are assumed to perform several visual tasks simultaneous with brain imaging, ECG and eye tracking data acquisition. If the extracted features of these affected human subjects' data are sufficiently matched with healthy subjects' data; corrective pupil surgeries might be recommended. We understand that such surgeries will require lots of work on bio-materials complex designs & manipulations, in addition to, surgical precision so that the new implementations will be mechanically cooperating synchronically with the mechanics of the iris, ciliary muscles & fibers in an optimal way. It

is a complex operation; however, we think that these corrections might not only avoid further deteriorations against the patients' visual awareness but it may improve their cardiac and respiration well-being.

Fulsome Discussion

Pupil dilation in humans has the ability to estimate emotional arousal and autonomic activation, (Bradley, 2008). It also betrays the timing of decisions, (Einhäuser, 2010); represents the surprising events, (Preuschoff, 2011); and it can reflect individual upcoming choices and biases, (Gee, 2014). Dynamics that triggers an extremely important question, why pupil dilates in such events? In fact, when pupil dilates, the lens become more rounded, and this assists the external stimuli to

have greater accessibility to the retinal peripheries, see

reference 7. In another word, pupil dilation promotes faster visual awareness that seems

to be very important for all of the aforementioned situations which require faster actions. In recent studies, human subjects with dilated pupils had assisted us the understand the significant importance of the pupil size. Namely, without dilated pupils the human's ability to be visually aware of high graded faces could be reduced, see reference 8. Constricted pupils may limit the numbers of illusory motion reversals, see reference 9, and may attenuate the illusory motion perception, and motion aftereffect, see reference 10, and 11. We had noticed that all of the human subjects are entertained by experiencing these illusions, and they had requested for solutions to have further dilation to their pupils to experience greater experience of visual illusions; possibly they're unconsciously would like to balance between the sympathetic and parasympathetic nerve systems; the best natural chemical solution is,

however, caffeine intake, see reference 12. To the best of our knowledge & expertise, without dilated pupils, the perception of the enlarged time & size will be partially reduced, see reference 13, additionally, the spatial wrapping effect might be decreased, see reference 14. Pupil size is therefore might be considered as a window on neural substrates of perceptual awareness, see reference 15. Vertical pupils could produce different visual awareness; mainly because they restrict huge number of light rays to access the retinal peripheries, whether they are temporal or nasal peripheries. Consequently, humans who had been suffering from cat-eye syndrome might not be able to socialize properly, because they might have been experiencing different spatiotemporal visual awareness than the normal human visual awareness. There are abnormalities in the affected patients' cardiac functionalities too, see reference 2, and this may influence their breathing! Deep breathing that had been showing astonishing results in healthy human visual motion perception, see reference 16, might bring to us many correlations to deeply understand the symptom. Namely, the tight correlations between the eyes, the brain, the lungs, and the heart in healthy subjects might recommend corrective surgeries to the iris of affected subjects; hoping for promoting possible natural rectifications to the gene expression. To the best of our knowledge, we had been noticing the significant importance of the pupil in human visual awareness; and its possible connections with the heart and the lungs functionalities through 'deep breathing' mechanism. Primarily investigating, we suggested that healthy (with specialized 'cat-eye' contact lens) and affected human subjects may undergo into several visual tasks with simultaneous collections of brain imaging, ECG and the eye tracking data from each subject; if the features of these data (between healthy and affected groups), that are extracted by deep learning algorithms are sufficiently matched; surgeries might be recommended for the affected patients. Important to mention, these surgeries will require lots of work on nano artificial neural circuits embedded in specialized compatible bio-materials, as well as surgical precision so that the novel implementations can be mechanically synchronized

with the iris, the ciliary fibers & muscles in an optimal way. Needless to say, these corrections might not only avoid further deteriorations in the patients' visual awareness, but it may stabilize their cardiac and respiratory well-being.

Essential Notifications

We noticed that human subjects who had horizontal pupils are very rare, however, the offered protocols and methodologies are assumed to deal with all of the variabilities. The author wishes to collaborate with scholars with experience in the biomaterials in challenging projects. Scholars who have access to patients with cat-eye syndrome are extremely welcome to collaborate. We also wish to collaborate with scholars with brain imaging, ECG, and professional eye-tracker facilities in challenging investigations. Enquiries may be sent to the author.

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