

The 3rd International Symposium on Visual Physiology, Environment and Perception



BOOK OF ABSTRACTS



Tallinn University in Tallinn, Estonia

NOVEMBER 12-13, 2021

CONFERENCE ORGANIZERS

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The 3rd International Symposium on Visual Physiology, Environment and Perception (VisPEP) at Tallinn University in Tallinn, Estonia in November 12-13, 2021

PROGRAMME (according to Eastern European Time)

Thursday, November 11th workshops

10.00 - 11.00 **Evaluation of the tear film quality**

Pēteris Cikmačs and Karīna Beļikova, OC Vision

11.15 - 12.15 **State-of-the-art techniques for refraction and vision screening**

Pēteris Pēteris Cikmačs and Annija Gulbe, OC VISION

12.15 - 13.30 Break

13.30 - 15.00 **Prescribing prisms based on fixation disparity (FD) and/or associated phoria (AP) measurements.**

Oskar Gawlik / Laboratory of Vision Science and Optometry, Faculty of Physics, Adam Mickiewicz University Poznan, Poland

Friday, November 12th

10.00 - 10.15 *Opening by Kristjan Kask (Tallinn University) and Aiga Svede*

(University of Latvia)

Welcome by Prof. Ruth Shimmo, Director of the School of Natural Sciences and Health

10.15 – 11.15 **Keynote 1: Prof. Bruce Evans** Institute of Optometry, London; and City, University of London (UK)

Myopia control: translating research into practice

11.15 – 11.30 Break

11.30 - 12.00 *Sponsor presentation* Michal Vymyslicky, Alcon Professional Affairs Manager

Dry Eyes and Systane Eye Drops

12.00 - 13.00 Lunch

13.00 - 14.30 *Oral presentations session 1*

13.00 - 13.20 Kristine Kalnica-Dorosenko*, Aleksandra Nikitina, Aiga Švede

Case Analysis of Amblyopia in the CCUH Eye Diseases Clinic

13.20 - 13.40 Zane Jansone-Langina*, Renars Truksa, Maris Ozolins, Luize Balode, Baiba Riekstina, Andrei Solomatins, Igors Solomatins

Contrast Sensitivity Changes at Different Background Brightness Levels in Patients with Cataract

13.40 - 14.00 Jelena Slabcova*, Anastasija Starceva, Evita Kassaliete, Aiga Svede and Gunta Krumina

The Criteria for Distance Visual Acuity Assessment in School-age Children Vision Screening

14.00 - 14.20 Mari Uusküla*, David Bimler

The green-blue border does not depend on the number of blues in a language: Evidence from cross-linguistic colour-naming data

14.30 – 15.00 Break

15.00 – 16.00 **Keynote 2: Prof. Tara Alvarez**, Vision and Neural Engineering Laboratory, New Jersey Institute of Technology (USA)

Significant Correlated Changes in Functional Activity of Thalamus and Peak Convergence Velocity: A Longitudinal Vision Therapy Clinical Trial called the Convergence Insufficiency Neuro-Mechanism in Adult Population Study (CINAPS)

Saturday, November 13th

10:00 – 11.00 **Keynote 3: Prof. Kairi Kreegipuu**, University of Tartu (Estonia)

Visual Mismatch Negativity: A Window to the Brain?

11.00 – 11.30 Break

11.30 – 13.00 *Oral presentations session 2*

11.30 - 11.50 Valeri Murnikov

The Relationship Between Visual Perception and Word Meaning Structure: An Explorative Study

11.50 - 12.10 Alina Kucika, Aiga Švede*, Ilona Rumjanceva, Tatjana Patrova

Effect of Viewing Distance on Subjective Refraction Assessment

12.10 - 12.30 Evita Kassaliete*, Tina Rumjanceva, Laura Zitmane, Kristīne Detkova, Gunta Krumina

Do the Soft Multifocal Simultaneous Image Contact Lenses Affect Accommodative Response of Young Adults?

12.30 - 12.50 Dominik Pražák

Metrological Traceability of the Eye-Tonometers

13.00 – 14.00 Lunch

14.00 - 15.00 *Poster session*

15.00 – 16.00 **Keynote 4: Assoc. Prof. Kristjan Kask**, Tallinn University (Estonia)

