

# **Integration of traditional and innovative methods in studying advertisements effectiveness via paper, tablet and website: a neuromarketing experiment**

V. Russo<sup>1,2</sup>, M. Ferraresi<sup>1</sup>, A. Ciceri<sup>1,2</sup>, G. Songa<sup>1,2</sup>, F. Onorati<sup>2,3</sup>, F. Sirca<sup>2</sup> and M. Mauri<sup>2</sup>

<sup>1</sup> Istituto di Consumi, Comportamenti e Comunicazione, Libera Università di Lingue e Comunicazione IULM of Milan, Milan, Italy. [vincenzo.russo@iulm.it](mailto:vincenzo.russo@iulm.it), [mauro.ferraresi@iulm.it](mailto:mauro.ferraresi@iulm.it)

<sup>2</sup> Behaviour and Brain Lab, Libera Università di Lingue e Comunicazione IULM di Milano, Milan, Italy. [brainlab@iulm.it](mailto:brainlab@iulm.it)

<sup>3</sup> Dipartimento di Elettronica, Informatica e Bioingegneria, Politecnico of Milan, Milan, Italy. [francesco.onorati@polimi.it](mailto:francesco.onorati@polimi.it)

## **Introduction**

In the last decades the availability of portable devices as well as of internet accesses provided such great changes in people's habits in taking advantage of media contents. Nowadays people are exposed to advertising through several media, such as newspapers, websites, and mobile/tablet applications . To establish which media might be more effective in terms of ads memorization is an arduous challenge, but the answer has a great importance for strategic media planning of advertising communication. Some studies have already shown that media via paper are more effective than media via internet and websites in promoting the recall and the recognition of the ads [1],[2]. However, the scientific debate about the effectiveness of some media over the others is still an open issue.

## **Aim**

The aim of this work is to evaluate which communication media between newspapers, websites and mobile applications is able to induce the higher ads memory performances.

For this purpose, we have applied both traditional methods, based on self-reports/interviews, and neuromarketing techniques [3], such as Eye-Tracking (ET) recordings synchronized with Electroencephalographic (EEG) signals.

## **Design/methodology**

The present study was carried out at the Behavior and Brain Lab (IULM University, Milan) with the participation of 72 subjects equally distributed in terms of age, gender, socio-economic level and habits in the use of communication media. Three subgroups of 24 subjects, one for each experimental condition (printed newspaper, website and mobile application on iPad), were arranged.

The experiment was divided into two phases: firstly, the subjects were asked to enjoy the reading as they were at home an Italian newspaper through three different media (i.e. print version, mobile version on iPad and website version), each one including ads of the same brands.

In the second phase every subject has been interviewed for an implicit and explicit [4] (Shapiro & Krishnan, 2001) memory task recognition over 50 ad flyers [5], [6] (Keller, 1987; Braun, 1999), half of them included in the respective medium during the first phase of the experiment, while the remaining ones served as distractors.

It is important to point up that for each medium the ads were always the same. On the other hand, the newspaper articles were the same in the print version and for the mobile version, while for the website version they could change. This choice was made to respect the ecological conditions of exploring website versions of newspapers. At the end of the memory recognition task, subjects were asked to fill in a self-report assessment about their brand

knowledge [7] to verify whether the memory task was affected or not by previous experiences (such as holding or willing to purchase one of the products belonging to the brands presented by the target ads used during the experiment).

The Emotiv EPOC electroencephalography (EEG) headset was synchronized with SMI Eye-Tracking glasses for the print version and the mobile version groups, while for the website version group the Emotiv Epoc EEG headset was synchronized with the SMI RED250 Eye-Tracking (ET) [8], [9], [10]. The analysis of eye movements is a good source of relevant informations. The fixation of an object, in fact, indicates that the subject paid attention to that, and the length is a good indicator of the amount of interest [11], [12]. Among the different areas of research that have benefited from the measurement of gaze behavior, there is the study of advertising [13], [14], [15], [16], as the level of attention paid to an advertising influence the perception of the message [17] that can influence the attitude and consequently the behavior [18]. ET and EEG recordings were monitored also during the memory recognition task.

## Results

Results show that print (paper) and mobile (iPad) versions obtained significant higher values in memory performances (t-student test:  $p \leq 0.05$ ). Mobile (iPad) version had a higher memory rate than print (paper) version even if not in a statistically significant way.

Moreover, as showed by Figure 1, on average the total eye fixation time (computed by eye-tracking SMI BeGaze software) on ads was lower in the website version than both tablet version (iPad) and printed version (paper), according also to the results showed by some previous studies which found the “banner blindness” phenomenon [19].

