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Developments in Optics and Communications 2012

Book of abstracts

April 12 – 14, 2012
Riga, Latvia

8th International Young Scientist Conference

„Developments in Optics and Communications"

Programme

Thursday, April 12

Registration **8:15 – 9:00**

Opening Session

	D.Jakovels	CHAIRMAN OF THE CONFERENCE	9:00 – 9:10
		SPEACH BY REPRESENTATIVE OF INSTITUTE OF SOLID STATE PHYSICS	9:10 – 9:20
	A.Lihachev	PRESENTATION ABOUT LASERLAB EUROPE	9:20 – 9:35
	D.Jakovels	PRESENTATION ABOUT SPIE	9:35 – 9:50
	A.Cinins	PRESENTATION ABOUT OSA	9:50 – 10:05

Coffee Break **10:05 – 10:30**

Atomic and Molecular Spectroscopy 1

Chairman: A.Cininsh

Inv	M.Tamanis	HIGH RESOLUTION SPECTROSCOPY OF THE ELECTRONIC GROUND STATES AT LARGE INTERNUCLEAR DISTANCE IN RbCs AND KCs MOLECULES	10:30 – 11:15
A1	N.Kolachevsky, A.Matveev, C.G.Parthey, K.Predehl, J.Alnis, A.Beyer, R.Holzwarth, T.Udem, T.Wilken, M.Abgrall, D.Rovera, C.Salomon, P.Laurent, G.Grosche, T.Legero, H.Schnatz, S.Weyers, T.W.Hänsch	PRECISION SPECTROSCOPY OF ATOMIC HYDROGEN AND THE PROTON CHARGE RADIUS	11:15 – 11:30
A2	M.Bruvelis, N.N.Bezuglov, A.Ekers	DOPPLER PROFILE PARTICULARITIES IN SUPERSONIC BEAMS FOR CIRCULAR, SQUARE AND ARBITRARY COLLIMATING APERTURES	11:30 – 11:45
A3	L.Busaite, L.Kalvans	MODELLING REDUCTION OF ELECTROMAGNETIC RADIATION GROUP VELOCITY IN ATOMIC VAPOR	11:45 – 12:00
A4	U.Kalninsh, L.Kalvans	MODELING OF LIF SIGNAL IN ATOMIC MEDIA INCLUDING REALISTIC ENERGY DISTRIBUTION WITHIN LASER BEAM PROFILE	12:00 – 12:15

Lunch **12:15 – 13:30**

Atomic and Molecular Spectroscopy 2

Chairman: A.Spiss

A5	A.Berzins, M.Auzinsh, R.Ferber, F.Gahbauer, A.Jarmola, L.Kalvans, A.Papoyan, D.Sarkisyan	INVESTIGATION OF MAGNETO-OPTICAL RESONANCES AT SUB-DOPPLER D_2 EXCITATION OF RUBIDIUM VAPOR CONFINED IN AN EXTREMELY THIN CELL	13:30 – 13:45
A6	A.Mozers, M.Auzinsh, A.Berzins, R.Ferber, L.Kalvans, F.Gahbauer and A.Spiss	LEVEL-CROSSING SPECTROSCOPY IN ATOMIC RUBIDIUM AT NONZERO MAGNETIC FIELD	13:45 – 14:00
A7	I.Birzniece, O.Nikolayeva, M.Tamanis, and R.Ferber	HIGH RESOLUTION SPECTROSCOPY AND DESCRIPTION OF LOW-LYING ENERGY LEVELS OF RbCs $B^1\Pi$ STATE	14:00 – 14:15
A8	A.Kruzins, K.Alps, O.Docenko, I.Klincare, M.Tamanis, R.Ferber	HIGH RESOLUTION SPECTROSCOPIC STUDY OF THE $A^1\Sigma^+$–$B^3\Pi$ COMPLEX IN RbCs	14:15 – 14:30
A9	V.Zuters, O.Docenko, M.Tamanis, R.Ferber	HIGH RESOLUTION SPECTROSCOPY OF THE EXCITED $(4)^1\Sigma^+$ ELECTRONIC STATE OF THE RBCS MOLECULE	14:30 – 14:45
A10	V.Fjodorovs, E.Bogans	SMALL-SIZE HFEDL COLD-SPOT INVESTIGATIONS WITH SPECTROMETRIC AND THERMOPHOTOMETRIC METHODS	14:45 – 15:00

