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The Impact of Advertisements Placement in the Computer Game on the Effectiveness of Social Campaign Messages

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Abstract:

Purpose: *The article focuses on two aspects, spatial location of advertisements and the engagement of the player during the gameplay and investigates, how they influence the effectiveness of advertising in the context of social campaign.*
Design/Methodology/Approach: *The analyses are conducted based on data collected in the survey and recorded by EEG and eye-tracker devices.*
Findings: *The results obtained for the memorization may indicate that message order (first or last) in a sequence of advertisements has major bearing on attention and recall. The computed outcomes of engagement indices show that, depending on the method of calculation, obtained results can differ. Moreover, research with the use of eye-tracking devices can allow for accurate predictions of advertising effectiveness, at least in terms of recall. Results allow to state that it would be recommended to place social advertisements in such spots where the player has less to do and is not distracted by any tasks required to achieve progress in the game.*
Practical Implications: *The proposed solution of testing the effectiveness of computer games in presenting social campaigns messages can be used both by pracitioners that develop such campaigns and by scientists aiming to conduct advertising reserch.*
Originality/Value: *Taking into account data from two different sources allows to capture both conscious and subconscious opinions about the social advertsising message in the game, which shows the comprehensive image of the advertisement's effectiveness.*

Keywords: *In-game advertising, computer games, cognitive neuroscience techniques, social advertising.*

JEL codes: *M39.*

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1. Introduction

Since the time of the mass market entry, computer games have been used as an advertising tool. In the 1980s, they were based on modifications of available games and served to entertain a small, limited group of people. In those days, product placement in computer games was limited by technological possibilities. However, over time, the attractiveness of games, their quantity, the graphic possibilities have improved and the number of players around the world has increased, which has attracted potential advertisers. Initially, computer games were aimed mainly at computer enthusiasts, but now they have become a mass product, aimed at different types of players, in different age ranges, with different interests. A breakthrough product that changed the player's profile was The Sims, launched in 2000, which attracted women and girls. This has opened up a new space for advertising activities (Gee and Hayes, 2010).

In 2020, the global games advertising market was estimated to be worth just over 4.0 billion U.S. dollars and is expected to reach 4.8 billion by 2024 (Clement, 2021). Moreover, according to the forecasts, the year 2023 will mark a major milestone for the global games market. That year, the total number of players will surpass the three-billion mark (Newzoo, 2020). These two statistics prove that the computer game could be very promising as medium for advertising, not only commercial, but also social.

Generally, there are two tendencies of using games in advertising (Cauberghe and De Pelsmacker, 2010):

- Advergaming (advertising + gaming)
- In-game advertising (IGA) – in which game is used as a medium of advertisement (similarly to traditional product placement).

Advergaming approach covers games created especially for advertising specific product or service. In commercial marketing it was applied, among others, by Burger King (Hyman, 2007) and Doritos (Denton, 2019). Such type of the game was also used by American army to encourage young people to join it (U.S. Army, 2017). Similar methods are also used for the purposes of social campaigns. This is beneficial because games give possibility to implement educational elements and good game scenario compensates for a low budget. An example of such game is *Food Force* (United Nations World Food Programme, 2006). Such games might be addressed also to children to develop specific behaviors. As an example, on the Nourish Interactive website, which promotes healthy diet, there is a *Kevin's Build-a-Meal Game* (Nourish Interactive, 2017). There are also games focused on the healthcare. One of such examples is *Veevia Cancer Game* (Wei and Wei, 2007).

However, creating a game from scratch for the purposes of campaign could be a time-consuming and complicated process. Much simpler approach is in-game advertising that uses the existing game, even not connected with the advertised

product or idea, only as a medium where advertisements are placed just like on TV. There are different ways of using the game as a means of advertising. The easiest way is to place advertising billboards. In 3D games, advertising billboards are placed according to the same rules as in the real world. An example is the 2008 advertising campaign of President Barack Obama, which used 18 games, including Need for Speed Carbon (Yenigun, 2012).

Nevertheless, especially in 3D games, billboards are quite problematic due to the low resolution of the screens. The inscriptions on advertisements are clearly visible only from a very close distance (Chang *et al.*, 2010; Yang *et al.*, 2006). This is a serious drawback for advertisements in the scope of social campaigns that promote positive ideas and behaviors and, to be effective, need to be understood accurately. We assume that a successful campaign does not always have to involve spectacular visuals – sometimes even a small element, if well prepared, can make a difference. Regardless of the scale of the actions taken, the overriding goal of each campaign is to change attitudes or behavior among its recipients. To achieve this goal, it is extremely important to prepare the visual identification of the campaign that will be clearly seen in the game. One of the important elements of such identification may be the campaign emblem – a simple image (sign or graphic), clearly linked to the promoted views or behaviors, which will be easy to remember.

Therefore, in the case of the in-game advertising method, it is necessary to place static ads appropriately and the player should reach such a level of commitment to the game that he plays it for as long as possible. Playing the game longer will give us a higher probability that social advertising will be noticed and thus remembered. The situation is similar in the case of TV commercials - once displayed, an advertisement will be remembered by a handful of people, but if it is repeated several dozen times, the number of recipients who will remember it will increase. What matters in the game is "its life expectancy". The number of views of the advertisement depends on the player's engagement, because the more the player gets involved, the longer he plays it, and consequently, the longer he plays it, the more often he watches the advertisement. The second aspect is the location of advertising. It should be placed in such a way that it is well visible and at the same time does not affect the game.

Therefore, the aim of the article is to present results of an experiment that intended to check how the location of advertising elements (campaign emblems) in the games and the engagement of the player during the gameplay influence the effectiveness of social campaign message.

2. Effectiveness of Advertising Placement in Games

Most effectiveness research has focused on the impact of in-game advertising on participants' cognitive response indicating their awareness. Such awareness is generally measured in terms of memory. The most common variables utilized in IGA effectiveness studies are measures such as brand recall and brand recognition

(Jeong and Biocca, 2012; Martí-Parreño *et al.*, 2017; Nelson, 2002; Nelson *et al.*, 2006), since they give an indication of people's intentional and conscious recollection of the advertisements. However, some researchers have also employed measures that determine memory effects that occur without intentional or conscious recollection (Yang *et al.*, 2006).

Effectiveness of in-game advertising, regardless of its measure, may depend on many different factors. The most important groups of these factors are following: characteristics of the advertisements, characteristics of the player and the characteristics of the game (Herrewijn Poels, 2014b). Details on factors belonging to these three categories and references to the research articles investigating their influence on advertising effectiveness are summarized in the table. Research in this field was conducted mostly for commercial marketing, but the most of results and conclusions can be also applied in social advertising context.

