



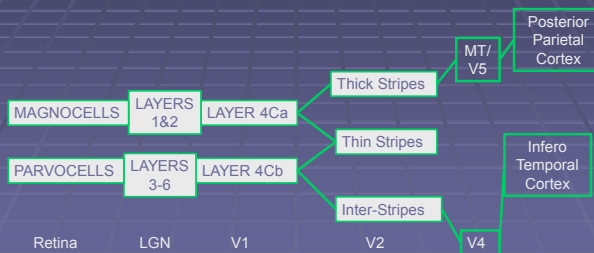
## GLOBAL MOTION PERCEPTION OF SCHOOL AGE CHILDREN

E.Kassaliete, A.Krastina, J.Blake, I.Lācis, S.Fomins, G.Krumina

Department of Optometry and vision Science,  
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Global motion perception is the perception of coherent motion in a noisy motion stimulus and it is one of the most important components in visual perception. This task strongly involves extrastriate brain areas, particularly V5/MT, where the dorsal stream dominates [R.Laycock et al, 2006, Behavioral and Brain Function, 2(26), 1-14]

## The two streams of visual processing



Mine, E., Swettenham, J., Hansen, P., Campbell, R., Jeffries, H., Plaisted, K. (2002). High motion coherence thresholds in children with autism. *Journal of Child Psychology and Psychiatry*, 43(2), 255-263.

## Motion perception

- Local
  - First – order: simple motion sensors, that detects a changes in luminance.
  - Second – order: moving contours are defined by contrast, texture
- Global - the visual system integrate those individual *local* motion signals at various parts of the visual field into a 2-dimensional or *global* representation of moving objects and surfaces.

- Single motion - system processing the whole range of directions and speeds, but they do not exclude the possibility of more motion systems.
- Three motion systems (Burr, Fioreniti, Morrone, 1998)
  - Slow chromatic motion
  - Slow achromatic motion
  - Fast chromatic and achromatic motion
- Independent slow and fast motion systems (Smaght et al., 1999) Where direction is integrated over the full 360°
- Motion detection is impaired when noise and signal dots move with similar speeds.

## The aim

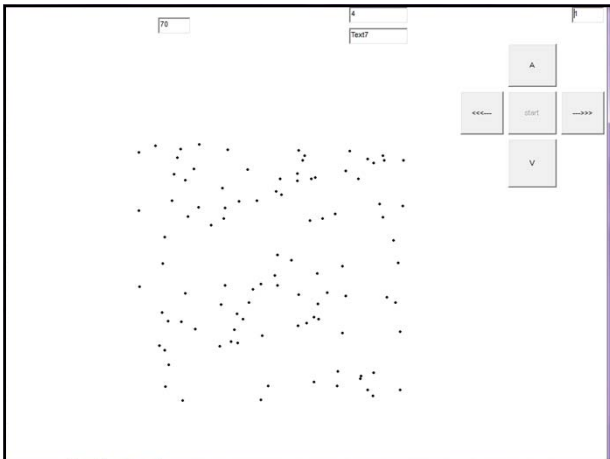
- Aim of this study was to determine global motion perception thresholds of school age children, using modified random dot cinematograms (RDK).

## Tasks of the research

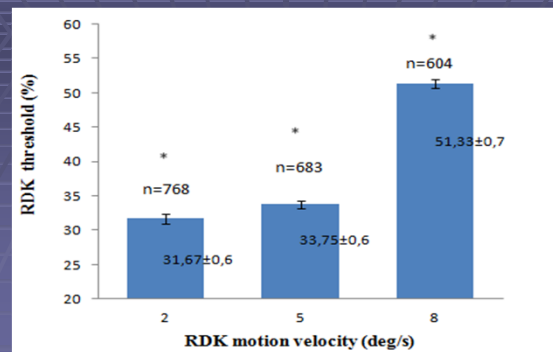
- To determine global motion thresholds to school age children at different dots velocities – 2deg/s, 5deg/s and 8deg/s, using identical signal and noise dots velocities.
- To compare the motion velocity systems
- To determine global motion threshold changes with age