Coffee Break **15:00 – 15:30**

Biophotonics

Chairman: L.Asare

Inv	T.Freivalds	FLUORESCENCE MICROSCOPY FOR CANCER CELL STUDIES	15:30 – 16:10
B1	J.Lesins, M.Rumaka, K.Rozniece, I.Ferulova, J.Spigulis	IMPACT OF PHYSIOLOGICAL STATE ON SKIN AUTOFLUORESCENCE PHOTOBLEACHING	16:10 – 16:25
B2	D.Jakovels, J.Savickis, J.Rubins, J.Spigulis	SIMPLE AND FAST MONITORING AND MAPPING OF SKIN BLOOD SUPPLY BY A CONSUMER COLOR CAMERA	16:25 – 16:40
B3	I.Saknite, M.Lange, D.Jakovels, J.Spigulis	DISTANT DETERMINATION OF BILIRUBIN DISTRIBUTION IN SKIN BY RGB IMAGING	16:40 – 16:55

Welcome Party **17:10 –**

Friday, April 13

Optical Materials 1

Chairman: A.Vembris

O1	M.Narels, E.Laizane, I.Muzikante	INFLUENCE OF TEMPERATURE ON PHOTOISOMERISATION PROCESS OF AZOBENZENE MOLECULES DOPED IN POLYMER THIN FILM	9:00 – 9:15
O2	S. Popova, A.Vembris, I.Muzikante	GLASSY FORMING LOW MOLECULAR WEIGHT ORGANIC COMPOUNDS AND THEIR ELECTROLUMINESCENT PROPERTIES	9:15 – 9:30
O3	R.Grzibovskis, J.Latvels, I.Muzikante, B.Turovska	RELATION BETWEEN ENERGY LEVELS AND REDOX POTENTIAL OF DMABI DERIVATIVES	9:30 – 9:45
O4	K.Pudzs, J.V.Grazulevicius, I.Muzikante	DETERMINATION OF ENERGY STRUCTURE OF BAY SUBSTITUTED PERYLENE BISIMIDES IN THIN FILMS	9:45 – 10:00
O5	D.Peckus, A.Devižis, D.Hertel, V.Gulbinas	ULTRAFAST PROCESSES IN EXCITED MEROCYANINE MD376 FILMS	10:00 – 10:15

Coffe Break **10:15 – 10:40**

Optical Materials 2

Chairman: E.Nitiss

Inv	M.Reinfelde	HOLOGRAPHY AND IT'S APPLICATION	10:40 – 11:25
O6	J.Aleksejeva, J.Teteris	PHOTOINDUCED PROCESSES AND HOLOGRAPHIC RECORDING IN AZO-DYED GELATIN FILMS	11:25 – 11:40
O7	V.Pranculis, V.Gulbinas, R.Karpic	ENERGY TRANSFER IN POROUS SILICON – LASER DYE COMPOSITES	11:40 – 11:55
O8	E.Titavs, E.Nitiss, M.Rutkis	EFFECT OF CORONA POLING PARAMETERS ON POLYMER FILM POLING EFFICIENCY	11:55 – 12:10

Lunch **12:15 – 13:30**

Vision Science 1

Chairman: V.Karitans

Inv	S.Fomins	COGNITIVE DISCOUNTING OR COLOR APPEARANCE PHENOMENA	13:30 – 14:10
V1	R.Truksa, S.Fomins, M.Ozolins	CHROMATIC SIGNALS TEMPORAL MODULATION AND LIGHT SENSITIVITY	14:10 – 14:25
V2	K.Luse, S.Fomins	PHOTOGRAPHIC AND INK PRINTING COLORIMETRIC DIFFERENCE AND SPECTRAL SPECIFICS	14:25 – 14:40
V3	A. Pausus, E. Kassaliete, R. Truksa	SUBJECTIVE BLUR PERCEPTION MEASUREMENTS USING COMPUTERIZED IMAGE DEFOCUS	14:40 – 14:55
V4	A.Kalteniece, G.Krumina	3D CINEMA AND HUMAN STEREOVISION	14:55 – 15:10