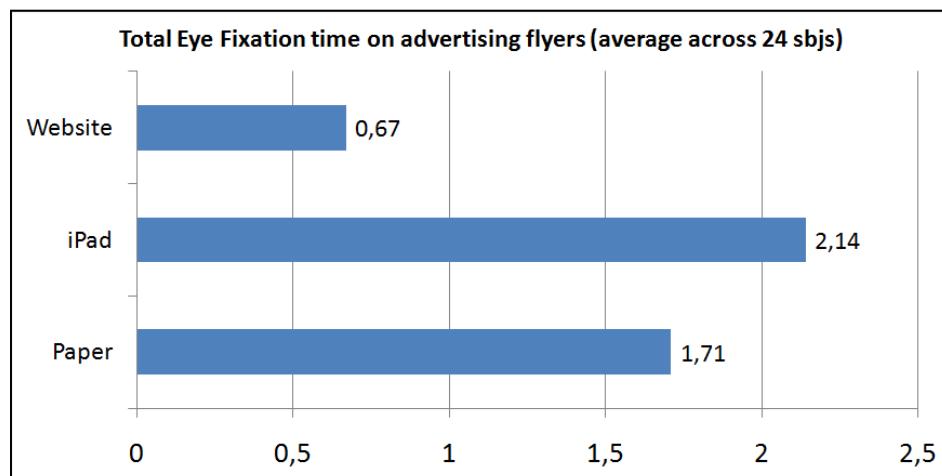


Figure 1. The graph shows the average values (expressed in seconds on the “x” axis, averaged across all 24 subjects for each media) about the total time of eye fixations on advertising flyers for the 3 different media exposition: paper, iPad and website (on the “y” axis).

EEG analyses shows that the Frustration Index from Emotiv Affective Suite is significantly lower in the website version with respect to both paper version and tablet version (t-student test:  $p \leq 0.05$ ), while there were no significant differences (t-student test:  $p \geq 0.05$ ) between paper version and tablet one (see Figure 2).

Moreover, the Frustration Index correlates significantly with memory performances (correlation test:  $p \leq 0.01$ ) and this finding is consistent with some empirical evidence about the relation between emotion and memorization [20], [21], [22], [23].

## Conclusion

Aside the findings presented in the results section, which should be taken into account with caution due to the small sample size enrolled in this study, this work shows that the integration of traditional methods (i.e., self-reports, interviews and traditional memory task recognition) and innovative techniques (such as eye-tracking recordings synchronized with EEG monitoring of brain activities) might provide a more complete information and understanding of user memorization phenomena about ads memorization. Limits and advantages of the presented neuromarketing methodologies will be deepen in further works.

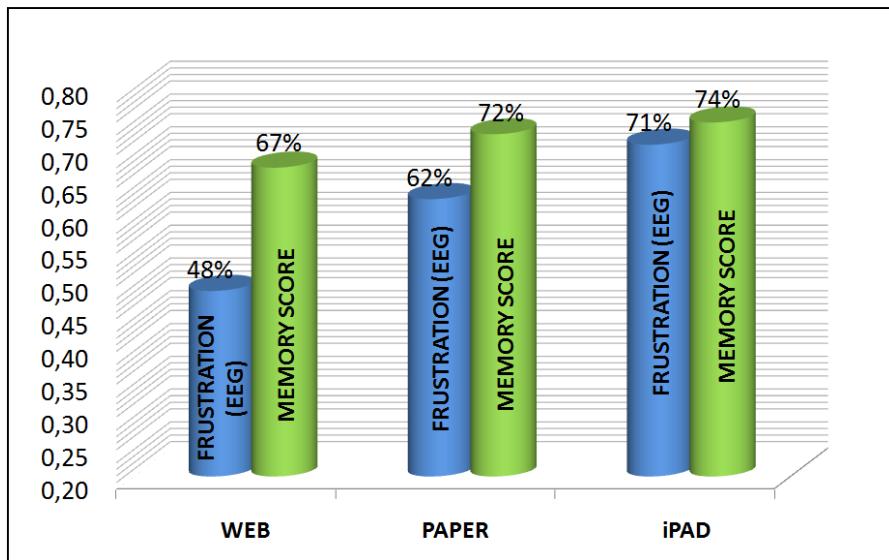


Figure 2. The graph shows the average values (percentages on the “y” axe, across all 24 subjects for each media) about the total memory task scores (in green) and EEG frustration levels (in blue) about advertising flyers for the 3 media: paper, iPad and website (on the “x” axe).