Table 1. *Factors influencing the effectiveness of in-game advertising.*

Group of factors	Factors in the group	References
Characteristics of the advertisements	Type of brand	(Mackay *et al.*, 2009; Martí-Parreño *et al.*, 2017; Mau *et al.*, 2008; Nelson, 2002; Nelson *et al.*, 2006)
	Type of ad	(Dardis *et al.*, 2012; Grigorovici and Constantin, 2004; Nelson, 2002)
	Prominence of the ad/brand in the game world (size, color, attractiveness and spatial position)	(Grigorovici and Constantin 2004; Schneider and Cornwell 2005; Acar 2007; Lee and Faber 2007; Jeong and Biocca 2012; Peters and Leshner 2013; Herrewijn and Poels 2014a; I. Chaney *et al.*, 2018; Nguyen *et al.*, 2020)
Characteristics of the player	Game experience/skills	(Chaney, Lin, and Chaney 2004; Schneider and Cornwell 2005; Lee and Faber 2007; Leng, Quah, and Zainuddin 2010; Kim and Leng 2017).
Characteristics of the game context	Physical and social setting in which the game is played (single, multi-player)	(Dardis *et al.*, 2012)
	Game difficulty	(Herrewijn and Poels, 2013; Hwang *et al.*, 2017)
	Game type	(Bracken and Skalski, 2009; Gangadharbatla, 2016; Jeong *et al.*, 2011; Lewis and Porter, 2010; Terlutter and Capella, 2013; Wu *et al.*, 2018; Yang *et al.*, 2006; Yoo and Peña, 2011)
	Congruity between the game and the ad	(Chang *et al.*, 2010; Lee and Faber, 2007; Lewis and Porter, 2010; Peters and Leshner, 2013; Williams *et al.*, 2011)
	Player's experience (arousal, immersion, engagement)	(Grigorovici and Constantin 2004; Lee and Faber 2007; Bardzell, Bardzell, and Pace 2008; Nicovich 2010; Jeong, Bohil, and Biocca 2011; Jeong and Biocca 2012; Yoon and Vargas 2013; Vermeir *et al.*, 2014)

Source: *Own study.*

Considering the aim of this article we have focused on research that studied the impact of prominence (spatial location) and player's experience (engagement) on the effectiveness of in-game advertising.

2.1 Prominence of the Advertising

Most of research on the prominence is focusing on the spatial position and size of advertisements in the game environment. The placement of the advertising is called as a prominent or focal when it is highly visible because of its size and/or position on the screen (Gupta and Lord, 1998). The opposite of this is a subtle placement in which advertising is peripherally placed on game screen or in the background or its size is very small (Gupta and Lord, 1998).

Previous research has already established that the recall rate of advertisements is influenced by the placement of the advertisement in the game. Generally, advertisements that appear in central locations are recalled at a higher rate than those that are peripheral to the game and results of most studies in this scope confirms that result (Chaney, Lin, and Chaney 2004; Schneider and Cornwell 2005; Acar 2007; Lee and Faber 2007; Leng, Quah, and Zainuddin 2010; Cauberghe and De Pelsmacker 2010; Vashisht and Sreejesh 2015).

Findings concerning the size of advertisements/brands are not that consistent. Research of Chaney *et al.* (2018) indicate that large size brands placed in a game are recalled and recognised significantly better than smaller size billboards. On the other hand, Nelson (2002) found there was no difference in brand recall between large and small product placements. Grigorovici and Constantin (2004) looked at the impact of advertising inside 3D virtual environments and found that ad size does indeed have an influence, although this effect varied according to the type of in-game ad that was used. Product placements, for example, had a greater impact when big, visible objects were integrated in the virtual environment, whereas billboards benefitted most from the integration of smaller size object.

2.2 Player's Experience

It has been shown that computer games are able to evoke a wide variety of psychophysiological responses or player experiences. The influence of these player experiences has been studied in a few IGA effectiveness investigations before. They have mostly focused on the impact of the intensity of arousal, involvement and immersion on brand or advertising awareness.

The aspect of player's experience is very important from the point of view of IGA effectiveness because of the assumptions of the limited capacity model of attention. According to his model, an individual's total attentional capacity at any specific point in time is limited and divided between the primary task and the secondary task (Kahneman, 1973). The more an individual allocates his or her cognitive capacity to

processing the primary task, the less he or she has capacity to process the secondary task. As a consequence, by devoting attention to playing a game, the player will have less available attention capacity to process the additional stimuli of advertisements in a game. This dependence was already confirmed by several different studies (Schneider and Cornwell, 2005; Yang *et al.*, 2006).

There is also research that have also suggested that the relationship between the level of engagement in games and recall rate of advertisement is not a simple one. When gamers are uninterested in the gameplay, they are more likely to be distracted by stimuli external to the game. Consequently, they do not pay much attention to the advertisements in the game and the recall rate of advertisement is lower. When the game is perceived to be more exciting or faster in pace, gamers are more involved in the game and may notice more of the advertisements in the game (Leng *et al.*, 2010).

However, at higher levels of involvement, the gamer may focus so much of his attention on the primary task of playing the game that there is no additional attention capacity to notice advertisements in the game (Lee and Faber 2007). Therefore, the relationship between the recall rate of advertisements and the level of engagement of the gamer had been suggested to follow an inverted U-shaped curve.

Another findings link the player's experience with spatial location of the ad. Chaney, Lin, and Chaney (2004) proved that when advertisements appear in a spot where the gamer is likely to be very focused on the game, then the gamer is unlikely to notice the advertisement. In such case the ad is ineffective. Our research aims to follow and check these findings in the context of simple platform game and social advertising elements.

2.3 Measuring Engagement

Player engagement is one of the dimensions of gaming experience and can be associated with many concepts such as (Filsecker and Kerres, 2014; Schoenau-Fog, 2011), flow (Chen, 2007; Csikszentmihalyi, 1991), gameflow (Sweetser and Wyeth, 2005), presence (Lombard and Ditton, 2006; Tamborini and Skalski, 2006), immersion (Brown and Cairns, 2004; Jennett *et al.*, 2008; Mcmahan, 2003), pleasure (Costello and Edmonds, 2009), motivation (Iacovides *et al.*, 2011; Przybylski *et al.*, 2010; Yee, 2006), enjoyment (Ijsselsteijn *et al.*, 2008), arousal (Ravaja *et al.*, 2006) and fun (Koster and Wright, 2004). Therefore, for the recipient to feel as many positive emotions as possible, it is necessary to maintain the player's commitment and concentration at a certain level, e.g., by introducing unexpected action phrases that will encourage him to continue exploring further areas of the game. First, to assess whether the game does not discourage the participant, it is necessary to conduct research on the participant's engagement in the game. Also, the growing community of video players creates demand among game developers or researchers for examining player engagement.