Coffee Break **15:10 – 15:30**

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Vision Science 2

Chairman: S.Fomins

V5	E.Kassaliete, E.Megne, I.Lacis, S.Fomins	VISUAL WORD RECOGNITION IN NORMAL READING CHILDREN AND CHILDREN WITH READING DIFFICULTIES	15:30 – 15:45
V6	J.Jakovleva, G.Krumina, J.Albon	METHOD OF PROTEOGLYCANS AND GLYCOSAMINOGLYCANS DETERMINATION IN OPTIC NERVE HEAD	15:45 – 16:00
V7	I.Timrote, G.Krumina, T.Pladere, M.Skribe	DEVELOPMENT OF A METHOD TO EVALUATE PERIPHERAL VISUAL PERCEPTION	16:00 – 16:15
V8	I.Laure, G.Krumina	EFFECT OF COLOUR ON MONOCULAR DIPLOPIA IN THE CASE OF ASTIGMATISM	16:15 – 16:30
V9	Z.Meskovska, D.Sice, G.Ikaunieks	CONTRAST SENSITIVITY AND VISION ACUITY MEASURED WITH VISUAL EVOKED POTENTIAL METHOD	16:30 – 16:45

Coffee Break **16:45 – 17:10**

Poster Session **17:10 –**

Saturday, April 14

Communications 1

Chairman: S.Berezins

Inv	J.Porins	INVESTIGATION OF POLARIZATION DYNAMICS IN OPTICAL WAVELENGTH DIVISION MULTIPLEXING COMMUNICATION SYSTEMS	9:00 – 9:45
C1	E.Nitiss, M.Rutkis	BASIC PRINCIPLES OF EO POLYMER WAVEGUIDE MODULATOR DEVELOPMENT	9:45 – 10:00
C2	A.Supe, J.Porins	ESTIMATION OF VARIABLES AFFECTING PARAMETRIC AMPLIFICATION IN FIBER OPTICS	10:00 – 10:15
C3	O.Ozolins, G.Ivanovs	NEW GENERATION ACCESS SYSTEM BASED ON DWDM-DIRECT WITH 55 GHZ FIBER BRAGG GRATING	10:15 – 10:30

Coffee Break **10:30 – 10:50**

Communications 2

Chairman: E.Nitiss

C4	S.Olonkins, G.Ivanovs	COMPARISON OF CO AND COUNTER PROPAGATING RAMAN AMPLIFICATION IN NONLINEARITY SENSITIVE DWDM TRANSMISSION SYSTEMS	10:50 – 11:05
C5	A.Udalcovs, V.Bobrovs	EVALUATION OF THE MAXIMUM PERMISSIBLE TRANSMISSION DISTANCE FOR MIXED HDWDM SYSTEMS	11:05 – 11:20

C6	I.Trifonovs, V.Bobrovs	PERFORMANCE ENHANCEMENT OF A BIDIRECTIONAL DWDM SOLUTION	11:20 – 11:35
C7	S.Berezins, V.Bobrovs	RESEARCH OF EDFA APPLICATION IN WDM SYSTEMS	11:35 – 11:50
C8	S.Spolitis, G.Ivanovs	A STUDY OF HIGH BIT RATE SPECTRUM-SLICED DWDM PON SYSTEM	11:50 – 12:05

