



Eye-Tracking Analysis of the Figures of Anti-Smoking Health Promoting Periodical's Illustrations¹

Ágnes MARÓDI¹, Iván DEVOSA², János STEKLÁCS², Alice
FÁYRNÉ-DOMBI¹, Zsuzsanna BUZAS², Melinda VANYA¹

agimarodi@gmail.com, devosa.ivan@tfk.kefo.hu,
steklacs.janos@tfk.kefo.hu, dombi@jgypk.u-szeged.hu,
buzas.zsuzsanna@tfk.kefo.hu,
vanya.melinda@med.u-szeged.hu

(¹University of Szeged, Szeged, Hungary)

(²College of Kecskemét, Kecskemét, Hungary)

Received: 15.06.2015; Accepted: 04.21.2015

Abstract: *Nowadays new education technologies and e-communication devices give new measuring and assessing tools for researchers. Eye-tracking is one of these new methods in education. In our study we assessed 4 figures from the anti-smoking health issues of National Institute for Health Development. In the study 22 students were included from a 7th grade class of a Kecskemét primary school. Our results show that students concentrate on the text-part of the figures except if the picture is frightening. However if the text and the picture are not both frightening enough, the message will not be transferred to young students.*

Keywords: eye-tracking, health, education, textbook, figure, effectivity

The eye-tracking in education

The eye-tracking, as method is already well-known in education (Maródi & Devosa, 2015). J. Steklács (2014) already described how the method can be used as a tool of studying the capabilities or reading and visual data processing. Even in 2011 the possibility of connecting the eye-tracking and EEG was published (Knight & Horsley, 2014), however the EEG technique had to get developed to be light and transportable enough to become really

¹ The study was supported by the TÁMOP-4.2.2.B-15/1/KONV-2015-0006 'A tehetség értékének kibontakoztatása a Szegedi Tudományegyetem kiválósága érdekében' project, financed by European Union and co-financed by the European Social Fund.

useable in education (Devosa et al., 2015). Nowadays we have experiences with ICT-tools in education, in e-communication: the students of teacher training schools learn how to use them (Devosa, 2013) even to teaching and learning music (Maródi et al., 2014) or how to teach the subject of geography with the latest educational ICT technology (Devosa et al., 2012). It is already also well-known, that the figures are very important in understanding and memorising the subject. The question is obvious: do the figures of teaching materials and health promoting issues reach the required level by students and teachers?

Eye-tracking of teaching materials

The science textbooks have ten times more illustration than a glossary. The natural science textbooks often include maps, but it is difficult for students to place geographical references in the text for larger geographical units. We need textual and visual information to understand the scientific textbooks, therefore complement pictures may help the reading and the learning. According to studies we are inclined to spend more time looking at the text than a part of a picture. For the duration of saccades (rapid eye movement between the fixations) of the test images and fixation lengths are longer on pictures, but more fixation was recorded on the text areas. The participants first read the large print letters, later the lower-case print letters and then looked at the picture (although some people looked at the picture first). Hannus and Hyönä's examination prove, that the integration of the text and a pictures of the textbooks is not an easy task for students. The researchers examined among the 10-aged students the understanding of the biology textbooks' the texts and the images. The study revealed that students had been spending 80% of the learning time for reading the texts and 66% of the remaining time had been dedicated to the figure captions and figures. The scientific motivation among Korean elementary school children with eye movement tracking method. They found that one part of the students, most of their time spends of reading the text, and they do little attempt to understand the conception of the picture and the text together. The novelty-seeking students spend equal time devoted to text and images, trying to interpret the text and the picture together.

Assessment of anti-smoking health promoting issues

Health promoting issues (including anti-smoking publications) are special teaching materials (Devosa, 2014) because they have to:

- educate on healthy life
- remind the reader on the harmful effects (environmental, social and economic costs)
- stimulate to request help (M.D, nurses, social workers, etc.)
- raising awareness of population
- increase the confidence by more and more successful quitting
- emphasize the benefits of quitting

- health warning messages according to *Canadian Cancer Society* (http://www.smoke-free.ca/eng_research/pscresearch_archive.htm), have to generate emotions; establish and strengthen the intention to quit; to emphasize the responsibility of the smoker to others.