The most common methods used to test a player's engagement in digital games are the following (Martey *et al.*, 2014):

- Questionnaire (Lombard and Ditton, 1997) – researched person determines the level of engagement in particular elements of the game;
- Engagement based on attention using eye tracking (ABE) (Ismail *et al.*, 2012; O'Brien and Toms, 2008; Read *et al.*, 2009; Renshaw *et al.*, 2009; Texeira *et al.*, 2012) – measure based on time during which the respondent looked at the monitor. Referring to the time when the person was not looking at the monitor, one can deduce how much attention the tested person was focused on the game;
- Electrodermal activity (EDA), also known as galvanic skin reaction (GSR) – allows to determine the emotions of the tested person based on measurement of skin conductivity *(Lim and Reeves, 2010; Mandryk and Inkpen, 2004; Ravaja et al.*, 2006);
- Mouse clicks and mouse movement (Dale *et al.*, 2007) – measurements of the number and location of clicks and mouse movement allow you to determine the level of player activity during the game;
- Engagement indexes measured by EEG (Pope, Bogart, and Bartolome 1995; Freeman *et al.*, 1999; Berka *et al.*, 2007; Smith and Gevins 2005; Yamada 1998; Kamzanova *et al.*, 2011; McMahan, Parberry, and Parsons 2015).

The above-mentioned methods are limited. In the self-reported survey, the researcher relies on the observations of the respondent. The test person may have difficulty in remembering his or her feelings during the whole game. It is difficult to determine the exact timeframe within which the growth of interest in the game begins and ends based on this study.

Attention-Based Engagement (ABE) depends not only on the player's engagement but also on the type of game and the situation in the game. During the fight, the player's focus on the game will be remarkably high, because he/she has to react quickly to the opponent's actions, while the wandering around the city can be smaller.

Galvanic skin response (GSR) allows you to define emotions in the first place. However, not always a player's engagement can be emotional. Certain elements of the game may not generate emotions until some success or failure is achieved.

Mouse clicks and mouse movements are strongly dependent on the scenario of the game itself. They can be useful if you are able to refer to other players. You can tell from them which player is more and which one is less involved. For example, during a fight, the mouse movements will depend on the weapon chosen by the player and the way the opponent fights. They may, therefore, be incomparable between opponents.

It is necessary to look for such methods of engagement research that will allow determining the level of engagement at any time in the game, while not being dependent on other factors. This would be possible with the use of cognitive neuroscience techniques. They are becoming more and more useful because they allow us to get to know the current state of the brain. This task is facilitated by the indexes calculated based on the recorded signals. In the literature on the subject, numerous indices of engagement can be found, which will be presented later in this chapter. They allow us to know the level of human engagement in each activity in a given moment.

New developments of wireless electroencephalographic systems (EEG) provide recording and access to neuronal activity, enabling the computer to retrieve and analyze information from brain waves. Using the EEG, along with an eye tracker device, we can determine the preferences of the player, as well as the moment of the game which is not interesting, and we can improve it to make the player fully active in the game.

Using the EEG to measure the involvement in performing different tasks is not a new concept. Pope *et al.* (1995) built a system to control the level of automation of tasks based on whether the operator had increased or decreased his engagement. Freeman *et al.* (1999) extended this system by evaluating the performance of each task with the use of absolute values of commitment. Berka *et al.* (2007) has invented a more accurate and effective method for people to interact with technology, with the ability to develop more productive work environments that increase motivation and productivity. The results suggest that the commitment measured using the EEG reflects information gathering, visual processing, and attention allocation. Smith and Gevins (2005) used a flight simulator to study the reactions of the human brain to low, medium, and high difficulty exercises. Studies have shown increased activity of the frontal lobe waves together with decreased activity of parietal lobe alpha waves during demanding tasks.

In turn, Yamada (1998) measured the activity of theta waves along with blinking of the eye and discovered that children playing video games had higher activity of theta waves during more frequent blinking. These results suggest that interesting tasks cause higher activity of theta waves, while the task inhibits the activity of blinking eyes. Kamzanova *et al.* (2011) compared the sensitivity of a series of EEG engagement indices by examining time pressure individuals performing tasks of varying degrees of stress to determine which one was most effective. McMahan *et al.* (2015) investigated in Super Meat Boy game whether there is a connection between engagement and arousal in events of death and general entertainment. The results of their research suggest that by combining engagement data with arousal data, we can establish thresholds indicating when a player has left the flow state.

On the other hand, Ewing *et al.* (2016) investigated the sensitivity of EEG power in the (front) theta and (parietal) alpha bands to changing levels of demand for play.

Besides, he also conducted a study that assessed the adaptive performance of Tetris in terms of system behavior and user experience. Vourvopoulos's (2017) research focuses on the impact of how gaming experience has on modulating brain activity, as an attempt to systematically identify elements that contribute to high BCI control and that can be used in the design of a neurogame.

For our purposes we will use EEG with an eye-tracker to measure the engagement of experiment's participants in the game and visibility of social advertising elements. Along with the questionnaire data, it will allow us to study the effectiveness if IGA in simple 2D platform game depending on the ad spatial location and player's engagement.

3. Materials and Methods

The experiment was attended by 32 people, but only 28 people joined the main survey. Four people were not taken into account because the specified target group had to be mainly occasional players and those who liked 2D platform games. The results of survey are presented in Table 2. In addition, respondents had to list three things that they like in playing games (story – about 70%, collecting items - about 40%), and whether they like 2D platform games - everyone answered positively.

Table 2. *Results of the survey.*

Question	Answers	Number of people
How often do you play computer games?	Every weekend	8
	Occasionally	7
	Rarely	13
What player would you describe yourself?	Commonly known gamer	3
	Reactional player	25
What is your preference for the way you play?	Single Player	21
	Multiplayer	7

Source: *Own study.*

3.1 Description of Game

The game was downloaded from the Unity Asset Store (*2D Platformer - Asset Store*, n.d.) and adapted for testing in the Unity engine. Before the start of the game, participants got instructions on how to move and on the goal that need to be achieved to win the game. In order to succeed each player had to collect three keys, which guaranteed the entrance to the room where the last opponent (so-called Boss) was located (
Figure ***1***).

In addition, the game also featured emblems connected with social advertising and social campaigns messages promoting various health issues (Table 3). The emblems were in the background, so the player did not have to avoid them.

Figure 1. *A screenshot of the game showing the fight with the Boss*

Source: *Authors' elaboration.*

Table 3. *Description of signs*

Level in the game	Name of sign	Emblem	Description
I	Pregnant woman		Prohibition of drinking alcohol during pregnancy
II	Key		Prohibition of driving on alcohol
	Alcohol		Prohibition of drinking alcohol
III	Stop		Prohibition of driving under the influence of alcohol

Level in the game	Name of sign	Emblem	Description
IV	Bottle		Prohibition of drinking alcohol
	Tap		Prohibition of drinking tap water
	Drug		Prohibition of using drugs
V	Key2		Prohibition of driving on alcohol

Source: *Authors' elaboration.*

3.2 Procedure of the Experiment

EEG data were collected from 28 healthy people (4=female, 24=male), the average age was 23 years. The persons were informed about the course of the examination. They then signed their consent to participate in the study and were seated in a comfortable chair with access to the keyboard and mouse. The next step was to put on the cap (Nautilus Research Wearable EEG Headset with 24 electrodes) and connect the electrodes to the participant's scalp and connect them to the data recorder of the participant's brain. The channels have been distributed according to the 10-10 system, the international EEG electrode distribution system (Jurcak *et al.*, 2007). In addition to the EEG, the study used the Eye Tracker (EyeTribe device with a frequency of 30 points per second) to track image elements that were particularly important to the respondent.