Eyewitness Identification: Current State and Future Challenges

16.00 *Ending of the conference*

POSTER SESSION PRESENTATIONS

1. Changes in Crossed and Uncrossed Disparity After Refractive Surgery

Gunta Krumina, Nigar Huseynova, Vsevolod Liakhovetsky

2. Perceived Size of Rhombuses and Rectangles

Irena Česnavičienė, A. Bielevičius, A. Bertulis

3. Triangle Size in Psychophysical Observations

Arūnas Bielevičius, T. Surkys, A. Bertulis

4. Contribution of Corners to the Illusion of Size

Jelena Loginovič, A. Bielevičius, A. Bertulis

5. Effect of Blue-Light-Blocking Lenses on Retinal Straylight

Gatis Ikaunieks, Inese Petroviča, Kristīne Kalniča-Dorošenko, Gunta Krūmiņa

6. Stimulus Parameters Affecting Saccadic Eye Movement Performance

Ilze Ceple, Viktorija Goliškina, Gunta Krūmiņa

7. Myopia and Astigmatism Prevalence in School Children in Madrid, Spain

Juan Oliveros Lopez, Nadiuska C. Platero Alvarado, Rafaela Garrido Mercado

8. Convergence Insufficiency (CI) and Convergence Excess (CE) in Schoolchildren in Spain

Nadiuska Cristine, Platero Alvarado

9. Visuo-Verbal Tests in Children with Fetal Alcohol Spectrum Disorders

Rozalia Żak, Alicja Brenk-Krakowska, Ryszard Naskręcki

10. Effect of Soft Contact Lenses on Retinal Straylight

Veronika Muravjova, Gatis Ikaunieks, Gunta Krūmiņa

11. The Effect of Various Focal Length Photographs on Eyewitness Identification Accuracy

Kristjan Kask, Erlend Art Arras and Elina Malleus

12. Comparative assessment of spatial perception in augmented reality depending on the consistency of depth cues

Linda Krauze, Tatjana Pladere, Roberts Zabels, Rendijs Smukulis, Viktorija Barkovska, Vita Konosonoka, Ibrahim Musayev, Aiga Svede and Gunta Krumina

13. Choosing Lineup Order vs. Knowing Which Lineup Corresponds to Which Suspect: Accuracy Implications in Multiple Perpetrator Identification

Kristjan Kask

14. Evaluation of the Impact of Relaxing Visual Exercises on Computer Users

Svetlana Semjonova

15. Usage of Remote Visual Acuity Testing

Kristine Kalnica-Dorosenko, Michelle Hammar, Aiga Svede

Keynote speakers



Prof. Bruce Evans, PhD (UK) Director of Research at the Institute of Optometry

Professor Bruce Evans is Director of Research at the Institute of Optometry and Visiting Professor to City University and Visiting Professor in Optometry to London South Bank University. He is a Fellow (by examination) of the College of Optometrists and holds their higher qualifications of Diploma in Contact Lens Practice and Diploma in Orthoptics. He is a Fellow of the: American Academy of Optometry, European Academy of Optometry, and British Contact Lens Association. He has been involved in over 80 research studies and his main areas of research are binocular vision (orthoptics), children's vision, dyslexia, contact lenses, myopia, optometric referrals, and headaches including migraine. Bruce Evans has supervised over 15 doctorate students, all of whom successfully graduated. He has authored over 240 scientific and professional papers, two books on dyslexia and vision, and five editions of books on binocular vision including the last three editions of the respected textbook, Pickwell's Binocular Vision Anomalies. He has given more than 250 invited lectures and 130 presentations at scientific conferences. Bruce Evans has contributed to several editions of professional guidelines. He is a director of an optometric practice in Brentwood, Essex where he specialises in children's vision, binocular vision anomalies, dyslexia and vision, contact lenses, and myopia control. For more information visit: <http://www.bruce-evans.co.uk>



Prof. Tara Alvarez, PhD (USA)

Tara Alvarez, Ph.D. is a professor of biomedical engineering, director and founder of the Vision and Neural Engineering Laboratory and director of the Undergraduate Biomedical Engineering Program. She is the lead engineer within a team that is making a difference in treating vision function in brain injury patients, especially children with concussion. Specifically, she is establishing new clinical standards for treating patients with vision dysfunction following brain injury and is working with five major children's hospitals to assess the effectiveness of her system. This will result in broader impact to further understand what is different in patients with convergence insufficiency (CI) and how the brain changes post-vision therapy. Her system is more cost-effective and can be used within the comfort of one's home or by a broad array of health care professionals which will revolutionize the way in which people are diagnosed and treated.

The mission of her research is to understand the underlying neural mechanisms that lead to a sustained reduction in visual symptoms and to take that knowledge, integrated with technology, to develop new diagnostic and therapeutic interventions that can be used for personalized point-of-care. Alvarez's research was the first to examine the link between vision therapy and the brain. Using functional magnetic resonance imaging (fMRI), she was able to document how the brain changed as a result of vision therapy. In 2016, she and her clinical collaborators published the first paper examining convergence in patients with concussion before and after vision therapy. They showed that the patients' eye movements improved significantly following therapy. Their proposal, entitled CICON (Convergence Insufficiency in Concussion) will study CI in children with concussion. Alvarez is the lead engineer for CICON and will be installing her novel instrumentation at Children's Hospital of Philadelphia, Boston Children's Hospital, the University of Alabama at Birmingham Children's Hospital, Southern California College of Optometry and Akron Children's Hospital in Ohio. With the knowledge acquired since 2001, she and her team are designing innovative diagnostic and therapeutic interventions with NJIT's Game Design program.