## Methods

- 2055 children in 14 age groups from 6 to 19 years participated in the study. The procedures of the present study followed the tenets of the Declaration of Helsinki.
- Modified random dot cinematograms (RDK) test (created by S. Fomins).
- Stimulus consisted of 100 black moving dots (7 arc min, 1 cd/m<sup>2</sup>) displayed for 1.7 seconds on the 12° white background (200 cd/m<sup>2</sup>) of rectangular form at 50 cm. - Weber contrast ratio was -99,5% .
- Signal and noise dots moved with identical velocities of 2, 5 or 8 deg/s..
- To threshold detection we use staircase method of psychophysics

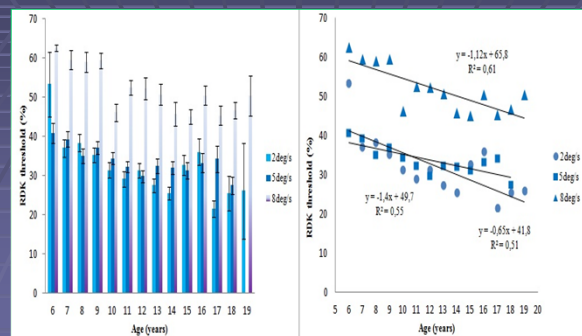


## Results



Age (years)	2deg/s		5deg/s		8deg/s	
	Coherence mean (%)	SE	Coherence mean (%)	SE	Coherence mean (%)	SE
6	53,3	8,2	40,8	2,5	62,5	0,8
7	37,1	2,2	39,3	2,0	59,5	2,4
8	38,3	2,2	35,0	1,9	58,9	2,5
9	35,3	1,9	37,1	1,6	59,4	2,0
10	31,4	1,9	34,5	1,6	46,1	2,2
11	29,1	2,0	32,2	1,3	52,4	1,9
12	31,4	1,9	29,8	1,5	52,3	2,7
13	27,5	1,8	32,4	1,9	50,7	2,7
14	25,5	1,5	32,1	1,7	45,8	3,0
15	32,7	2,6	31,3	2,1	45,1	1,9
16	36,1	3,4	33,3	2,4	50,4	2,5
17	21,6	2,0	34,3	3,4	45,4	2,5
18	25,4	4,4	27,5	2,1	46,8	2,1
19	26,1	12,1	3		50,3	5,1

## Results



## Results

- Motion thresholds
  - 2 deg/s:  $31.7\% \pm 0.6$  (n=768),  $11.55 \pm 0.42$  years ( $p < 0.002$ ),
  - 5 deg/s:  $33.7\% \pm 0.6$  (n=682),  $11.43 \pm 0.12$  years
  - 8 deg/s:  $51.3\% \pm 0.6$  (n=603),  $12.36 \pm 0.14$  years ( $p < 0.0001$ ),
- The threshold increase described the exponential equation:  $y = 25.41e^{0.0805x}$ ,  $R^2 = 0.85$ .

## Results

- Equation of linear regression for
  - 2 deg/s,  $y = -1.4x + 50$ ,  $R^2 = 0.55$ ,
  - 5 deg/s,  $y = -0.65x + 42$ ,  $R^2 = 0.51$ ,
  - 8 deg/s,  $y = -1.12x + 66$ ,  $R^2 = 0.61$
- Significance between slopes  $p > 0.05$ , with mean  $-0.99\% \pm 0.2$  a year.
- Changes at threshold was not significant at 11 years to 2deg/s and 5deg/s, and 10 years to 8deg/s.

## Conclusion

### We Have!

- Method, that can assess the overall range of global motion perception of school-age children
- Global motion thresholds at three different coherent motion velocities and in 14 different age groups

## Conclusion

- Motion perception increase with age and stabilizes at 10-11 years
- It is shown that there are at least two motion velocities systems

Thank you

## Acknowledgments

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