Coffee Break **12:05 – 12:30**

Closing Session

		CLOSING REMARKS	12:30 – 12:40

Excursion **12:40 –**

Poster Session

P1	I.Mihailova, V.Gerbreders, E.Tamanis, E.Sledevskis	PREPARATION OF $CUINSE_2$ POLYCRYSTALLINE THIN FILMS BY SEQUENTIAL DEPOSITION OF ELEMENTS
P2	V.Kolbjonoks, V.Gerbreders, J.Teteris, A.Bulanovs	THIN FILMS CHALCOGENIDE AS-SE-S GLASSES
P3	A.Svilans, V.Kashcheyevs	MODELING THE CHARGING OF A PERIODICALLY DRIVEN QUANTUM DOT
P4	A.Vembris, S.Popova, K.Pudzs, I.Muzikante	ELECTRICAL AND OPTICAL PROPERTIES OF GLASS FORMING INDAN-1,3-DIONE PYRAN DERIVATIVES
P5	K.Klismeta, J.Teteris, J.Aleksejeva	OPTICAL PROPERTIES OF AZORUBINE AND GELATINE SYSTEM
P6	E.Potanina, J.Teteris	OPTICAL RECORDING IN DISPERSE RED 1 AND DISPERSE YELOW 7 CONTAINING ORGANIC POLYMERS
P7	V.Zaiceva, V.Bobrovs	INVESTIGATION OF SPECTRAL SLICING TECHNOLOGY IN WDM-PON SYSTEMS
P8	I.Diebele, A.Derjabo, J.Kapostinsh, J.Spigulis	SKIN EUMELANIN AND PHEOMELANIN MAPPING USING SPECTRAL IMAGING
P9	A.Derjabo, I.Diebele, J.Kapostinsh, J.Spigulis	A CASE REPORT OF MULTISPECTRAL IMAGING FOR SKIN CANCER ASSESSMENT
P10	A.Bekina, I.Diebele, U.Rubins, J.Zaharans, A.Derjabo, J.Spigulis	TEST OF A VIDEO-MICROSCOPE, MODIFIED FOR SKIN ASSESSMENT
P11	M.Lange, I.Saknite, D.Jakovels	SPECTRAL IMAGING USED IN DETERMINING THE AGE OF BRUISES DEPENDING ON THE BILIRUBIN CONCENTRATION
P12	L.Asare, M.Ozols, U.Rubins, O.Rubenis, J.Spigulis	MULTI-SPECTRAL PHOTOPLETHYSMOGRAPHY DEVICE FOR WAVEFORM ANALYSIS OF VASCULAR LESIONS
P13	I.Ferulova, J.Lesins, D.Jakovels, A.Lihachev, J.Spigulis	SKIN OPTICAL DENSITY CHANGES AFTER LOW POWER LASER IRRADIATION

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P14	G.Sprude, A.Lihachev, D.Jakovels, J.Lesins, J.Spigulis, M.Tamosiunas, S.Satkauskas, M.Venslauskas	FLUORESCENCE SPECTROSCOPY FOR MONITORING OF FLUORESCENT MARKERS DISTRIBUTION IN TISSUES
P15	S.Fomins, M.Ozolinsh, K.Luse	DESIGNING COLOR VISION TEST PLATE –PRINT TECHNOLOGY, CHROMATICITY, LUMINANCE AND FORM AMBIGUITY CHALLENGES
P16	A.Vicinska, S.Fomins, G.Krumina	COLOR MATCH TOLERANCES OF CHROMATIC FILTERS FOR STEREOVISION TESTING PURPOSES
P17	I.Zakutajeva, S.Fomins	DEPOSIT TYPES AND LOCALIZATION ON THE CONTACT LENSE SURFACE
P18	L.Zake, I.Lacis	MEMORY-GUIDED EYE MOVEMENTS
P19	I.Laicane, L.Filimonova, I.Lacis	THE PARAMETERS OF SACCADIC EYE MOVEMENTS IN READING AND DOT SCANNING TASKS
P20	T.Pladere, I.Timrote, G.Krumina	ATTENTION AND WORKING CAPACITY DEPENDING ON PERIPHERAL VISUAL STIMULI
P21	E.Caure, G.Ikaunieks, E.Kassaliete	CHANGES IN MYOPES VISUAL ACUITY WITH DIFFERENT CONTRAST STIMULI

VISUAL WORD RECOGNITION IN NORMAL READING CHILDREN AND CHILDREN WITH READING DIFFICULTIES

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Introduction: About 15-20% of school-aged children have reading difficulties.[1] There are many neural processes which participate in text decoding during reading: processing rate, verbal short term memory, phonological processing and visual processing, word identification (visual word recognition), word memory (working memory) and text comprehension. [2] Study aim is to determine differences in visual word recognition for different lengths of words showed in short interval of time between normal reading children and children with reading difficulties.

Method: Fifty-two children took part in the study. Thirteen children in Grade 4 (9-10 years old) and fourteen children in Grade 3 (8-9 years old) had a reading speed less than average in class, in Grade 4 89±5.29 (wpm), in Grade 3 63±3.41 (wpm) . These groups will be called children with reading difficulties, others - normal reading children. The stimulus set consisted of 150 words. The length of the items varied from four to ten letters. Each word was shown on a computer for 500 ms. The answers were expected verbally and correctly and incorrectly named words were recorded. Each word length was shown 15 times. Letter size corresponded to 6 cycles / degree. Duration of the test was ~ 3.5 min. Word samples for this research was selected with help of a speech therapist.