Before the gameplay, there was information shown what the game will be about, its goal, and instructions how to move around. Then, after clicking the "Play" button, a black screen appeared, lasting 60 seconds, during which the participant silenced himself. The recorded signals during the play were used to calculate the EEG indicators. On the basis of the respondent's engagement, concentration, and responses (in relation to the game and the recalled ads), a comparison of responses and indicators was made. It enabled to investigate which social advertisements have been remembered and whether this is related to player's engagement.

3.3 Game Survey

After the game was finished, an interview was conducted about the general impressions of playing the game There were also questions which stage in the game was the hardest, which game elements should be improved, and what was the declared engagement during the levels and the fight. The last questions focused on free recall of the social advertisements' emblems.

3.2 Measures

Measuring the level of engagement and memory of a player is one of the elements determining their experience while playing a computer game. In particular, it can be used to determine player preferences. For this purpose, the relevant indicators of engagement have been calculated, as indicated in Table 4. These indices were selected for the study because they were used by their developers to study player engagement in computer games or simulations.

Table 4. *Description of the indices used in the study*

Index	Formula	Counting method
Index 1 (McMahan *et al.*, 2015)	$\frac{beta3}{alpha2 + theta}$	Average registration value of all electrodes on the head
Index 2 (McMahan *et al.*, 2015)	$\frac{theta}{alpha2}$	Average registration value from electrodes placed on the frontal lobe (theta band) and parietal lobe (alpha band)
Index 3 (McMahan *et al.*, 2015)	$theta$	The average value of registration from electrodes placed on the frontal lobe (theta band)
Index 4 (Kamzanova *et al.*, 2011)	$\frac{beta4}{alpha3 + theta}$	Average registration value from electrodes: F3, F4, F7, F8, Cz, P3, Pz, P4
Index 5 (Kamzanova *et al.*, 2011)	$\frac{beta5}{alpha4 + theta}$	Average registration value from electrodes: F3, F4, F7, F8, Cz, P3, Pz, P4
Index 6 (Chaouachi and Frasson, 2012)	$\frac{beta6}{alpha5 + theta}$	Average registration value from electrodes: P3, C3, Pz, Fz, Cz, FPz

Source: *Authors' elaboration.*

Memorization of social advertising emblems was measured during the post-game survey. Participants of the experiment were asked to recall freely the signs that they remember. The recall was not aided by the experimenter.

4. Results

Based on the questionnaire, the memorization rate of each emblem was calculated by dividing the number of people who saw the mark by the total number of participants in the study (Table 5). Calculations were made based on formula:

$$\text{Memorization rate} = \frac{\text{Number of people seen the sign on the basis of the survey}}{\text{Number of people who took part in the experiment}}. \quad (1)$$

Table 5. *Emblem memorization rate expressed as a percentage.*

Name of the advertisement	No. of people declaring to see the emblem	Memorization rate
Pregnant woman	25	0.89
Key	14	0.5
Alcohol	10	0.36
Stop	12	0.43
Bottle	17	0.61
Tap	20	0.71
Drag	11	0.39
Key2	13	0.46

Source: *Authors' elaboration.*

Most of the participants of the experiment have remembered the emblem showing pregnant woman on the first level. The least remembered was alcohol bottle placed next to the doorway to the last level.

Engagement indices were calculated based on registered EEG signals for all participants in the experiments. Results, presented in Table 6, show the values if each index during the presentation of every emblem used in the game. These are also associated with game elements that accompanied each social advertising element. The context of showing the signs during the game could be either static or dynamic. Static (S) means that the player does not need to perform any task, dynamic (D) that the game requires specific actions (fight, jump, etc.).

Table 6. *Player's engagement during the presence of social advertising emblems on the screen*

Emblem	Game element	Static/ dynamic	Index1	Index2	Index3	Index4	Index5	Index6
	Moving to the next level	S	-0.07	-0.02	-0.14	0.016	0.30	0.30
	Doorway to the last level (Boss)	S	-0.14	-0.04	-0.13	-0.01	0.20	0.24
								

Emblem	Game element	Static/ dynamic	Index1	Index2	Index3	Index4	Index5	Index6
	Water	S	-0.24	-0.12	-0.19	-0.04	0.21	0.26
	Column destruction	D	-0.01	0.12	0.08	0.02	0.12	0.11
	Spikes	D	-0.13	-0.05	-0.21	-0.06	0.31	0.39
	Fighting the monster	D	-0.31	0.09	-0.27	-0.09	0.34	0.40
	Entering the last level	S	0.25	0.26	0.14	0.11	0.34	0.27
Pearson correlation coefficient between engagement and memorization rate			-0.08	-0,06	-0,31	-0,11	0,55	0,59

Source: *Authors' elaboration.*

In addition, it was examined whether there was a correlation between engagement indices and memorization rates. It was obtained that for Index1, Index2, Index4 the correlation is weak, for Index3 moderate, while for Index5 and Index6 strong. For the indexes with negative sign (Index1, Index2, Index3, Index4), when the engagement increases then the recall rate decreases. On the other hand, for indexes with a positive sign (Index5 and Index6), when the engagement increases, the recall rate also increases. Emblems were then categorized into two groups – static and dynamic. For each group mean engagement for every index was calculated. Results are presented in Table 7.

Table 7. *Mean engagement for emblems displayed in static and dynamic context*

	Mean engagement	
	Static	**Dynamic**
Index1	0.016921624	-0.12161558
Index2	0.064900464	-0.010125664
Index3	-0.043580329	-0.118171126
Index4	0.039598555	-0.025397674
Index5	0.281519771	0.19859807
Index6	0.271325911	0.240871541

Source: *Authors' elaboration.*

Using the Student's t statistic test, it was examined whether there was a difference in means between static and dynamic sign display. It was obtained that $p = 0{,}382125$ with $\alpha = 0{,}05$ and $df = 10$. Therefore, there is no basis for rejecting the hypothesis that the average commitment for both groups is the same.

Data recorded with eye-tracker were used to examine the visibility of the social campaign's emblems placed in the game. For this purpose, the number of times an average person looked at a sign was calculated (Table). The result shows that most people noticed the emblem representing a pregnant woman - 25 people and the average time of looking at the sign was 2 seconds.