Prof. Kairi Kreegipuu, PhD (EST)

Professor of Experimental Psychology

PhD Psychology in University of Tartu, Professor of Experimental Psychology. Kairi Kreegipuu is an experimental psychologist at the University of Tartu (UT) studying perceptual processes, pre-attentive information processes (e.g., mismatch negativity) and their state-dependency. She defended her PhD on movement perception at the University of Tartu (2004, prof. Jüri Allik as supervisor). Her most important studies concern visual pre-attentive information processing, and time perception. She has taught several courses on general psychology, cognitive psychology, experimental psychology and ethics, and has been a visiting professor at University of Latvia and Dalian University of Technology (China).



Assoc. Prof. Kristjan Kask, PhD (EST)

Associate Professor in Legal Psychology

Kristjan Kask has a PhD in forensic psychology from University of Leicester, UK. He is an accredited clinical psychologist specialised on cognitive-behavioural therapy. His research interests are investigative interviewing of child and adult victims and witnesses, and factors influencing eyewitness issues. He has conducted several trainings to police investigators, prosecutors, judges and child protection workers about the principles of investigative interviewing of child victims and witnesses.

Abstracts

Oral session 1

Case Analysis of Amblyopia in the CCUH Eye Diseases Clinic

Kristine Kalnica-Dorosenko*, Aleksandra Nikitina and Aiga Svede

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Amblyopia is one of the most common visual impairments in children and can cause permanent visual impairment for life if not treated in time. In Latvia, there have been no recent studies to assess the prevalence of amblyopia, neither are there statistics on amblyopia. The study on the prevalence of amblyopia in children of different ages at the Eye Diseases Clinic of the Children's Clinical University Hospital will give some insight into the seriousness of the situation at the Latvian Eye Clinic. 1216 patients' hospital records were analyzed from Children's Clinical University Hospital Eye Disease Clinic. Theoretical and empirical methods were used in the research. The study used and analyzed data from the outpatient records of CCUH patients for the year 2019. The data analysis shows that the age of the child has a direct correlation with the prevalence of a specific type of amblyopia ($p < 0.001$). The distribution of different refractions depends on the type and degree of amblyopia. The predominant types of amblyopia are refractive and strabismic amblyopia. The mean age at which amblyopia is diagnosed is 5 ± 3.2 years. Prevalence of amblyopia in 2019 in CCUH patients, clinical ophthalmology population, was 12.3%. This shows that amblyopia is one of the more serious and prevalent eye disorders in children. The prevalence of amblyopia in medical centers and clinics cannot accurately reflect the prevalence in the general population, as the prevalence in the clinical ophthalmology population is always higher than the population average.

Keywords: Amblyopia, prevalence of amblyopia, classification of amblyopia, visual acuity, refraction

Contrast Sensitivity Changes at Different Background Brightness Levels in Patients with Cataract

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In the clinical practice, contrast vision tests are not used as primarily tests to check the progression of cataract but it can be a useful method to detect cataract development and help to understand patient's complaints about daily life tasks like driving. Our aim was to estimate the contrast vision sensitivity at different background levels in patients with cataract and control group. Methods: In our research, 36 eyes with cataract and 30 eyes in the control group were tested. The contrast sensitivity was measured with alternative forced choice test design (AFC) before and two weeks after Femto laser cataract surgery. Measurements were performed under mesopic conditions with different test background brightness levels (60 cd/m², 85 cd/m², 100 cd/m²) and spatial frequencies (4 cpd, 6 cpd, 12 cpd, 18 cpd). Results: Cataract-induced light scattering significantly decreased contrast sensitivity at all spatial frequencies. In the group before cataract surgery and the control group, there were no significant differences between the Weber constants when the background lighting level changed. At the lighting level of 60 cd/m², cataract surgery provided significant improvement at the average spatial frequencies; at the background lighting level of 85 cd/m² and 100 cd/m², an improvement in contrast sensitivity was observed at the high and low spatial frequencies.

Acknowledgement: The study is supported by project No. KC-PI-2020/10 "Development of vision screening and training device".

Keywords: cataract, contrast vision, intraocular lens

The Criteria for Distance Visual Acuity Assessment in School-age Children

Vision Screening

Jelena Slabcova*, Anastasija Starceva, Evita Kassaliete, Aiga Svede and Gunta Krumina

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Education is one of the main factors in the development of myopia among school-age children (Morgan et al., 2020). Decreased distance visual acuity is used for early detection of myopia (Metsing et al., 2018). Currently, there is no standard threshold value of distance visual acuity screening that would define myopia in school-age children (Evans et al., 2009). The study aimed to determine the threshold value of distance visual acuity in the developed digital vision screening device for school-age children. First, we analyzed the results of digital vision screening conducted in 2011-2013 (696 children aged 6-19) and data of a comprehensive eye exam in children with reduced visual acuity at a distance, where the type and size of ametropia were determined. The results demonstrate that uncorrected myopia (-1.00 ± 0.65 D) and uncorrected simple myopic astigmatism (-0.66 ± 0.12 D) significantly decreased visual acuity at a distance ($p < 0.001$). Second, we evaluated the sensitivity and specificity of our improved computerized distance visual acuity test. We suggest that the optimal visual acuity threshold for computerized visual screening to detect myopia and simple myopic astigmatism is logMAR 0.1. Additionally, the threshold depends on the type of optotypes and their presentation features.