Results: Data of correctly named words for children with reading difficulties and without them were compared with t-Test: Two-Sample Assuming Unequal Variances. There was a significant difference between results of both groups for all word length. In Grade 4 - four letters long words decoding $F(1.77)=2.63$, $p<0.02$; ten letters words decoding $F(1.75)=5.04$, $p<0.00015$, but in Grade 3 – four letters word decoding $F(1.73)=2.94$, $p<0.009$; ten letters decoding $F(1.8)=4.44$, $p<0.001$.

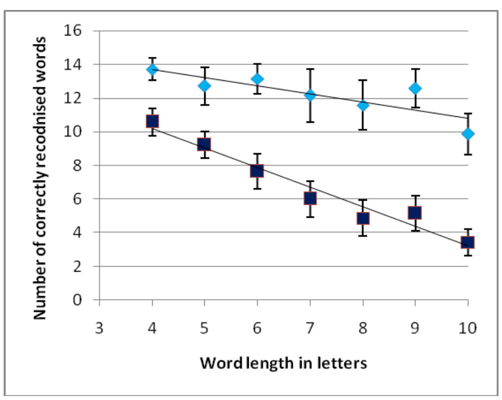

Image 1. *Grade 3* (line with diamond the mean values in normal reading children, line with square - children with reading difficulties)

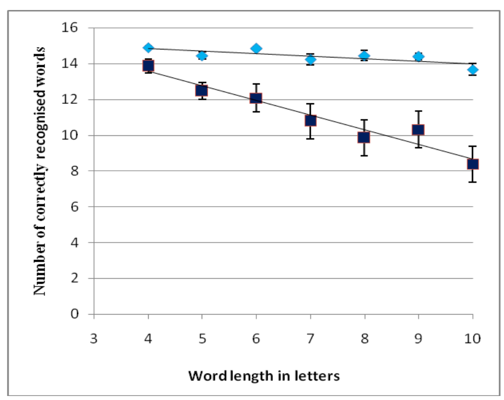

Image 2. *Grade 4* (line with diamond the mean values in normal reading children, line with square - children with reading difficulties)

Conclusion: The study confirms that children with reduced reading speed can decode words shorter than normal reading children. These children have different reading pattern –

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nonlexcal route, the graphemes of a word are decoded into phonemes one- by-one, in serial way, and - lexcal rout, letters are activated in parallel, and these letters activate a words entry in the orthographic lexicon. Another model works with global and local visual attention. In our study we can`t distinguish these patterns. [3]

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2. http://brainconnection.positscience.com/topics/?main=gal/text-comprehension
3. Vanessa E.G. Martens, Peter F. De Jong, "The effect of word length on lexical decision in dyslexic and normal reading children"; *Brain and Language*, 98, p.140.-149., (2006).

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DEVELOPMENT OF A METHOD TO EVALUATE PERIPHERAL VISUAL PERCEPTION

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Visual information is organized and combined with memory and other senses in the visual cortex, hence making our visual perception [1]. It is within the cortex that visual information travels in two independent pathways – temporal or "what" system and parietal or "where" system. It is thought that temporal pathway receives the main input from *parvo* (P) pathway, and parietal – from *magno* (M) pathway [1]. P pathway consists of *midget* cells whose properties let us see objects in detail in central visual field, whereas M pathway consists of *parasol* cells whose properties let us see things in motion in peripheral visual field [2, 3]. We wanted to develop a method that would lead to evaluation of peripheral visual perception properties. For this reason individuals had to perform visual search task with additional noise in central and peripheral visual field.

An individual had to sit 60 cm from a projection screen and memorize the first letter from the upper left row. Afterwards he had to count all the letters he could find in a letter grid consisting from fifteen letters in fifteen rows. This task had to be performed several times while letters could be seen on a blank background, on lines or in squares. Peripheral noise could be white background, white background with ten times ten or five times five black dots.

