

PERIPHERAL VISION EFFECTS CENTRAL TASK PERFORMANCE UNDER VISUAL FATIGUE

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Introduction

Visual load and difficult visual conditions can reduce performance [1]. Nevertheless, open space offices are becoming more popular as well as GPS navigation while driving. This means peripheral vision is playing an important role in our daily activities. With the increase of using computers and other electronic devices for long hours, visual load increases, and therefore visual fatigue is common. In order to test fatigue, subjective scales are used in addition to objective measurements [2]. What is more, a lot of tests are made to examine central vision and few of them involve periphery. For this reason, we investigated the role of visual fatigue on visual search task performance with varying peripheral information.

Results

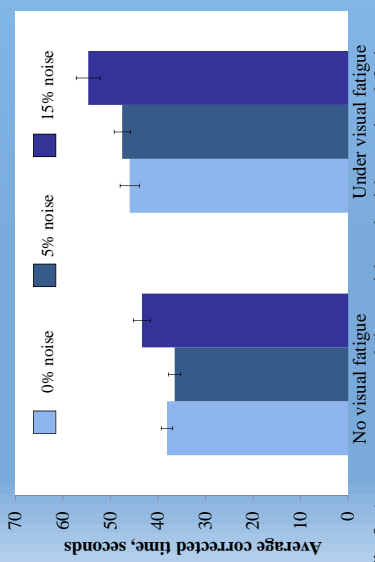


Fig.3. Average corrected time with and without visual fatigue.

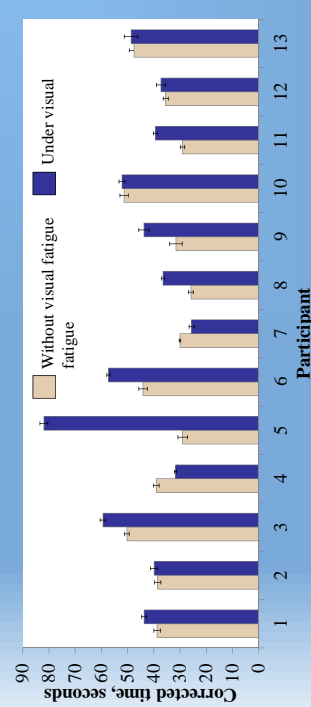


Fig.4. Average corrected time for each participant with and without visual fatigue. Visual search task was performed with 0% noise in the periphery.

Conclusions

1. Visual search task is performed longer under visual fatigue.
2. Corrected time increases with increasing peripheral information.
3. Binocular functions are reduced under visual fatigue – near point of convergence is reduced, and phoria increases towards esophoria.

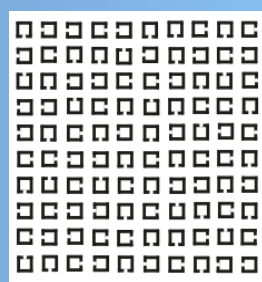


Fig. 1. An example of the main task.

- Thirteen participants, age 21–28 (average 22,5).
- Each participant sat 60 cm from a computer screen.
- Task was to memorize one of the targets (Landolt square with a gap in on of four directions) and click on all the identical ones with a computer mouse.
- Total time, errors, targets and their location was recorded in the program.
- 10 targets in each set of Landolt squares. Each target was 15px with a gap 3px and space between the squares 3px.
- Visual search task performance, near point of convergence (break and recovery), positive relative accommodation, negative relative accommodation, phoria, and binocular visual acuity was measured.
- Questionnaire about fatigue was given to each participant.
- Statistical data analysis was made using Microsoft Office Excel 2007.

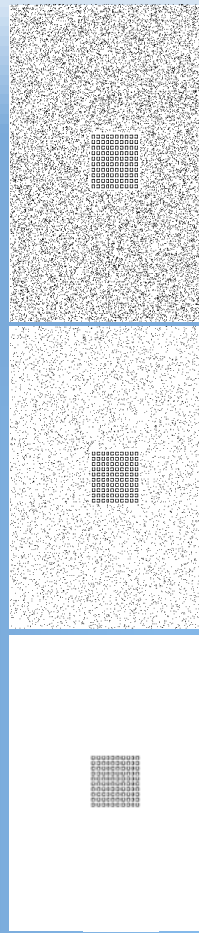


Fig. 2. Three different conditions in the periphery – 0%, 5%, and 15% noise. Visual search task was demonstrated nine times, three times with each peripheral condition.

Participant	Near point of convergence break, cm	Near point of recovery, cm	Phoria, pd (-exo; +exo)	Positive relative accommodation, D	Negative relative accommodation, D
1	11	13	-4	1.75	2.25
2	8	10	-6	3	5.25
3	7	8	0	4.25	4
4	8	10	-4	4.75	3.25
5	6	10	0	3.5	2.5
6	5	7	-12	2.25	2
7	5	9	0	4	2.5
8	5	7	10	2.5	4
9	5	6	7	3.25	3
10	9	11	-8	5	4.75
11	5	6	8	1.25	4.5
12	10	12	0	1.25	2
13	9	10	0	2	3.5
p	<<0.001	<<0.001	0.001	<<0.001	0.001

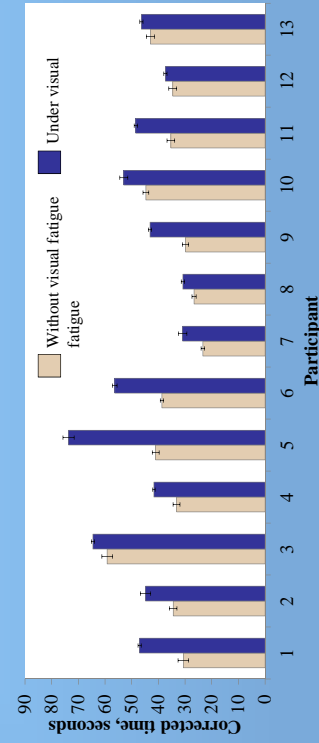


Fig.5. Average corrected time for each participant with and without visual fatigue. Visual search task was performed with 5% noise in the periphery.

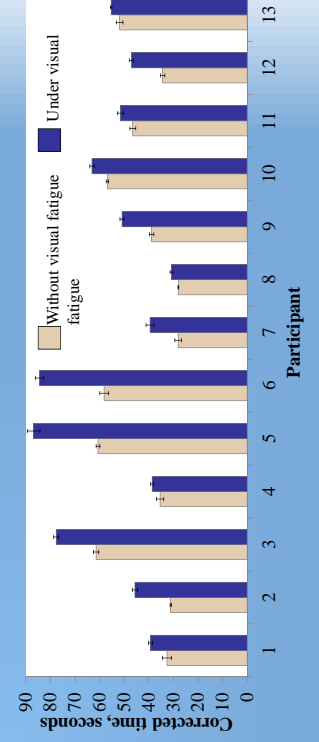


Fig.6. Average corrected time for each participant with and without visual fatigue. Visual search task was performed with 15% noise in the periphery.

References

- [1] Richter, H. O. Neck pain brought into focus. IOS Press. 2014; 47: 413-418.
- [2] Thiagarajan, P., Ciuffreda, K. J. Visual fatigue effects on vergence dynamics in asymptomatic individuals. Ophthalmic and Physiological Optics. 2013; 33: 642-651.

Acknowledgements

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