Table 8. *Average time and number of glances at each sign*

Emblem	Average number of glances	Average time of glances	No. of people declaring to see the emblem	Level	No. of people that reached the level
Pregnant woman	72	2,311378	25	I	28
Key	27	0,879667	14	II	28
Alcohol	13,73077	0,44902	10		
Stop	17,23077	0,565488	12	III	28
Bottle	16,80769	0,527995	17		
Tap	47,26923	1,539069	20	IV	22
Drag	9,692308	0,323447	11		
Key2	5,153846	0,173572	13	V	9

Source: *Authors' elaboration.*

The average time of glances was then calculated for emblems in static and dynamic groups. Mean values were M_S= 0.953409 and M_D = 0.739 respectively. Using Student's t-statistic test, we obtained $p = 0{,}708965$ with $\alpha = 0{,}05$ and $df = 6$, which leads us to conclude that there is no reason to reject the hypothesis that the average gaze time for the static and dynamic group is the same.

We have also checked whether there is a correlation between engagement (index values) and the time of looking at a given sign. The analysis was conducted with the use of Pearson coefficient. The general case results present average engagement for each level compared with time of looking at signs on this specific level. The results show that correlation is very strong and negative (Table 9). Therefore, as the player's engagement increases the time spent looking at the characters decreases. In case of individual emblems the correlation is moderate or strong. Depending on the engagement index it is also negative or positive (Table 10). In the negative case, the situation is analogous to the previous one. On the other hand, in the positive case, i.e., for Index5 and Index6, when the engagement increases the time of looking at the signs also increases.

Table 9. *Pearson correlation coefficient (general case).*

	Index1	Index2	Index3	Index4	Index5	Index6
Pearson correlation coefficient for the time of looking at a given sign	-0.815	-0.829	-0.908	-0.871	-0.776	-0.815

Source: *Authors' elaboration.*

Table 10. *Pearson correlation coefficient (detailed case).*

Emblem	Index1	Index2	Index3	Index4	Index5	Index6
Pregnant woman	-0.06839	-0.01915	-0.1428	0.015581	0.30343	0.296364
Key and Alcohol	-0.13569	-0.0426	-0.12555	-0.00649	0.200065	0.244007
Stop	-0.23779	-0.12311	-0.19062	-0.03765	0.211297	0.258965
Bottle	-0.03359	0.037904	-0.06047	0.024677	0.188833	0.229048
Tap	-0.15303	0.026838	-0.16787	-0.0715	0.325848	0.39592
Drug	-0.06206	0.017864	-0.05372	-0.01712	0.068414	0.079553
Key2	0.254844	0.25645	0.137601	0.109701	0.341064	0.273607
Pearson correlation coefficient for the time of looking at a given sign	-0.35395	-0.34965	-0.5591	-0.32243	0.434363	0.55592

Source: *Authors' elaboration.*

5. Discussion

The aim of the article was to present results of an experiment that intended to check how the location of advertising elements (campaign emblems) in the games and the engagement of the player during the gameplay influence the effectiveness of social campaign message. We wanted to check, if the placement of social advertising elements and the engagement of players can significantly influence the effectiveness of ads in terms of their recall.

Referring to the results of social advertising memorization, it was found that most people (almost 90% of the respondents) remembered the sign on which the pregnant woman was placed. The reason for this is to place the sign when jumping from platform to platform when, as confirmed by the survey, the player's engagement was high. In addition, from the platform where the sign was located, the next level was moved to the next level, which could also affect the memory. Moreover, the average time of looking at the sign was 2 seconds, which could also be relevant. In addition, the majority of respondents, i.e., 70% remembered the sign showing the ban on using drinking tap water, which was in the place where players jumped on the platform to avoid spikes. It can be assumed that the combination of medium

engagement in the case of a spike element in the game and high for a moving platform helps to remember social advertising.

On the other hand, the signs located on the Level II, which was a transition level, were remembered by 43% of people on average. It would seem that there will be many more because each time the key is lifted, there is a close-up on the door and the graphic emblems next to it. This fact may also be influenced by the short time of looking at the advertisements, but also by the lack of action at this level. On Level V 13 people indicated an advertisement with a ban on driving under the influence of alcohol, which may be due to the fact that a fairly similar sign was placed at the door, but on Level II. Low memorization is also for a sign representing drugs at Level IV. Probably because the monsters absorbed more attention than the sign in the background that did not stand out.

The results obtained for the memorization may indicate that message order (first or last) in a sequence of advertisements has major bearing on attention and recall. Although some evidence supports a recency effect (the last presented information such as advertisement or placement is remembered better), majority literature supports the primacy effect (Gupta and Gould 2007). Drawing on primacy theory, it is suggested that the first advertisement in a computer game is likely to be recalled more than subsequent ones. This effect can be also observed in our findings, since the pregnant woman emblem, which was presented as first, was memorized best.

The computed outcomes of engagement indices show that, depending on the method of calculation, obtained results can differ. Pearson correlation coefficient values show that, based on four indexes (Index1 to Index4), higher engagement decreases the recall rate. However, this correlation is weak or moderate. On the other hand, results obtained for Index5 and 6 indicate strong positive correlation between engagement and memorization rates for the presented emblems. The discrepancy in results would need further research concerning the detailed comparison of engagement indexes.

Categorization of social advertising emblems into two categories – static and dynamic (in terms of player's activity and tasks during the presentation of each sign) allowed to compare whether there is a difference between average engagement and memorization rates calculated for each group. Although some differences can be observed (in favor of static group), the tests do not show that they are statistically significant.

Data gathered with eye-tracker allowed to calculate the average number of glances and average time of looking at each sign. These results confirmed the memorization rate calculated based on questionnaires – the more glances (longer time of looking), the better was the recall of the emblem. This allows us to state, that research with the use of eye-tracking devices can allow for accurate predictions of advertising effectiveness, at least in terms of recall.

On the other hand, the analyses show that the greater engagement of the player causes the reduction of number of glances at the social advertising emblems. This result confirms previous findings by Chaney *et al.* (2004). Therefore, it would be recommended to place social advertisements in such spots where the player has less to do and is not distracted by any tasks required to achieve progress in the game. The outcomes that we have obtained should be strengthened by conducting a study with larger number of participants.

Moreover, the use of various indexes of engagement can be ambiguous. Further research is needed to determine, which index would be the best in the context of our research. It would be also advised to focus on more factors that can influence the effectiveness of social advertising placement in games. The dependencies between these factors can be complex and discovering the relationships between them can substantially contribute to the advertising effectiveness research.

References:

2D Platformer - Asset Store, n.d. Retrieved from: https://assetstore.unity.com/packages/essentials/tutorial-projects/2d-platformer-11228.

Acar, A. 2007. Testing the Effects of Incidental Advertising Exposure in Online Gaming Environment. Journal of Interactive Advertising, 8(1), 45-56. https://doi.org/10.1080/15252019.2007.10722136.