Acknowledgments: The study is supported by the project No. KC-PI-2020/10 “Development of vision screening and training device”.

Keywords: vision screening, myopia, distance visual acuity, threshold, school-age children

The green-blue border does not depend on the number of blues in a language: Evidence from cross-linguistic colour-naming data

Mari Uusküla¹, David Bimler²

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Scholars are eager to find out the number of basic colour terms in any given language and the borders between the basic colour categories. The discussion centers on the border of green and blue colours as this is often unclear between or within languages. We hypothesised that the division of the ‘blue’ category would affect boundaries with the adjacent ‘green’ category, where a single basic term covers the lightness range vs when there are two categories for blue – light blue and dark/middle blue. The colour-naming data was collected as part of a larger cross-linguistic study. The stimuli were 65 Color-aid Corporation uniform papers glued on 5x5 cm plywood tiles randomly shown to the participants one by one. For the analysis, we made a comparison between two pairs of closely related Indo-European languages spoken in Europe: Italian and Castilian Spanish from the Romance group and Lithuanian and Latvian from the Baltic group. The results reveal that despite the narrower scope of ‘light blue’ and ‘medium/dark blue’ terms, the boundaries of the blue and green categories maintained the same in these language pairs. The number of blue categories does not affect the borderline with the green category and it is plausible that partitioning between green and blue happens before blue splits into two categories.

Keywords: basic colours, green-blue border, colour categories, language boundaries, colour-naming

Effect of Viewing Distance on Subjective Refraction Assessment

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Accurate detection of subjective refraction is important to provide patients with the best visual quality. One of the factors affecting detection of subjective refraction is viewing distance. Lack of requirements for optometric office arrangement and required space dimensions leads to smaller optometric offices that provide shorter distance between the patient and the optotype chart. However, the effect of decreased viewing distance on detected subjective refraction remains unknown. The aim of this study was to evaluate the effect of viewing distance on the assessment of subjective refraction. Two types of subjective refraction of the dominant eye were determined in 45 participants at five viewing distances (6 m, 5 m, 4 m, 3 m, and 2.5 m): subjective refraction that ensured visual acuity 1.0 (in decimal units) and maximum subjective refraction that ensured the best corrected visual acuity. The results demonstrated that viewing distance significantly affected the outcome of subjective refraction detection; there were hyperopic shifts in all types of refractions that increased as the viewing distance decreased. To conclude, the most appropriate viewing distance for subjective refraction detection is 5 m or 6 m. If viewing distance is reduced to 4 m or less, a negative spherical lens of the corresponding proximity should be added to the obtained subjective refraction since it cannot be reliably stated that ocular accommodation is fully relaxed. Since this is not always achievable by 0.25 D steps, mirror systems should be used in smaller (3 m and closer viewing distances) optometric offices to provide more appropriate subjective refraction detection.

Keywords: optometry, viewing distance, subjective refraction, optometric office, visual acuity

Oral session 2

The Relationship Between Visual Perception and Word Meaning Structure: An Explorative Study

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Visuospatial ability is often considered a distinct nonverbal cognitive function. However, as previous studies suggest that visuospatial abilities are semiotically mediated, they cannot be considered completely nonverbal. Previous studies empirically and theoretically have shown that for example higher visuospatial abilities, such as visual discrimination and mental rotation are semiotically mediated. In this explorative study, we examined the relationship between word meaning structure and visual perception. This study relies on results of the two tasks from the larger test battery measuring different aspects of speech and cognition. The first task measured visual-perception and ability to inhibit the distracting stimuli; in the second task, we measured individuals' dominant conceptual thought. Sample consisted of 58 native Estonian speakers. Results indicated three different behavioral patterns while solving visual-perceptual tasks. Two of the behavioral patterns relied on verbalization during the process of solving tasks. Participants who used verbalization had less dominant logical conceptual thought. Theoretically, verbalization suggests that participants find a given task cognitively demanding. The fact that the majority of participants verbalized the process in connection with word meaning structure supports the idea that visuospatial abilities are not totally nonverbal, but rather semiotically mediated.

Keywords: Visuospatial abilities, perception, word meaning structure, explorative study

Metrological Traceability of the Eye-Tonometers

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The eye-tonometers are crucial for the screening of the intra-ocular hypertension which is the only treatable risk factor of glaucoma. These measurements have such an importance that some EU countries (e.g., Czechia and Germany) require the periodical metrological verifications of these instruments by law. In other countries, the legislative situation is freer (in various degrees). Nevertheless, all the eye-tonometers in service must be periodically checked for their metrological correctness. Moreover, these checks must be metrologically traceable to the national standards and/or to the clinical tests. The presentation shows how the Czech Metrology Institute (CMI) ensured this for the most common eye-tonometer principles. The created system also synoptically illustrates the problem of ensuring the metrological traceability of the medical devices with measuring function in general. The problems connected with the intra-ocular pressure metrology are rather complex that several countries joined their force in the EMPIR Programme Project INTENSE, see [1,2]. Its results will be presented, including a novel intra-ocular pressure transfer-standard and the results of a unique interlaboratory comparison for this quantity. A smart specialisation concept and a training centre developed at the CMI during this project will be further extended by the follow-up EMPIR Programme Project CEFTON.