The pictures are more important than words in these publications because of

- better memory (Strasser et al., 2012) fear making images cause increased chances of quitting (Hammond et al., 2004);
- colour images more motivating to stop smoking and better in addiction prevention (Hammond, 2009);
- the efficiency depends on size and location, appearance, personal factors and environmental variables (Hammond et al., 2007)
- effective at a very young age and lower social status as well (Hammond, 2009).

Eye-tracking studies

Previously our study some eye-tracking study already focused on health promoting issues. According to the results of The Bristol University ex-smokers claimed the figures, pictures help in quitting because of a better remembrance. The pictures are more effective it retention than in quitting. In the same year University of South Carolina: terrifying images are more effective then informing pictures by a study done in Canada, Mexico, Brazil (Cantrell et al., 2013). A cross-sectional study in England in 2008 and in 2011, including 11-16 year-old, about 1400 people, where groups were: non-smokers, experimental and regular smokers. In the study they realized that the graphic images do not deter young smokers, the pictorial warnings have little impact on them. The latest results indicate that the warnings are effective for those who have never smoked or just tried it (Moodie et al., 2013).

Our study was organized in the elementary school of College of Kecskemét, Teacher Training Faculty.

Population, methods and materials

The sampling population was consisted of 7th grade primary school students $N = 22$ (12 boys and 10 girls). The research was conducted using Tobii T120 type of eye tracker; data collection was done using the Tobii Studio software. Data was collected in December 2014 in a primary school of Kecskemét. The 22 students 3 student smokes (2 boys, 1 girl) consuming 5-10 pieces. Our study consisted of an eye-movement tracking and a survey phase. The eye-movement tracking phases (Figure 1.) of the students could see details of the text, which is supplemented by pictures, these texts were selected from pages of a health promotion issue.

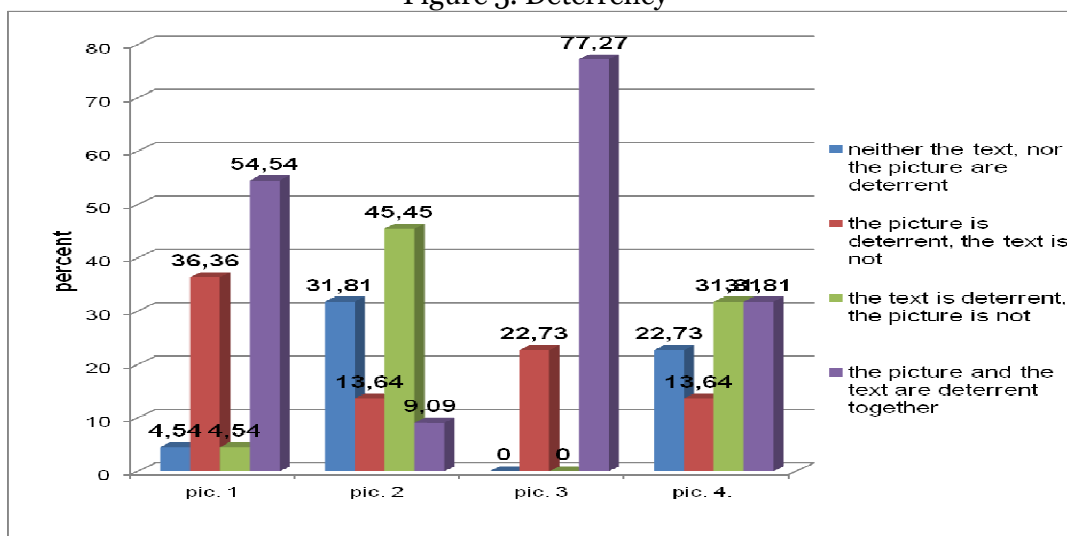
Figure 1-4. pictures and texts were selected from pages of a health promotion issue of Nemzeti Egészségfejlesztési Intézet (National Institute for Health Development).



Participating students in the study received the instruction to read the text and look at the related images because related questions will be found. For students it was not defined for how long they can view the text, we asked them to sign if they have read all the text and looked at the pictures.

