PSYCHOPHYSICS CONTRAST SENSITIVITY, GLARE AND READING

1431

EXISTING GLARE TESTERS AND THE EVALUATION OF NIGHT DRIVING GLARE PROBLEMS.

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Purpose One of the main early complaints of cataract patients, even when they exhibit only mild glare problems as measured by standard tests, is that glare impairs their night driving. In order to better measure the patients' impairment, glare tests should include measurements of the glare effect in conditions more similar to those found in night driving. When driving at night the ambient light is very **low**, oncoming headlights present a **transient** temporal pattern, and the objects of interest often appear initially in the **peripheral** visual field. Thus, three important characteristics of glare in night driving are that the ambient illuminance is in the scotopic/mesopic range, the detection stimulus is in the periphery, and the glare source is transient. Most of the current glare testers measure glare only at photopic levels, and all the glare tests that we know of use only steady sources of glare with foveal discriminations. We studied all three conditions. **Methods:** Detection stimuli were presented on a computer monitor, and the glare source was a high-intensity tungsten bulb. Stimuli were presented at different times following the sudden onset of glare, in the fovea and peripheral visual field. **Results:** Disability glare effects are stronger in the periphery than in the fovea. The difference between the **transient** glare effect and the **steady** glare effect is greater in the periphery than in the fovea. The duration of the transient effect is also longer in the periphery than in the fovea, and the recovery time from glare is longer in the periphery. **Conclusions:** Transient glare effects, such as those often encountered in real world, are much stronger than those tested with a steady glare source in the fovea, and even more so in the periphery. Existing glare testers seriously underestimate disability glare effects in everyday life.

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1432

ASSESSMENT OF VISUAL ACUITY IN PRETERM AND NEWBORN INFANTS BY CPL (COMPUTERIZED PREFERENCIAL LOOKING)

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Purpose
To develop a useful tool for early diagnosis of visual acuity impairment in infants and small children, both preterm and regular.
Methods
A dedicated software sends step-by-step narrowing visual stimuli to one of two screens at a time, and detects "right" (the subject's preference for the screen onto which the stimulus is actually given) or "wrong" visual-behavioural responses. Operator is blind to the position of the stimulus; eye movements are controlled and recorded by a camera.
102 infants (68 preterm, intra-uterine age 24-33 weeks), aged 3-18 months, with and without anamnestic perinatal sufference, or major signs of neurological-neuropsychiatric disorders, have undergone the test.
Preliminary results
In 89 (87.2%) cases the test was conducted successfully. Spatial frequencies detected were: 12.6 c/deg in 47% of cases, 6.50 c/deg in 35%, 4.25 c/deg in 12% and <2.50 c/deg in 8% of cases.
Conclusions
CPL shows several features (such as good compliance of small patients, simplicity of procedure, low number of required operators, operator-independence of results), which can make it a good tool for diagnosis and follow-up in small children. We consider a larger number of tests to be necessary for adequate standardisation of procedure and results.

1433

INTER-BLINK TEAR FILM DIOPTRIC POWER CHANGES CAN EXPLAIN CONTRAST SENSITIVITY MODIFICATIONS IN NORMAL AND KERATOCONJUNCTIVITIS SICCA EYES

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Purpose: A significant loss in spatial contrast sensitivity is a frequent finding in eyes with keratoconjunctivitis sicca, nevertheless the real cause of such finding has not been elucidated yet. Aim of the study was to evaluate if changes in the power of precomeal tear film/air diopter can play a role in the build-up of the phenomenon.
Methods: Spatial Contrast Sensitivity (SCS) was tested by means of Vistech MCT 8000, wich allows reproduceable testing conditions, with target illumination of 68-72 Watts. 1.5-3-6-12-18 c/d Spatial frequencies were tested before and 5' after the use of a commercial available tear substitute. In the same patients, variations of the tear surface were also evaluated by means of the Topographic Modeling System 1 (TMS). The global and central dioptric power at the tear film surface have been evaluated. The TMS testing was performed just after blinking, after 5" and when discomfort at the eye surface was felt (range 17-49") while the subjects refrained from blinking. For our calculations Spatial Contrast Sensitivity Loss (SCSL) was arbitrarly quantified as the difference between contrast sensitivity results obtained before and 5' after the use of a tear substitute. The presence of a correlation between SCS and tear film/air interface dioptric power was then studied.
Results: All subjects who showed contrast sensitivity impairment or the possibility of contrast sensitivity improvement after the use of a tear substitute had significant changes of central tear film dioptric power 5" after the last unforced blink. Statistically significant correlation ($p<0.001$) was present between the entity of dioptric power changes from baseline and tear surface irregularity and the degree of spatial contrast sensitivity loss.
Conclusions: Changes of spatial contrast sensitivity can be explained by the dioptric power changes of the precomeal tear film.

1434

CONTRAST SENSITIVITY IN EMMETROPES AND MYOPES USING ON- AND OFF- STIMULATION

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Purpose. The dopaminergic system in the retina seems to be involved, among other things, in the normal development of the eye and in the regulation of the activity of the on- and off- pathways. It is also established that light-induced peak of dopamine synthesis and turnover under photopic conditions is reduced in myopic eyes (Štone et al., 1989, Proc Natl Acad Sci USA, Vol. 86: 704-706). These findings prompted us to assume that myopic eyes will perform differently to on- and off- stimulation while with emmetropic eyes there will be no such difference.

Methods. To test the above assumption we compared contrast sensitivity in myopic and emmetropic subjects using the method suggested by Pelli et al. (1988, Clin. Vision Sci., Vol. 2: 187-199). The method allows to employ either positive or negative contrast patterns while using the same background and thus simulating on- or off- stimulation. The stimuli (triplets of Sloan letters) were presented on a computer monitor for approximately 3 seconds and the experimental subjects had to read aloud the letters. The different triplets were presented in a succession with decreasing contrast by a factor of approximately $1/\sqrt{2}$. Thirty five subject (18 emmetropes and 17 myopes) participated in the study. All had normal or corrected to normal visual acuity (1.0). The degree of myopia varied within the range of 1.0 to 8.0 D. The mean age of the subjects was 24.00 and 23.17 years for the myopic and the emmetropic group respectively. The observation was monocular under photopic conditions.

Results. The results showed that in emmetropes the contrast sensitivity was the same with stimuli in positive and negative contrast. In myopes, however, the contrast sensitivity with negative contrast stimuli was significantly lower in all subjects. This difference seems to become even more pronounced with increased degree of myopia.

Conclusions. These findings confirm our initial assumption concerning the different on- and off- response in myopes. They provide also grounds for improved visual work-place design.