[1] intense.cmi.cz

[2] http://dx.doi.org/10.21014/acta_imeko.v9i5.999

Keywords: eye-tonometer; metrology; traceability; interlaboratory comparison; glaucoma

Do the Soft Multifocal Simultaneous Image Contact Lenses Affect Accommodative Response of Young Adults?

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The treatment of progression of myopia in young adults is currently one of the global research actualities. Studies have demonstrated that multifocal contact lenses as the digital zone optics design lenses have an effect on retinal defocus and accommodative response. The aim of this study was to assess the accommodative lag and visual acuity using various design multifocal contact lenses. The study was conducted on 15 emmetropic subjects aged 20-29 years. An open-field autorefractor PowerRef3 was used to assess the response of the eye accommodation to stimulus placed at a distance of 25 cm and Freiburg Visual Acuity and Contrast Test (FrACT) for visual acuity. It was determined that the distance vision power zone in the centre of the lens reduces the accommodation lag in the same manner as the near vision power zone in the centre for high-grade additive (2.50 D) multifocal contact lenses, but effect of digital zone optics lens design does not produce a statistically significant change. All multifocal simultaneous image contact lenses significantly lower visual acuity at a distance. Therefore, none of the contact lenses used in the study provided a sufficient reduction of accommodative lag and good visual quality at the same time.

Acknowledgments: This study was conducted within the framework of the project No. KC-PI-2020/10 "Development of vision screening and training equipment" and supported by the project No. Y5-AZ77-ZF-N-100

Keywords: soft multifocal simultaneous image contact lenses, accommodative lag, visual acuity, myopia control

Poster session

Changes in Crossed and Uncrossed Disparity After Refractive Surgery

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Stereoacuity is one of the most important parameters which indicates the quality of vision that at the same time means the quality of life. Unfortunately, the importance of maintaining and improving the level of stereoacuity after different interventions often does not attract the proper attention. Furthermore, the opportunity to measure existence, type, and level of stereoacuity for far distance with a standard Osterberg test, which provides information only about crossed disparity. The study aimed to develop the method and find the changes in crossed and uncrossed stereoacuity after LASIK surgery. The measurements of stereoacuity were performed on the computer screen at 4 m distance using the developed global-random-dot computerized stereovision test by 102 participants (from age 19 to 45 years) before and after LASIK. All participants had full eye examinations before and after refractive surgery. The statistical analysis stated that there was no difference before and after refractive surgery in crossed disparity. However, we found a statistically significant improvement in the uncrossed disparity during the six months after the refractive surgery. We concluded that the direct connection does not exist between crossed and uncrossed disparity, because the improvement was only in one disparity – uncrossed or in the far compensatory mechanism.

Acknowledgements: This work was supported by KC-PI-2020/10, UL Y5-AZ77, UL Y9-B003.

Keywords: stereoacuity, global stereotest, LASIK surgery.

Perceived Size of Rhombuses and Rectangles

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The purpose of the study was to evaluate the influence of the stimulus shape on the object-size illusion. Rhombuses, rectangles, and hybrid stimuli (elongated hexagons) were presented on the monitor screen as the shapes of blank contours or filled blocks. All stimuli were equal in length and height (180×72 arc min). The rhombus apex angle was 44 deg. The angle of the peak apexes of the hybrid stimuli was changing by steps in the 49-148 deg. range. As the angles were increasing in presentations, the diagonal edges, consequently, were shortening and the horizontal one's lengthening. In all subjects' data, the illusion of rhombuses was weaker (2-10%) than that of rectangles (5 to 30%). For some individuals, the rhombuses caused a negative illusion value. The hybrid stimuli produced medium-sized errors that can be arranged in an ascending order according to the apex angle growth: as the shape of the stimulus approached the rectangle, the illusion was increasing, and as it approached the diamond, the illusion strength was decreasing. For the blank and filled stimuli, the illusion magnitude orders were similar to each other, and the curves practically overlapped. To conclude, the angle component in the stimulus contour suppressed the stimulus-size-expansion effect.

Keywords: Size expansion effect, negative illusion value

Triangle Size in Psychophysical Observations

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Visual objects cause some overestimation of length, height, and, consequently, size. The strength of the illusion is largely determined by the shape of the stimulus. We have discovered that, for asymmetric shapes, the magnitude of the illusion may depend on the object orientation. In psychophysical experiments with distance matching, the isosceles triangles with vertices pointing toward the middle or outside of the two-part stimulus were tested. Contour triangles and combinations of three spots were used. In the stimuli presentations, the altitude of the triangles varied from 36 to 360 arc min. Subjects were adjusting the empty stimulus interval to be equal perceptually to the horizontal or vertical triangles. The errors of the subjects were evaluated as the object-size-illusion values. Contoured triangles with vertices at the center of the stimulus caused significantly greater perceptual distortions (mean 12.6%) than the triangles with vertices at the outer end of the stimulus (6.6%). Although in all cases the strength of the illusion increased with increasing height of the triangle, the angle of inclination of the curves was obviously larger for the middle rather than the outer orientation. The perceived expansion of the three-spot patterns was quite small if any.