Bardzell, J., Bardzell, S., Pace, T. 2008. Player Engagement and In-Game Advertising. OTO Insights.

Berka, C., Levendowski, D.J., Lumicao, M.N., Yau, A., Davis, G., Zivkovic, V.T., Olmstead, R.E., Tremoulet, P.D., Craven, P.L. 2007. EEG correlates of task engagement and mental workload in vigilance, learning, and memory tasks. Aviation, Space, and Environmental Medicine, 78(5 Suppl), B231-244.

Bracken, C.C., Skalski, P. 2009. Telepresence and video games: The impact of image quality. PsychNology Journal, 7(1), 101-112.

Brown, E., Cairns, P. 2004. A grounded investigation of game immersion. Extended Abstracts of the 2004 Conference on Human Factors and Computing Systems - CHI '04, 1297. https://doi.org/10.1145/985921.986048.

Cauberghe, V., De Pelsmacker, P. 2010. Advergames: the impact of brand prominence and game repetition on brand responses. Journal of Advertising, 39(1), 5-18. https://doi.org/10.2753/JOA0091-3367390101.

Chaney, I., Hosany, S., Wu, M.S.S., Chen, C.H.S., Nguyen, B. 2018. Size does matter: Effects of in-game advertising stimuli on brand recall and brand recognition. Computers in Human Behavior, 86, 311-318. https://doi.org/10.1016/j.chb.2018.05.007.

Chaney, I.M., Lin, K.H., Chaney, J. 2004. The Effect of Billboards within the Gaming Environment. Journal of Interactive Advertising, 5(1), 37-45. https://doi.org/10.1080/15252019.2004.10722092.

Chang, Y., Yan, J., Zhang, J., Luo, J. 2010. Online In-Game Advertising Effect: Examining the Influence of a Match Between Games and Advertising. Journal of Interactive Advertising, 11(1), 63-73. https://doi.org/10.1080/15252019.2010.10722178.

Chaouachi, M., Frasson, C. 2012. Mental Workload, Engagement and Emotions: An Exploratory Study for Intelligent Tutoring Systems. Springer Vol. 7315. https://doi.org/10.1007/978-3-642-30950-2_9.

Chen, J. 2007. Flow in games (and everything else), Communications of the ACM, 50(4), 31-34. https://doi.org/10.1145/1232743.1232769.

Clement, J. 2021. Revenue of the video gaming advertising market worldwide from 2015 to 2024 (in billion U.S. dollars), Statista. URL https://www.statista.com/statistics/558502/value-video-games-advertising-market-global/.

Costello, B., Edmonds, E. 2009. A Tool for Characterizing the Experience of Play. Proceedings of the Sixth Australasian Conference on Interactive Entertainment, 2:1-2:10. https://doi.org/10.1145/1746050.1746052.

Csikszentmihalyi, M. 1991. Flow: the psychology of optimal experience. Harper Perennial.

Dale, R., Kehoe, C., Spivey, M.J. 2007. Graded motor responses in the time course of categorizing atypical exemplars, Memory & Cognition, 35(1), 15-28. https://doi.org/10.3758/BF03195938.

Dardis, F.E., Schmierbach, M., Limperos, A.M. 2012. The Impact of Game Customization and Control Mechanisms on Recall of Integral and Peripheral Brand Placements in Videogames. Journal of Interactive Advertising, 12(2), 1-12. https://doi.org/10.1080/15252019.2012.10722192.

Denton, M. 2019. Advergaming: How Video Game Advertising Helps with Consumer Engagement. Gamify. URL https://www.gamify.com/gamification-blog/how-game-advertising-is-built-for-consumer-engagement.

Ewing, K.C., Fairclough, S.H., Gilleade, K. 2016. Evaluation of an Adaptive Game that Uses EEG Measures Validated during the Design Process as Inputs to a Biocybernetic Loop. Frontiers in Human Neuroscience, 10, 223-223, PubMed. https://doi.org/10.3389/fnhum.2016.00223.

Filsecker, M., Kerres, M. 2014. Engagement as a Volitional Construct: A Framework for Evidence-Based Research on Educational Games, Simulation & Gaming, 45(4-5), 450-470. https://doi.org/10.1177/1046878114553569.

Freeman, F.G., Mikulka, P.J., Prinzel, L.J., Scerbo, M.W. 1999. Evaluation of an adaptive automation system using three EEG indices with a visual tracking task. Biological Psychology, 50(1), 61-76.

Gangadharbatla, H. 2016. A Comparison of In-Game Brand Placement for Active Versus Passive Players. Journal of Interactive Advertising, 16(2), 117-132. https://doi.org/10.1080/15252019.2016.1208124.

Gee, J.P., Hayes, E.R. 2010. Women and gaming the Sims and 21st century learning. Palgrave Macmillan.

Grigorovici, D.M., Constantin, C.D. 2004. Experiencing Interactive Advertising beyond Rich Media: Impacts of Ad Type and Presence on Brand Effectiveness in 3D Gaming Immersive Virtual Environments. Journal of Interactive Advertising, 5(1), 22-36. https://doi.org/10.1080/15252019.2004.10722091.

Gupta, P.B., Lord, K.R. 1998. Product Placement in Movies: The Effect of Prominence and Mode on Audience Recall. Journal of Current Issues & Research in Advertising, 20(1), 47-59. https://doi.org/10.1080/10641734.1998.10505076.

Herrewijn, L., Poels, K. 2013. Putting brands into play: How game difficulty and player experiences influence the effectiveness of in-game advertising. International Journal of Advertising, 32(1), 17-44. https://doi.org/10.2501/IJA-32-1-017-044.

Herrewijn, L., Poels, K. 2014a. Recall and recognition of in-game advertising: the role of game control. Frontiers in Psychology, 4. https://doi.org/10.3389/fpsyg.2013.01023.

Herrewijn, L., Poels, K. 2014b. Rated A for Advertising: A Critical Reflection on In-Game Advertising, In M.C. Angelides, H. Agius (Eds.), Handbook of Digital Games, 305-335. John Wiley & Sons, Inc.). https://doi.org/10.1002/9781118796443.ch11.

Hwang, Y., Ballouli, K., So, K., Heere, B. 2017. Effects of Brand Congruity and Game Difficulty on Gamers' Response to Advertising in Sport Video Games. Journal of Sport Management, 31(5), 480-496. https://doi.org/10.1123/jsm.2017-0022.

Hyman, P. 2007. Burger King has it their way with advergame sales. The Hollywood Reporter. https://www.hollywoodreporter.com/news/burger-king-has-way-advergame-129675.

Iacovides, I., Aczel, J., Scanlon, E., Taylor, J., Woods, W. 2011. Motivation, Engagement and Learning through Digital Games. IJVPLE, 2, 1-16. https://doi.org/10.4018/jvple.2011040101.