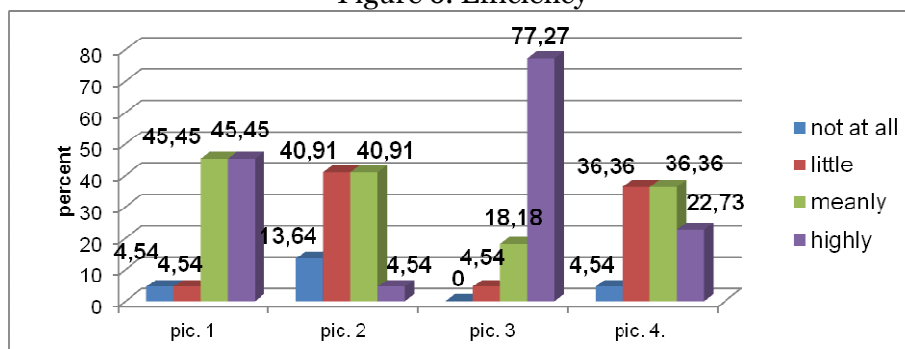
Results

Figure 5. Deterrency



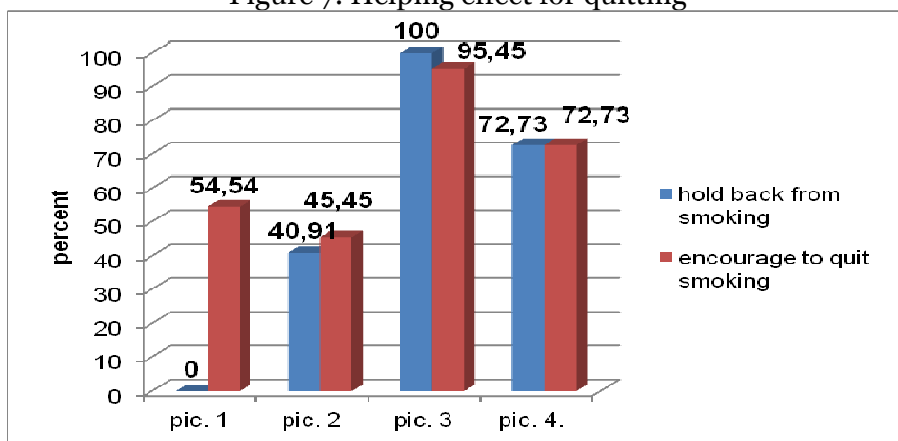
On most figures the students found the text and the pictures most deterrent together, extremely on figure 3.

Figure 6. Efficiency



According to the reactions, figure 3 was highly the most efficient figure. 77.27% of students answered “highly” for the question “what do you think how effective the picture and the text together against smoking?”. The possible answers were “not at all”, “little”, “meanly” highly”.

Figure 7. Helping effect for quitting



Very high difference can be seen between figure 1 and figure 3 for the question “hold back from smoking”: figure 1 got 0%, figure 3 got 100% from students.

Eye-tracking results

The heat maps of figures 1-4 can be seen as figures 8-11.

Figure 8.

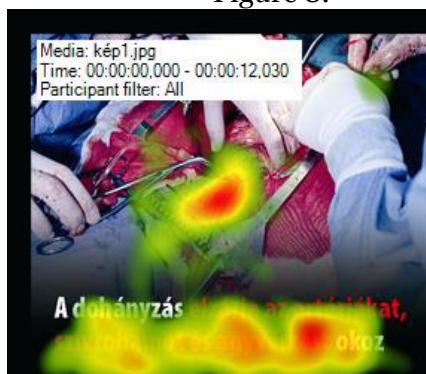


Figure 9.