Keywords: Object size illusion, asymmetric shapes

Contribution of Corners to the Illusion of Size

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Perceptual expansion of the visual objects' size is a common sensory phenomenon. Objects with disconnected or missing boundaries produce stronger illusions than continuous and fully closed ones. We studied whether the absent corners in the triangle shapes increased the illusion effect. Subjects were adjusting the blank interval of the two-part stimulus to be equal to the length (altitude) of the isosceles triangles oriented horizontally but having various contour compositions: a complete contour, the baseline absent (a pair of wings), one sideline absent, the corners missing, and just the three-spot combination. In presentations, the triangle length varied in steps within the 6–360 arc min interval. The illusion strength increased monotonously with the stimuli length growth, except the illusion for the three-spot image which caused a faint effect if any. The stimuli with the missing corners definitely determined the strongest illusion. The illusion of the complete contour and a borderline missing was about of the same strength. We presume that the visual system re-established the missing borderlines by illusory contours in the distance matching experiments but did not restore the corners. The triangle apex absence left no Müller-Lyer effect reducing the distance therefore, the illusion became stronger.

Keywords: illusion of size, disconnected boundaries

Effect of Blue-Light-Blocking Lenses on Retinal Straylight

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Purpose. Sometimes it is believed that yellow lenses could decrease the intensity of scattered light in the eye (retinal straylight). However, the results of some studies have contradicted this assumption (Van Os et al., 2017). Currently, various non-tinted blue-light-blocking lenses are used to protect the eyes from short-wavelength light. Objective of this research was to determine whether blue-light-blocking lenses affect the levels of retinal straylight.

Methods. The measurements a straylight meter were performed under four different conditions: 1) without a spectacle lens in front of the eye, 2) with a plano lens without an antireflective (AR) coating, 3) with a lens with a blue-light-blocking coating, and 4) with a yellow-tinted lens without an AR coating. The study involved 37 subjects with a mean age of 21.6 years.

Results. No significant differences in straylight parameters (s) ($p > 0.05$) were observed for measurements obtained without a lens in front of the eye, with the uncoated lens and with the lens with a blue-light-filtering coating. Retinal straylight was significantly increased with the use of a yellow-tinted lens compared with no lens ($p < 0.001$).

Conclusion. Neither yellow-tinted lenses nor non-tinted blue-light-blocking lenses reduce the levels of retinal straylight.

Keywords: tinted lenses, blue-light blocking lenses, retinal straylight, short-wavelength light, quality of vision

Stimulus Parameters Affecting Saccadic Eye Movement Performance

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Saccades are accurate, high-velocity eye movements that function to change the point of fixation and foveate the object of interest (Ciuffreda & Tannen, 1995; Purves et al., 2001). While saccadic eye movement analysis has been widely applied in different scientific fields (e.g., medicine, cognitive processing, virtual reality), all studies addressing saccadic performance should take into account that saccadic eye movements are dependent on the physical properties of the demonstrated stimuli, such as stimulus luminance (Yamagishi & Furukawa, 2020) and stimulus distance (Cohen & Ross, 1978). The aim of the study is to develop and test visual stimuli for saccadic eye movement analysis, based on a comprehensive analysis of physical properties affecting saccadic eye movement parameters and as possible reducing different variables affecting the task performance. Latency, accuracy, and peak velocity of saccadic eye movements were observed in stimuli of different directions, contrast, and distance. The results of the pilot study demonstrate that the latency of saccades to higher-contrast stimuli are lower than to low-contrast stimuli. Saccadic peak velocity is dependent on the stimulus distance, explained by the main-sequence of saccadic eye movements. Further investigation is necessary to obtain a broader understanding in stimulus properties affecting saccadic eye movement performance.

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Keywords: Saccadic eye movements, stimulus luminance, stimulus distance, saccadic accuracy

Myopia and Astigmatism Prevalence in School Children in Madrid, Spain

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Visual habits have been changing towards more time spent in near vision activities and less time outdoors, increasing the risk of refractive dysfunctions. The aim of the study was to determine the myopia and astigmatism prevalence of a sample of school-age children in Madrid, Spain. We carried out a cross-sectional epidemiological study of 1st, 6th and 8th grades children of 3 Schools in Madrid. Myopia was defined as a spherical equivalent (SE) $\leq -0.50\text{D}$ and a far visual acuity ≤ 0.1 LogMAR. Astigmatism was classified in the following ranges: $< 1.00\text{D}$; ≥ 1.00 and < 2.00 ; $\geq 2.00\text{D}$. 447 children (149 of 1st, 189 of 6th and 109 of 8th grade) participated in the study. Myopia prevalence was 3.52%, 9.83% and 15.54% in 1st, 6th and 8th grades, respectively, with significant differences between grades ($p = 0.000$). 49.55% of children didn't have astigmatism, 39.46% had an astigmatism $< 1.00\text{D}$; 7.4% ≥ 1.00 and < 2.00 ; and 3.59% $\geq 2.00\text{D}$. Astigmatism was significantly different between grades ($p=0.001$). A significant correlation was found between SE and astigmatism ($p = 0.037$). No differences in cylinder were found between myopes and no-myopes ($p = 0.121$). Myopia prevalence is not high in children in the Madrid region, and it does not seem to be increasing in the last decades. The prevalence of myopia increases with age.