It is known that accuracy and working capability is characterized by attention and power of concentration. Therefore we tested attention by comparing actual number of letters to count with ones that were counted by an individual. The results demonstrated that here are no obvious errors for counting the letters that would correlate with central noise or peripheral noise.

Time that an individual needed to accomplish the task was used to evaluate concentration (attention that is directed towards an object or placement proceeds processing [4]). As demonstrated from the results, all the individuals could be divided in two groups. For one group of individuals peripheral noise essentially influenced the time needed to accomplish the central task. For another group central noise had an essential influence on peripheral noise. Looking at the time needed to accomplish the task, we saw that an individual could count all the letters faster when looking at blank central noise and slower when counting letters in squares. Individuals accomplished their task faster if there was peripheral noise.

Acknowledgement

This work has been supported by the European Social Fund within the project «Support for Doctoral Studies at University of Latvia».
Thanks to S.Fomins for the help with the program.

References

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COLOR MATCH TOLERANCES OF CHROMATIC FILTERS FOR STEREOVISION TESTING PURPOSES

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Stereovision is an ability of fusion of two images (of each eye) into one percept which result in enhanced depth perception. Nowadays this skill is widely used in visual activities like binocular microscopy and 3D media. There is a variety of methods to divide the signals of each eye and to produce a stereoscopic sensation. Hereby, our interest is in splitting technique, which deals with two spectral filters. Color sensation can differ in population and it is important to quickly and efficiently fix the color filter pairs so they can be used in stereo tests and binocular balance tests. We try to introduce a methodology for easy and guided characterization of filters and stimuli color for different projection devices (CRT, LCD, OLED).

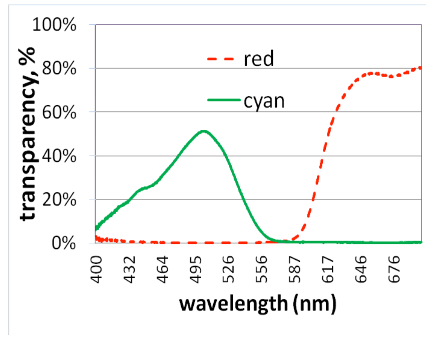

Fig.1 Spectrum of cyan and red filter, as example of totally divided filters.

Ten pairs of commercially available gel filters were chosen for experiment. Filter combinations comprised yellow and red against the blue and green filters. Matching experiment started with each eye individually. Subject`s task is to match the chromatic value of test stimuli on the grey backgrounds until one disappears. Three brightness levels were chosen for match procedures. When the match is found the subject is asked to find the minimum and maximum values of the match range.

Results show that filters with completely divided spectra (fig.1) produce more narrow color tolerances then mixed spectra filters. Match procedure depend on spectral composition of projection device and in many cases all primaries (R, G, B) should be engaged to completely vanish the stimuli. Our aim is to find the unique filter pair for many devices, when match procedure is done using minimal set of primaries.

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MEMORY-GUIDED EYE MOVEMENTS

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Smooth pursuit eye movements are conjugate and serves to stabilize gaze on a moving object in the area of fovea. Thus the velocity of retinal image, which moves together with object, is near zero, but the angular velocity of eye movement is equal as velocity of stimulus movement.

Smooth pursuit eye movements have been observed two phenomena - prescribing and continuing, if the stimulus abruptly gets lost. Then short-term memory guides eye movements with saccadic eye movements. /1/ Fukushima, et al., /2/ research results show longer anti-saccade latencies for children with learning disorders by the side of others. Therefore we decided to try experimentally, if memory-guided tasks affect smooth pursuit eye movement parameters.

In our experiments is a foursquare (size 0,6°), which horizontally goes across the computer screen from left side. Distance between the screen and eye is 60 cm. The velocity is changed within 5°/s and 10°/s. In the middle of the screen is a not transparent mask 5° or 10° wide. The task is to fix a gaze to square and follow, while it goes across the screen. When the square disappears behind the mask, pacient imagines the motion and continue to follow. After the mask pacient tries to catch again the square and follows after it till the edge of the screen. Meanwhile gaze position is recorded.