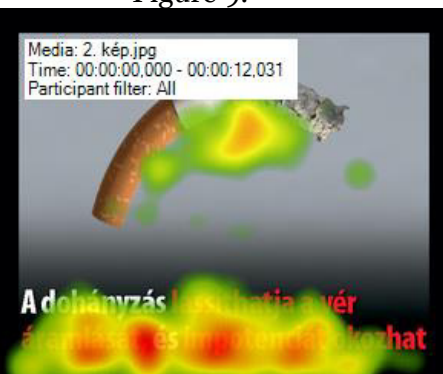
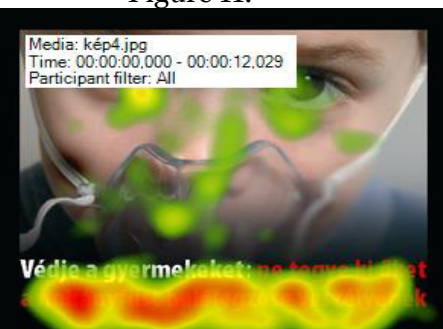


Figure 10.



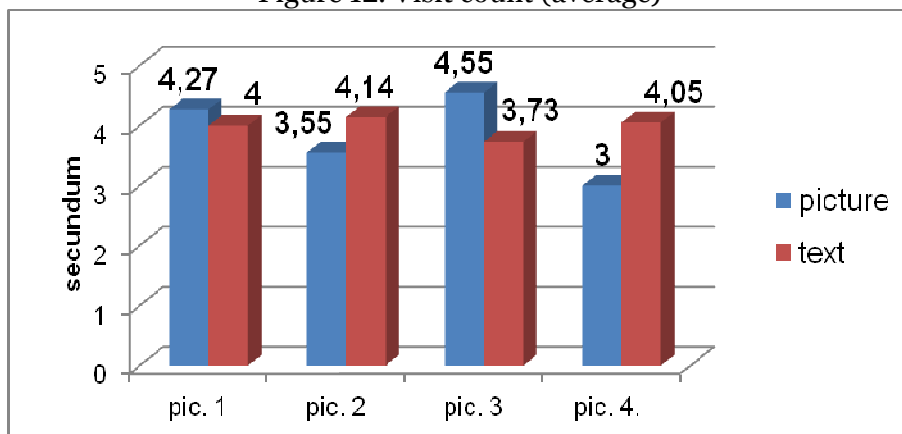
Figure 11.



In the first phase of eye tracking data processing we selected the pictures and texts in figures, as interest areas to be analyzed. The thermographic analysis shows the students' aggregated eye movements.

Although half of the students claimed that they remembered more on images than the text, yet only 20% of students answered the questions correctly about the pictures, while 70% of them responded well to questions about the text.

Figure 12. Visit count (average)



Inside the figures, the visiting count of pictures were higher than texts only in picture 1 and picture 3.

Figure 13. Time to First Fixation (average)