Ijsselsteijn, W., van den Hoogen, W., Klimmt, C., De Kort, Y., Lindley, C., Mathiak, K., Poels, K., Ravaja, N., Turpeinen, M., Vorderer, P. 2008. Measuring the experience of digital game enjoyment. Proceedings of Measuring Behavior.

Ismail, S.N. Sidek, M.R. Khan, N.A. Jalaludin, J. 2012. Analysis of engagement factor in trajectory tracking-based experiment. 2012 International Conference on Computer and Communication Engineering (ICCCE), 787-791. https://doi.org/10.1109/ICCCE.2012.6271325.

Jennett, C., Cox, A.L., Cairns, P., Dhoparee, S., Epps, A., Tijs, T., Walton, A. 2008. Measuring and defining the experience of immersion in games. International Journal of Human-Computer Studies, 66(9), 641-661. https://doi.org/10.1016/j.ijhcs.2008.04.004.

Jeong, E.J., Biocca, F.A. 2012. Are there optimal levels of arousal to memory? Effects of arousal, centrality, and familiarity on brand memory in video games. Computers in Human Behavior, 28(2), 285-291. https://doi.org/10.1016/j.chb.2011.09.011.

Jeong, E.J., Bohil, C.J., Biocca, F.A. 2011. Brand Logo Placements in Violent Games. Journal of Advertising, 40(3), 59-72. https://doi.org/10.2753/JOA0091-3367400305.

Jurcak, V., Tsuzuki, D., Dan, I. 2007. 10/20, 10/10, and 10/5 systems revisited: their validity as relative head-surface-based positioning systems. NeuroImage, 34(4), 1600-1611. https://doi.org/10.1016/j.neuroimage.2006.09.024.

Kahneman, D. 1973. Attention and effort. Prentice Hall.

Kamzanova, A.T., Matthews, G., Kustubayeva, A.M., Jakupov, S.M. 2011. EEG indices to time-on-task effects and to a workload manipulation (Cueing). World Academy of Science, Engineering and Technology, 80, 19-22.

Kim, Y., Leng, H.K. 2017. Effectiveness of In-game Advertisement: An Examination of Repetition Effect, Brand Familiarity and the Relationship Between Gaming Skills and Advertising Execution. Journal of Global Sport Management, 2(1), 42-64. https://doi.org/10.1080/24704067.2017.1281714.

Koster, R., Wright, W. 2004. A Theory of Fun for Game Design. Paraglyph Press.

Lee, M., Faber, R.J. 2007. Effects of Product Placement in On-Line Games on Brand Memory: A Perspective of the Limited-Capacity Model of Attention. Journal of Advertising, 36(4), 75-90. https://doi.org/10.2753/JOA0091-3367360406.

Leng, H.K., Quah, S.L., Zainuddin, F. 2010. The Obama Effect: An Exploratory Study on Factors Affecting Brand Recall in Online Games. International Journal of Trade, Economics and Finance, 1(1), 1-5. https://doi.org/10.7763/IJTEF.2010.V1.1.

Lewis, B., Porter, L. 2010. In-Game Advertising Effects: Examining Player Perceptions of Advertising Schema Congruity in a Massively Multiplayer Online Role-Playing Game. Journal of Interactive Advertising, 10(2), 46-60. https://doi.org/10.1080/15252019.2010.10722169.

Lim, S., Reeves, B. 2010. Computer agents versus avatars: Responses to interactive game characters controlled by a computer or other player. International Journal of Human-Computer Studies, 68(1), 57-68. https://doi.org/10.1016/j.ijhcs.2009.09.008.

Lombard, M., Ditton, T. 1997. At the heart of it all: The concept of presence. Journal of Computer-Mediated Communication, 3(2), No Pagination Specified.

Lombard, M., Ditton, T. 2006. At the Heart of It All: The Concept of Presence. Journal of Computer-Mediated Communication, 3(2). https://doi.org/10.1111/j.1083-6101.1997.tb00072.x.

Mackay, T., Ewing, M., Newton, F., Windisch, L. 2009. The effect of product placement in computer games on brand attitude and recall. International Journal of Advertising, 28(3), 423-438. https://doi.org/10.2501/S0265048709200680.

Mandryk, R., Inkpen, K. 2004. Physiological indicators for the evaluation of co-located collaborative play. https://doi.org/10.1145/1031607.1031625.

Martey, R.M., Kenski, K., Folkestad, J., Feldman, L., Gordis, E., Shaw, A., Stromer-Galley, J., Clegg, B., Zhang, H., Kaufman, N., Rabkin, A.N., Shaikh, S., Strzalkowski, T. 2014. Measuring Game Engagement: Multiple Methods and Construct Complexity, Simulation & Gaming, 45(4-5), 528-547. https://doi.org/10.1177/1046878114553575.

Martí-Parreño, J., Bermejo-Berros, J., Aldás-Manzano, J. 2017. Product Placement in Video Games: The Effect of Brand Familiarity and Repetition on Consumers' Memory. Journal of Interactive Marketing, 38, 55-63. https://doi.org/10.1016/j.intmar.2016.12.001.

Mau, G., Silberer, G., Constien, C. 2008. Communicating brands playfully: Effects of in-game advertising for familiar and unfamiliar brands. International Journal of Advertising, 27(5), 827-851. https://doi.org/10.2501/S0265048708080293.

Mcmahan, A. 2003. Immersion, engagement, and presence: A method for analyzing 3-D video games. In The Video Game Theory Reader, 67-86.

McMahan, T., Parberry, I., Parsons, T.D. 2015. Evaluating Player Task Engagement and Arousal Using Electroencephalography. Procedia Manufacturing, 3, 2303-2310. https://doi.org/10.1016/j.promfg.2015.07.376.

Nelson, M.R. 2002. Recall of Brand Placements in Computer/Video Games. Journal of Advertising Research, 42(2), 80-92. https://doi.org/10.2501/JAR-42-2-80-92.

Nelson, M.R., Yaros, R.A., Keum, H. 2006. Examining the Influence of Telepresence on Spectator and Player Processing of Real and Fictitious Brands in a Computer Game. Journal of Advertising, 35(4), 87-99. https://doi.org/10.2753/JOA0091-3367350406.

Newzoo. 2020. Global Games Market Report, Newzoo. https://resources.newzoo.com/hubfs/Reports/2020_Free_Global_Games_Market_Report.pdf.

Nguyen, N.T., Zuniga, A., Lee, H., Hui, P., Flores, H., Nurmi, P. 2020. (M)ad to See Me?: Intelligent Advertisement Placement: Balancing User Annoyance and Advertising Effectiveness. Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies, 4(2), 1-26. https://doi.org/10.1145/3397324.

Nicovich, S.G. 2010. The effect of involvement on ad judgement in a computer mediated environment: The mediating role of presence. International Journal of Advertising, 29(4), 597-620. https://doi.org/10.2501/S0265048710201361.