In all experiments (by different combinations of mask width and stimulus velocity) we observed an inertia of pursuit, which reaches even 2°. During inertia gaze velocity becomes lower, e.g., if the stimulus velocity up to mask is 4,9°/s, then it`s 2,3°/s when the stimulus disappears. On average after 600 ms the first saccade is observed. The number of saccades and their amplitudes are depend on stimulus velocity before the mask, mask width and presence of other factors, e.g., additional tasks or distractors. Frequently behind the mask is observed a delay of smooth pursuit (approximately 200 ms) and overtaking in the end of mask. 500 ms later, when stimulus is visible, this is corrected with a small saccade.

Comparing the parameters of eye movements (such as inertial velocity decreasing, the character of saccades, gaze precision by prediction for sight again stimulus), when eye crosses the mask, there is a difference between students in various ages.

We offer a model of short-term memory testing for students, which gives an analysis of smooth pursuit eye movement parameters before and after the mask on the screen.

References

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THE PARAMETERS OF SACCADIC EYE MOVEMENTS IN READING AND DOT SCANNING TASKS

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Saccades are rapid voluntary eye movements that transfer gaze from one fixation point to another, however often they are generated involuntary and automatically. [1] Cognitive processes can also influence the gaze transfer, e.g. during reading or making a regular saccade sequence. Study of both the visual attention models and psychology of reading shows that the reading process can also be performed automatically.[2, 3] The aim of the study is to determine, whether reading in Latvian with statistic significance can be described as an automatic process and to determine whether the average gaze transferring data of one person change during repeated tasks. Knowing, that when reading in Latvian , the saccades are on average 6-8 symbols or approximately 2^o long, we decided to compare gaze parameters in reading with that in scanning of dots that are organized in rows with the distance of 2^o between them.

The text of reading task was artificially constructed of words that all were 6-8 symbols long and hence located approximately 2^o from each other. The dots on a plate of the scanning task were 0.5^o big and were organized in 10 rows. In order to analyze only the successive saccades, the regressions and the saccades to the next row were removed from the data. The histogram interval for the distribution of the amplitudes was determined by the Sturge's rule. The data were processed by BeGaze and Microsoft Excel c programs and analyzed with the statistical methods. The dispersions of the saccade amplitudes were compared using Fisher's test and the average amplitude values were compared using t-test. The distribution of the saccade amplitudes of the reading and dot scanning tasks were compared individually for every participant of the experiment.

The differences of dispersions of the amplitude distributions during repeated reading were statistically significant in a half of tests. However the average gaze amplitudes confirm the automaticity of the reading process: less than 15% of the tests showed statistically significant differences between the average amplitudes. The results also show that for 80% of participants of the experiment the distribution of the saccade amplitudes in reading is similar to the distribution in the dots scanning task. The differences between the mean saccadic amplitudes in both tasks varied from 0 to 0.5^o. And the results of t-test assuming equal variances showed that the differences between the mean values of amplitudes were not statistically significant. Null hypothesis was that the average amplitudes were equal. P value varied from 0.28 to 0.96 that means that the data appear to be consistent with the null hypothesis. Neither the reading nor the dot scanning tests show saccades with predictable average amplitude and a small standard deviation. This allows us conclude, that in a task, where it is necessary to make successive horizontal saccades, the brain perceives it as a reading task and transfers gaze automatically and similarly to reading.

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ATTENTION AND WORKING CAPACITY DEPENDING ON PERIPHERAL VISUAL STIMULI

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In everyday life each visual stimulus is generally surrounded by a lot of other stimuli – distracting items. The visual system has limited capacity and cannot process everything that falls onto retina [1]. Physiological characteristics of visual system and visual attention save the brain from an overdose of information [1, 2].

In order to study peripheral visual perception, we developed a programme with a type of visual search task. For a stationary central stimulus there was a chosen set consisting from black Latin letters (10x10). The main task for each individual was to count how many times a certain letter was repeated within each set of letters. The task was performed at four different conditions: white background without peripheral stimuli, white background with peripheral stimuli, dotted (100 randomly located points) background without peripheral stimuli and dotted background with peripheral stimuli. For each of conditions ten measurements were carried out. After each of the sets an individual had an additional task – to report whether he had noticed a peripheral stimulus and to describe it.

The first results showed that, subjectively, the central task is completed faster on the dotted background comparing with the white background – the individual was aware of increasing complexity of the task and was more focused on it. However, there was a statistically significant difference only for one of the individuals.