Keywords: myopia, astigmatism, prevalence, children

Convergence Insufficiency (CI) and Convergence Excess (CE) in Schoolchildren in Spain

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Convergence Insufficiency (CI) and Convergence Excess (CE) are a group of visual disorders that can cause visual symptoms and low performance at near vision activities. There is not much information about their prevalence. We conducted a prospective cross-sectional study to determine the prevalence of CI and CE at school age. A total of 450 children participated in the study: 151 from 1st grade, 190 from 6th grade and 109 from 8th grade. As clinical evaluation we included near and far cover test (CT), near point of convergence (NPC) and near vergences. We defined CI as having base out break or blur point $\leq 15\Delta$; NPC ≥ 6 cm and difference between near and far phoria $\geq 4\Delta$. We defined CE as having esophoria $> 2\Delta$ at near and base in break or blur point $< 7\Delta$. The prevalence of CI was 2.0%; 4.80% and 4.60% in 1st, 6th and 8th grade, respectively. The difference of CI frequency between groups was not significant ($X^2: p = 0.37$). The prevalence of CE was 0.7%; 1.1% and 0.9% in 1st, 6th and 8th grade. The prevalence of CI and CE in Spanish schoolchildren seems to be similar to other studies and did not vary between school grades.

Keywords: Convergence Insufficiency, convergence excess, visual disorders, prevalence, schoolchildren

Visuo-Verbal Tests in Children with Fetal Alcohol Spectrum Disorders

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Fetal Alcohol Spectrum Disorders (FASD) is a consequence of prenatal alcohol exposure. Current diagnostic process is difficult, time-consuming and expensive. Due to central nervous system dysfunction, children with FASD have, among other deficits, problems in oculomotor functions. Visuo-verbal tests are based on measurement of the speed of rapid number naming and captures impairment of eye movements, attention, language, and other correlates of suboptimal brain function. Eight children with FASD (age 9.9 ± 1.5) and 28 age matched controls (age 9.7 ± 1.0) attended the pilot study. Each subject was administered, in random order, each of the three eye movement tests: Developmental Eye Movement test (DEM), King-Devick test (K-D) and NSUCO observational test. The study showed that FASD children were reading each DEM test card slower and made more mistakes. In the K-D test, also children from the FASD group were slower and made significantly more errors on a card with the crowding effect and in all cards together. In the NSUCO test, there was no important difference between the two groups. The study showed that visuo-motor tests could be a good tool to help in the FASD diagnostic process. Early detection and therapeutic action are important factors in development and life quality of FASD children.

Keywords: Fetal Alcohol Spectrum Disorders, Visuo-verbal tests, K-D test, DEM test, NSUCO test

Effect of Soft Contact Lenses on Retinal Straylight

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Purpose. For some monthly contact lens wearers, vision discomfort appears before replacement time of contact lenses. One of the reasons for such vision discomfort are deposits on the surface of contact lenses. The aim of this study was to find out if there is an increase in retinal straylight with contact lenses which were worn for a month compared to new monthly soft contact lenses.

Methods. Retinal straylight was measured with new monthly soft contact lenses and contact lenses, which were worn at least 3 weeks. Measurements were done with straylight meter C-Quant. 33 participants with a mean age of 23 years participated in this research.

Results. Retinal straylight was significantly higher ($p < 0.001$) with used contact lenses compared to new soft monthly contact lenses. Average increase in retinal straylight parameters (in logarithmic units) with used contact lenses was $\log(s) = 0.11$.

Conclusion. The monthly soft contact lenses, which were worn at least 3 weeks, could decrease vision quality, because with the used soft contact lenses retinal straylight is significantly larger than with the new soft contact lenses.

Keywords: Retinal straylight, soft contact lenses, vision quality, deposits, vision discomfort

The Effect of Various Focal Length Photographs on Eyewitness Identification Accuracy

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A key factor that has rarely been investigated regarding the technical details of photographs in eyewitness identification research is focal length. Focal length can be defined as the distance between the camera lens and the camera sensor, providing variance in the viewing angle and magnification of objects in the frame. In this paper, the effect of various focal length photographs on eyewitness identification accuracy is examined. Ninety adult participants watched a video of a mock theft, after which they were randomly shown a simultaneous six-person target-present lineup of photographs using a 24 mm, 50 mm, or 100 mm focal length. The participants who viewed photographs taken with either a 100 mm or 50 mm focal length identified the suspect more often than those who viewed photographs taken with a 24 mm focal length. Based on these findings we suggest that the standard focal length of photographs used for the purpose of eyewitness identification should always be between 50 mm and 100 mm.