Nourish Interactive. 2017. Kevin's Build-a-Meal Game. http://www.nourishinteractive.com/kids/healthy-games/6-kevins-build-a-meal-game-balanced-meals.

O'Brien, H., Toms, E. 2008. What is User Engagement? A Conceptual Framework for Defining User Engagement with Technology. JASIST, 59, 938-955. https://doi.org/10.1002/asi.20801.

Peters, S., Leshner, G. 2013. Get in the Game: The Effects of Game-Product Congruity and Product Placement Proximity on Game Players' Processing of Brands Embedded in Advergames. Journal of Advertising, 42(2-3), 113-130. https://doi.org/10.1080/00913367.2013.774584.

Pope, A.T., Bogart, E.H., Bartolome, D.S. 1995. Biocybernetic system evaluates indices of operator engagement in automated task. Biological Psychology, 40(1-2), 187-195. https://doi.org/10.1016/0301-0511(95)05116-3.

Przybylski, A., Scott Rigby, C., Ryan, R. 2010. A Motivational Model of Video Game Engagement. Review of General Psychology, 14, 154-166. https://doi.org/10.1037/a0019440.

Ravaja, N., Saari, T., Salminen, M., Laarni, J., Kallinen, K. 2006. Phasic Emotional Reactions to Video Game Events: A Psychophysiological Investigation. Media Psychology, 8(4), 343-367. https://doi.org/10.1207/s1532785xmep0804_2.

Read, J., MacFarlane, S., Casey, C. 2009. Endurability, Engagement and Expectations: Measuring Children's Fun. Interaction Design and Children.

Renshaw, T., Stevens, R., Denton, P. 2009. Towards understanding engagement in games: An eye-tracking study. On the Horizon, 17, 408-420. https://doi.org/10.1108/10748120910998425.

Schneider, L.P., Cornwell, T.B. 2005. Cashing in on crashes via brand placement in computer games: The effects of experience and flow on memory. International Journal of Advertising, 24(3), 321-343. https://doi.org/10.1080/02650487.2005.11072928.

Schoenau-Fog, H. 2011 The player engagement process - An exploration of continuation desire in digital games. Proceedings of the 2011 DiGRA International Conference: Think Design Play, 6. http://www.digra.org/digital-library/publications/the-player-engagement-process-an-exploration-of-continuation-desire-in-digital-games/.

Smith, M., Gevins, A. 2005. Neurophysiologic monitoring of mental workload and fatigue during operation of a flight simulator. Proceedings of SPIE - The International Society for Optical Engineering, 5797. https://doi.org/10.1117/12.602181.

Sweetser, P., Wyeth, P. 2005 GameFlow: a model for evaluating player enjoyment in games. Computers in Entertainment, 3(3), 3-3. https://doi.org/10.1145/1077246.1077253.

Tamborini, R., Skalski, P. 2006. The role of presence in the experience of electronic games. In P. Vorderer, J. Bryant (Eds.), Playing Video Games: Motives, Responses, and Consequences, 225-240.

Terlutter, R., Capella, M.L. 2013. The Gamification of Advertising: Analysis and Research Directions of In-Game Advertising, Advergames, and Advertising in Social Network Games. Journal of Advertising, 42(2-3), 95-112. https://doi.org/10.1080/00913367.2013.774610.

Texeira, T., Wedel, M., Pieters, R. 2012. Emotion-Induced Engagement in Internet Video Advertisements. Journal of Marketing Research, 49. https://doi.org/10.2307/23142841.

Vashisht, D., Sreejesh, S. 2015. Effects of brand placement strength, prior game playing experience and game involvement on brand recall in advergames. Journal of Indian Business Research, 7(3), 292-312. https://doi.org/10.1108/JIBR-11-2014-0082.

Vermeir, I., Kazakova, S., Tessitore, T., Cauberghe, V., Slabbinck, H. 2014. Impact of flow on recognition of and attitudes towards in-game brand placements: Brand congruence and placement prominence as moderators. International Journal of Advertising, 33(4), 785-810. https://doi.org/10.2501/IJA-33-4-785-810.

Vourvopoulos, A., Bermudez I Badia, S., Liarokapis, F. 2017. EEG Correlates of Video Game Experience and User Profile in Motor-imagery-based Brain—computer Interaction. Vis. Comput., 33(4), 533-546. https://doi.org/10.1007/s00371-016-1304-2.

United Nations World Food Programme. 2006. Food Force. https://web.archive.org/web/20050605073447/http://www.food-force.com.

U.S. Army. 2017. America's Army: Proving Grounds. https://www.americasarmy.com/.

Wei Wei. 2007. Veevia Cancer Game. http://www.veevia.com/playgame/cancergame.html.

Williams, K., Petrosky, A., Hernandez, E., Page, R. 2011. Product placement effectiveness: revisited and renewed. Journal of Management and Marketing Research, 7, 1-24.

Wu, C., Tsung-Kuang, E.M., Tien, T.W. 2018. The Effect of In-game Brand Placement Prominence and Players' Flow Experience on Brand Recall: The Moderating Role of Game Genre. International Journal of Business and Social Science, 9(7).

Yamada, F. 1998. Frontal midline theta rhythm and eyeblinking activity during a VDT task and a video game: useful tools for psychophysiology in ergonomics. Ergonomics, 41(5), 678-688. https://doi.org/10.1080/001401398186847.

Yang, M., Roskos-Ewoldsen, D.R., Dinu, L., Arpan, L.M. 2006 The Effectiveness of 'in-Game' Advertising: Comparing College Students' Explicit and Implicit Memory for Brand Names. Journal of Advertising, 35(4), 143-152. https://doi.org/10.2753/JOA0091-3367350410.

Yee, N. 2006. Motivations for play in online games. Cyberpsychology & Behavior : The Impact of the Internet, Multimedia and Virtual Reality on Behavior and Society, 9(6), 772-775. https://doi.org/10.1089/cpb.2006.9.772.

Yenigun, S. 2012. Presidential Campaigns Rock the Gamer Vote, National Public Radio. https://www.npr.org/2012/10/01/162103528/presidential-campaigns-rock-the-gamer-vote?t=1588329129931.

Yoo, S.C., Peña, J. 2011. Do Violent Video Games Impair The Effectiveness of In-Game Advertisements? The Impact of Gaming Environment on Brand Recall, Brand Attitude, and Purchase Intention. Cyberpsychology, Behavior, and Social Networking, 14(7-8), 439-446. https://doi.org/10.1089/cyber.2010.0031.

Yoon, G., Vargas, P.T. 2013. Seeing Without Looking: The Effects of Hemispheric Functioning on Memory for Brands in Computer Games. Journal of Advertising, 42(2-3), 131-141. https://doi.org/10.1080/00913367.2013.774587.