Peripheral stimulus significantly increased the time to complete the task on white background. In turn, it did not attract attention so pronounced when completing the task on the dotted background therefore not increasing the time to complete the task. (See Fig.1).

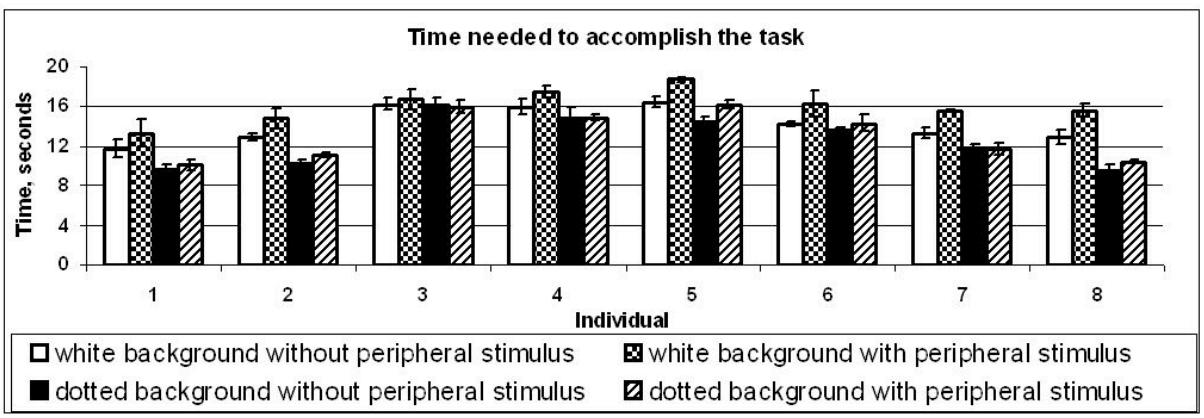

Fig.1. *The dependence of the time needed to accomplish the task of the type of background around it and of peripheral stimuli*

Analyzing the results of the additional task there was identified that three of the eight individuals had not noticed a peripheral stimulus in any of the conditions of the central task performance. Focusing on the task performance allowed them to "switch off" the peripheral vision.

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CHANGES IN MYOPES VISUAL ACUITY WITH DIFFERENT CONTRAST STIMULI

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Introduction. For young emmetropes visual acuity usually is better with negative Weber contrast NWC (black letters on white background) than with positive contrast PWC (white letters on black background) stimuli. Some authors showed that in case of myopia visual acuity is better with the positive than with negative contrast optotypes. One of explanations of this difference between myopes and emmetropes is that myopes have neurological changes in ON and OFF pathways of the visual system [1]. However it is well known that in case of increased light scattering level in the eye symbols with PWC are resolved better than with NWC, because bright background increases straylight level in the eye more than dark background. Some studies showed that increased axial length of the eye increases retinal straylight [2]. From this can be concluded that myopes have larger retinal straylight than emmetropes, so it cannot be excluded that myopes have better visual acuity with positive contrast also due to optical factors of the eye. Additional source of retinal straylight for myopes is corrective spectacle or contact lenses. In our research we wanted to find out how optical correction influences myopes visual acuity with positive and negative contrast stimuli.

Method. 17 persons (11 myopes and 6 emmetropes) at the age from 20 to 22 participated in this research. The spherical equivalent refractive error of the myopic subjects ranged from -2.5 to -6.75 D. Monocular visual acuity (VA) with PWC (97%), NWC (-97%) and low contrast (-10%) Landolt optotypes was determined using FrACT computer program. Measurements for myopes were done using spectacle or contact lenses correction.

Results. As was expected, the worst visual acuity was found with the low contrast optotypes. For myopes these values were lower than for emmetropes, but for myopes visual acuity obtained with high contrast stimuli also were lower, so we can't conclude that myopes have worse contrast sensitivity than emmetropes.

For emmetropes visual acuity with positive and negative contrast was not significantly different, while for myopes visual acuity was better with PWC than with NWC stimuli. A greater difference between these values for myopes was in measurements done with spectacles. These results are in accordance with other researches which showed that spectacle lenses increase retinal straylight more than contact lenses.

Conclusions. Better visual acuity for myopes with positive than negative contrast stimuli is related not only with neurological, but also with optical factors.

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