Keywords: focal length, eyewitness identification, simultaneous lineup, confidence, accuracy

Comparative Assessment of Spatial Perception in Augmented Reality Depending on the Consistency of Depth Cues

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Vergence-accommodation conflict affects not only user comfort, but also spatial judgements in a stereoscopic augmented reality. Despite the availability of display architectures that are developed to mitigate or eliminate this issue, it has remained unknown whether its implementation is reflected in the accuracy and temporal aspects of spatial perception. In this study, we investigated the effect of the consistency of depth cues on perceptual distance matching in augmented reality using a head-mounted display that was driven in two modes: multifocal mode and single-focal plane mode. The participants matched the distance of a real object with the images projected at three viewing distances (45 cm, 65 cm, and 115 cm). As a result, no significant differences in the accuracy of spatial perception were shown depending on the consistency of cues. However, the tasks were completed faster when the images contained consonant information about depth, especially at close viewing distance. Further technological advancements might be required to improve the accuracy of spatial judgements in augmented reality.

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Keywords: visual perception, augmented reality, depth cues, distance matching, head-mounted display, multiple planes.

Choosing Lineup Order vs. Knowing Which Lineup Corresponds to Which Suspect: Accuracy Implications in Multiple Perpetrator Identification

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Although many crimes involve multiple perpetrators, most eyewitness studies examine identification accuracy within the context of a single perpetrator. Prior research has indicated that stronger memory traces and lower cognitive load result in more accurate perpetrator identifications. In this study, 180 participants were shown a video of a simulated theft that involved two perpetrators. Afterward, participants were randomly shown two lineups, each with a six-person simultaneous lineup. In one group ($n = 60$), the participant selected which lineup to view first; in other groups, the administrator selected which lineup to view first. When the administrator chose the viewing order, half of the participants ($n = 60$) were aware of which lineup corresponded to which perpetrator and half ($n = 60$) were not. Participants who selected which lineup to view first correctly rejected target-absent lineups more often (65%) than those who did not know which lineup corresponded to which perpetrator (45%). There were no differences between participants who selected which lineup to view first and those who could not choose the order but were aware which lineup corresponded to which perpetrator. In conclusion, being aware of which lineup corresponds to which perpetrator seems to be an important factor associated with eyewitnesses' cognitive load.

Keywords: eyewitness identification, multiple perpetrators, simultaneous lineups, memory trace strength, cognitive load.

Evaluation of the Impact of Relaxing Visual Exercises on Computer Users

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With the development of new technologies, the number of people who feel discomfort working with computers is increasing, as a result, the number of asthenopic complaints is increasing. The purpose of the study was to evaluate the effectiveness of vision relaxation exercises in computer users. In the study, 14 participants were evaluated for clinical and subjective changes before and after vision relaxation exercises using optometrist's office equipment and a specially designed questionnaire. The results demonstrated that vision relaxation exercises do not significantly change clinical measurements but reduce the set of asthenopic complaints. Complaints such as eye and vision discomfort and tearing were significantly reduced. To conclude, vision relaxation exercises are not harmful, and they can be used by computer users to reduce asthenopic complaints after working with computers.

Acknowledgement: The study was supported by the project “Research and Application Methodology Development of a New Preventive Eye Muscle Training and Strengthening Device EYE ROLL”

Keywords: optometry, vision relaxation exercises, computer users, asthenopic complaints, vision examination.

Usage of Remote Visual Acuity Testing

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Testing a person's visual acuity is one of the main clinical steps in order to detect and correct refractive errors, or when evaluating the progression of visual anomalies or pathologies. As most optometric industries become more and more mobile each day, the need for good remote visual acuity assessment tools increase. Application systems and computerized e-health tools are still being relatively new and not much study has been done to test the reliability of these tests. Remote screening tools today do not have any guidelines or regulations. Therefore, there is a constant need for evaluation of these tests. The aim of this study was to analyze the efficiency of the FrACT test as a remote visual acuity assessment tool. The study involved 45 participants (mean age 31 ± 5.3). Using FrACT the visual acuity was measured and analyzed under two different remote conditions (1) by the assistance of the optometrist (2) by the assistance of an instruction manual. The results do not reflect the functionality of the FrACT test itself, but rather the effectiveness of FrACT as a remote screening tool and how the participants perform a test under supervised and unsupervised conditions. The results showed a significant difference in mean visual acuity between both groups ($p < 0.05$). A qualitative questionnaire was further studied and showed that participants using the instruction manual did not follow the guidelines and they found the process complicated. Previous studies implied that there is a clear correlation between visual acuity and factors such as surrounding light, distance to the screen, and optotype size. As the remote visual acuity test used in this study was performed under unsupervised conditions, it was rather complicated to make a full analysis of all factors that could influence the subject's visual acuity when performing the examinations remotely.

Keywords: remote screening tools, visual acuity, FrACT, telehealth, vision.