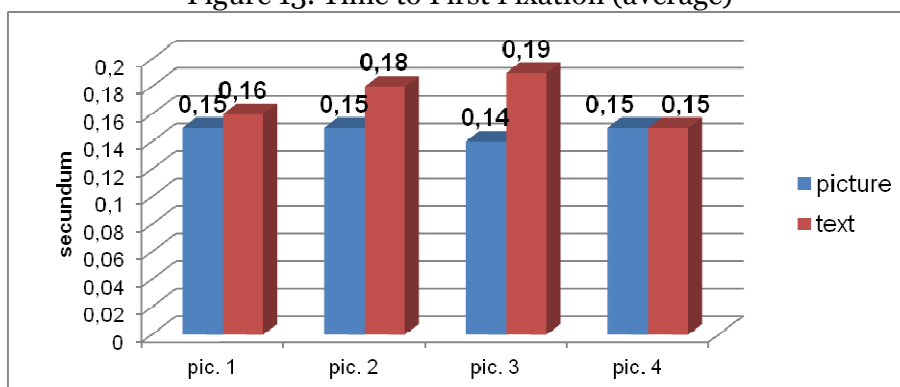
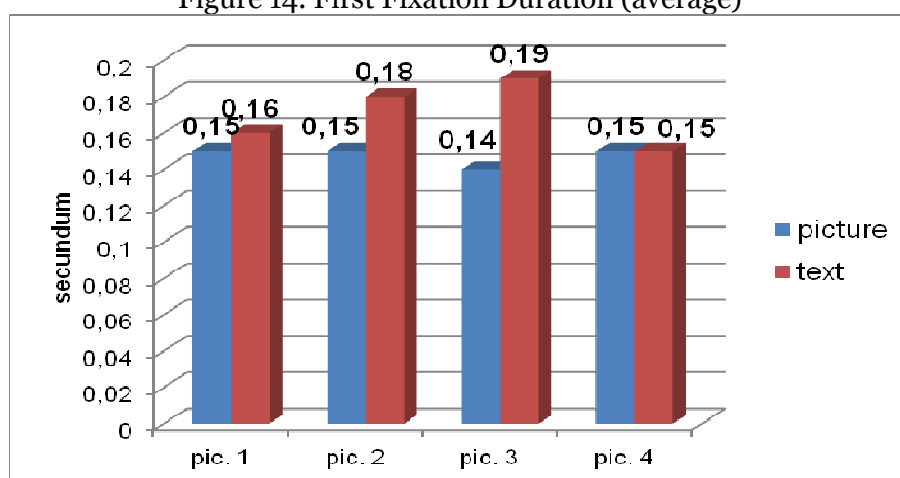
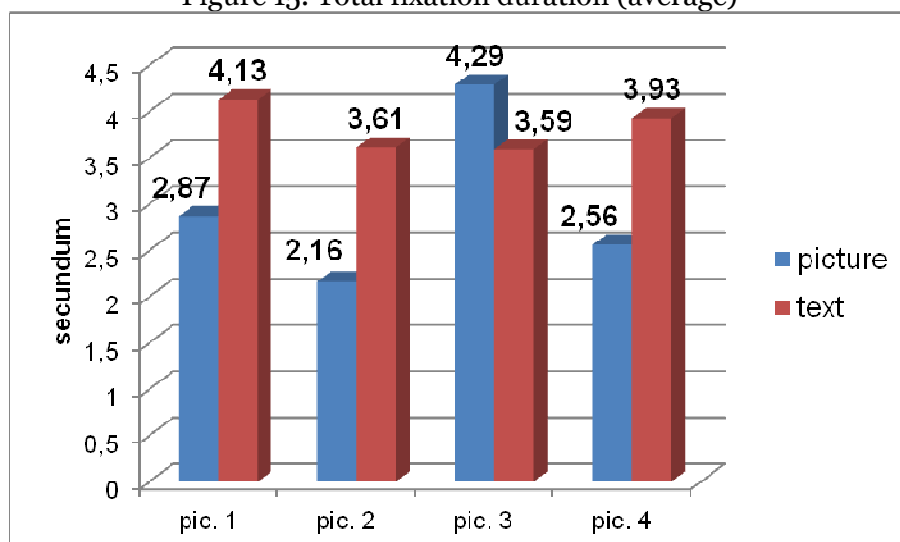


Figure 14. First Fixation Duration (average)



On figure 13 “time to first fixation”, on figure 14 “first fixation duration” are displayed. Very interesting, that both figures’ values are exactly the same.

Figure 15. Total fixation duration (average)



On figure 15 it becomes clear, that text is more important for students, only picture 3 has more fixation duration time, then text 3 on figure 3.

By the results it can be stated that on figures, the numbers of fixations on the images were typically low. Mostly the students were reading the texts.

Conclusions

According to the results we have several conclusions.

- For effective prevention both the pictures and the text should be deterrent.
- Fear motivates to quit (Hammond et al., 2004)
- New warning messages are needed: have to concern about the different needs of young people, and keep in mind the gender differences (Koval et al., 2005).