## References

1. Sundar, S. S., Narayan, S., Obregon, R., & Uppal, C. (1998). Does Web advertising work? Memory for print vs. on line media. *Journalism & Mass Communication Quarterly*, **75** (4), 822–835.
2. Bezjian-Avery, A., Calder, B., & Iacobucci, D. (1998). New media interactive advertising vs. traditional advertising. *Journal of Advertising Research*, **38** (4), 23–32.
3. Plassmann, H., Ramsøy, T. Z., & Milosavljevic, M. (2012). Branding the brain: A critical review and outlook. *Journal of Consumer Psychology*, **22** (1), 18–36.
4. Shapiro, S., Krishnan, H.S. (2001). Memory-Based Measures for Assessing Advertising Effects: A Comparison of Explicit and Implicit Memory Effects. *Journal of Advertising*, **30**(3), 1–14.
5. Keller, K. L. (1987). Memory factors in advertising: The effect of advertising cues on brand evaluations. *Journal of Consumer Research*, **14**, 316–333.
6. Braun, K. A. (1999). Postexperience advertising effects on consumer memory. *Journal of Consumer Research*, **25** (4), 319–334.
7. Kent, R. J., Allen, C. T. (1994). Competitive interference effects in consumer memory for advertising: the role of brand familiarity. *Journal of Marketing*, **58** (3), 97–105.
8. Esfahani, E. T. and Sundararajan, V. (2011). Using Brain-Computer Interfaces to Detect Human Satisfaction in Human-Robot Interaction. *International Journal of Humanoid Robotics*, **8** (1), 87–101

9. Khushaba, R. N., Wise, C., Kodagoda, S., Louviere, J., Kahn, B. E., Townsend, C. (2013). Consumer neuroscience: Assessing the brain response to marketing stimuli using electroencephalogram (EEG) and eye tracking. *Expert Systems with Applications*, **40** (9), 3803–3812.
10. Krober-Riel, W. (1984). Effects of emotional pictorial elements in ads analized by means of eye movement monitoring. *Advances in Consumer Research*, **11**, 591–596.
11. Hollingworth, A., & Henderson, J. (1998). Does consistent scene context facilitate object perception? *Journal of Experimental Psychology*, **127**, 398–415.
12. Pieters, E., & Wedel, M. (2004). Attention capture and transfer in advertising: Brand, pictorial, and text-size effects. *Journal of Marketing*, **68**, 36–50.
13. Mackenzie, S. B. (1986). The role of attention in mediating the effect of advertising on attribute importance. *Journal of Consumer Research*, **13**, 174–195.
14. Ulleberg, P., & Rundmo, T. (2003). Personality, attitudes and risk perception as predictors of risky driving behaviour among young drivers. *Safety Science*, **41**, 427–443.
15. Pieters, R., & Wedel, M. (2007a). Informativeness of eye movements for visual marketing. In P. Wedel, & R. Pieters (Eds.), *Visual marketing: From attention to action* (pp. 43–71). Hillsdale, NJ: Erlbaum.
16. Pieters, R., & Wedel, M. (2007b). Goal control of attention to advertising: The yarbus implication. *Journal of Consumer Research*, **34**, 224–233.
17. Rayner, K., & Castelhano, M. S. (2007). Eye movements during reading, scene perception, visual search, and while looking at print advertisements. In P. Wedel, & R. Pieters (Eds.), *Visual marketing: From attention to action* (pp. 9–42). Hillsdale, NJ: Erlbaum.
18. Wedel, M., & Pieters, R. (2000). Eye fixations on advertisements and memory for brands: A model and findings. *Marketing Science*, **19** (4), 297–312.
19. Benway, J. P. & Lane, D.M. (1998). Banner blindness: Web searchers often miss 'obvious' links. *Internetworking*, **5**.
20. Bradley, M. M., Greenwald, M. K., Petry, M. C., & Lang, P. J. (1992). Remembering pictures: Pleasure and arousal in memory. *Journal of Experimental Psychology: Learning, Memory, & Cognition*, **18**, 379–390.
21. Christianson, S. A., & Fallman, L. (1990). The role of age on reactivity and memory for emotional pictures. *Scandinavian Journal of Psychology*, **31**, 291–301.
22. Ohme, R., Reykowska, D., Wiener, D., Choromanska, A. (2009). Analysis of neurophysiological reactions to advertising stimuli by means of EEG and galvanic skin response measures. *Journal of Neuroscience, Psychology, and Economics*, **2** (1), 21–31.
23. Appel, V., Weinstein, S., & Weinstein, C. (1979). Brain activity and recall of TV advertising. *Journal of Advertising Research*, **19**, 7–15.