References

- Cantrell, J., Vallone D. M., Thraser, J. F., Ngler R. H., Feirman S. P., Muenz, L.R., He D. Y., & Viswanath, K. (2013). Impact of tobacco-related health warning labels across socioeconomic, race and ethnic groups: results from a randomized web-based experiment. *PLoS One*, 8 (1), e52206. DOI: 10.1371/journal.pone.0052206.
- Devosa I. (2013). Az iskolai egészségfejlesztés szociálpedagógiai aspektusból. In Dombi A., & Dombi M. (Eds.), *Fejezetek a szociálpedagógia köréből* (pp. 125-131). Szeged: Universitas Szeged.
- Devosa I. (2014). Az e-kommunikáció lehetőségei és csapdái az oktatásban. In Dombi A., & Dombi M. (Eds.), *Pedagogikum és kommunikáció: Comprehensive pedagogy and communication* (pp. 197-205). Szeged: Universitas Szeged.
- Devosa I., Csallner A. E., & Vízvári G. (2012). IKT fejlesztések a Szegedi Tudományegyetem Juhász Gyula Pedagógusképző Karán 2011-ben. In *1st Android Development Competition & Workshop (ADCW)*. Szeged, 2012. január 12. Szeged: Szegedi Tudományegyetem Juhász Gyula Pedagógusképző Kar.
- Devosa I., Maródi Á., & Grósz T. (2015). EEG and TOBII – new results. In Buzás Zs., Devosa I., Steklács J., & Maródi Á. (Eds.), *International Conference on Eye Movements 2015*. Kecskemét, Hungary, 08.06.2015. Kecskemét: Kecskeméti Főiskola Tanítóképző Főiskolai Kar.
- Hammond, D., Fong, G. T., McDonald, P. W., Brown, K. S., & Cameron, R. (2004). Graphic Canadian Warning Labels and Adverse Outcomes: Evidence from Canadian Smokers. *American Journal of Public Health*, 94 (8), 1442-1445.
- Hammond, D. (2009). *Tobacco labelling & packaging toolkit: a guide to FCTC Article 11*. Waterloo, ON: Tobacco Labelling Resource Centre.
- Hammond, D., Fong, G. T., Borland, R., Cumming, K. M., McNeill, A., & Driezen, P. (2007). Text and graphic warnings on cigarette packages. *American Journal Preventive Medicine*, 32 (3), 202-209.
- Knight, B. A., & Horsley, M. (2011). A New Approach to Cognitive Metrics: Analysing the Visual Mechanics of Comprehension using Eye-Tracking Data in Student Completion of High-Stakes Testing Evaluation. In Horsley, M., Eliot, M., Knight, B. A., & Reilly, R. (Eds.), *Current Trends in Eye Tracking Research* (pp. 287-296). Switzerland: Springer.

- Koval, J. J., Autbut J-A. L., Pederson, L. L., O'hegarty, M., & Chan, S. S. H (2005). The potential effectiveness of warning labels on cigarette packages: The perceptions of young adult Canadians. *Canadian Journal of Public Health*, 96 (5), 353-356.
- Maródi Á., Benedekfi I., Devosa I., & Buzás Zs. (2014). Teaching and learning music with the aid of digital technology. In Ádámné Major A., Kovács L., Johanyák, Zs. Cs., & Pap-Szigeti R. (Eds.), *Proceedings of TEAM 2014: 6th International Scientific and Expert Conference of the International TEAM Society, Kecskemét, Hungary, 10/11/2014-11/11/2014* (pp. 186-189). Kecskemét: Kecskeméti Főiskola Gépipari és Automatizálási Műszaki Főiskolai Kar.
- Maródi Á., & Devosa I. (2015). Eye tracking - from pedagogical aspect. In Buzás Zs., Devosa I., Steklács, J., & Maródi Á. (Eds.), *International Conference on Eye Movements 2015. Kecskemét, Hungary, 08/06/2015* (p. 3.). Kecskemét: Kecskeméti Főiskola Tanítóképző Főiskolai Kar.
- Moodie, C., Mackintosh, A. M, & Hastings, G. (2013). *Adolescents' response to pictorial warnings on the reverse panel of cigarette packs: A repeat cross-sectional study*. Crawford: Press Release.
- Steklács J. (2014). A szemmozgás vizsgálatának lehetőségei az olvasás és a vizuális információfeldolgozás képességének a megismerésében. *Anyanyelv-pedagógia*, 3. Retrieved from <http://www.anyanyelv-pedagogia.hu/cikkek.php?id=524> [11.06.2015].
- Strasser, A. A., Tang, K. Z., Romer, D., Jepson, C., & Capella, J. N. (2012). Graphic Warning Labels in Cigarette Advertisements: Recall and View Patterns. *American Journal of Preventive Medicine*, 43 (1), 41-47.