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Neuroscience for Content Innovation on European Public Service Broadcasters

La Neurociencia para la innovación de contenidos en la televisión pública europea

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ABSTRACT

The new media landscape is characterized by the fragmentation and disaffection of the audience towards traditional television. Such a context requires innovative strategies to meet the needs of the public and connect with it. This article analyses the ability of Neuroscience to optimize the production of content adapted to audiences. For this purpose, a review of management and economic reports and corporate websites of the European public broadcasters (n=100) was carried out, as well as the evolution of the audience in the period 2010-15. Also, an exploratory analysis and in-depth interviews with open and closed questionnaires was undertaken. The data collect the opinion of neuroscientific experts, Neuromarketing consultants, academics and professionals in European public television (n=22) on the usefulness and introduction of this science for audience research, its possible application in programming, and the role of Neuroeducation in the design of educational programmes. The findings determine that almost a dozen public service media in Europe are already applying audiovisual Neuromarketing as an incipient and innovative tool to test entertainment programmes, commercial spaces and competitiveness improvement strategies. However, it has not been implemented in educational content, which is a core mission of public broadcasters.

RESUMEN

En el nuevo panorama mediático, caracterizado por la fragmentación y desafección de las audiencias hacia la televisión tradicional, urge la incorporación de innovadoras estrategias que atiendan a las demandas de sus públicos y conecten con ellos. El presente artículo analiza la capacidad de la Neurociencia para optimizar la producción de contenidos adaptados a las preferencias de los espectadores y comprueba la introducción de esta metodología en las radiotelevisiones públicas europeas. Para ello se realizó una revisión de los informes de gestión, memorias de cuentas y webs de las radiotelevisiones públicas estatales y regionales de la Unión Europea (n=100) así como de la evolución de sus audiencias de 2010-15. Complementariamente, a partir de un análisis exploratorio y de entrevistas en profundidad con cuestionario abierto y cerrado, se recogió la opinión de expertos neurocientíficos, consultores de Neuromarketing, académicos y profesionales de la televisión pública europea (n=22) sobre la utilidad e introducción de esta ciencia para el estudio de las audiencias y su aplicación en la programación, y el rol de la Neuroeducación en el diseño de programas educativos. Los resultados determinan que cerca de una docena de RTV públicas ya aplican el Neuromarketing Audiovisual como herramienta innovadora para probar y diseñar productos de entretenimiento, bloques comerciales y estrategias de mejora de la competitividad frente a su implementación en la programación educativa, encomienda principal del servicio público.

KEYWORDS | PALABRAS CLAVE

Neuroscience, audiovisual Neuromarketing, Neuroeducation, television, audience, public service, educational content, entertainment.
Neurociencia, Neuromarketing audiovisual, Neuroeducación, televisión, audiencia, servicio público, contenido educativo, entretenimiento.

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1. Introduction

Interest in new research methods and innovation is part of the concern about how audiences consume and behave towards linear and non-linear television, due to the proliferation of screens (Wilson, 2016), hybrid systems for production and transmedia and interactive dissemination (Perrinet & al., 2011), receiving and access devices and channels, audience fragmentation (Prado, 2012), engagement and social audience (Carpentier, 2014), and decline in the value of traditional measuring systems (Quintas-Froufe & González-Neira, 2016). As regards audience measurements, most countries still include only linear television, 31 deferred TV and 21 VoD. Only 14 countries monitor computer use and 6 the access via tablets and smartphones (Eurodata, 2016). Nevertheless, great effort is made by companies to incorporate new techniques and devices of Television Audience Measurement, Cross Media Audience Measurement, Media Metrix Multiplatform, and Return Path Data.

As regards Public Service Media (PSM), attention is drawn to innovation in methods on new consumption trends and TV use (Patriarche, Bilandzic, Linaa, & Jurisic, 2014). Also, qualitative studies have gained ground (Jensen, 1993; McQuail, 1997) due to the quantitative decline in PSM´s traditional audiences and the need to reorient their core values (Moore, 1995), to demonstrate their contribution to society and thus to renew their legitimacy (Suárez, 2015).

Changes in TV access and consumption are significant in young and active audiences. Average audience share in European public service media was 21.7% in 2015, which dropped to 13.5 among youngsters. The average daily consumption was 3 hours and 41 minutes, one minute less than the previous year. Young people consumed, however, 2 hours and 6 minutes on average, six minutes less than 2014 (Eurodata, 2016). Something similar happens with traditional radio (EBU, 2016), where the average PSM market share was 37.7% in 2015, 0.2 points less than the previous year. Among youth, the average radio market share was 21%, 0.3% less than the previous year. As regards radio listening time, European people consumed 2 hours and 29 minutes on average (13 minutes less than 2010) and 1 hour and 30 minutes among young people (14 minutes less than five years ago.)

The countries of northern Europe, which are financially stable and have solid reputations and are known for their innovation, maintain their leadership in audience daily share, such as Denmark (69.9%), United Kingdom (43.9%), Finland (43%), Norway (40.3%), Germany (43.9%) and the Flemish VRT (39%). Almost all of these public service media organisations have increased their audience by 10% in the period 2010-2015. Quite the opposite happens in public broadcasters from southern Europe. Affected by the crisis, these organizations lost audience share by 53.6% in Greece, 38.9% in Portugal, 35.5% in Slovakia and 33.7% in Spain in the aforementioned five-year period.

To meet these challenges, public service media organizations are facing the technological transition (Iosidifis, 2011), the 2.0 revolution (Brevini, 2015), the search for new online opportunities (Donders & Raats, 2015), the redefinition of their public service remit across the digital boundary (Trappel, 2016), the preservation of the use of spectrum and universal accessibility in all platforms (Michalis, 2016) through the reinvention of public service media (Moe, 2008) and the transformation of the values that gave rise to the ethos of PSM (Cunningham, 2015); and the strengthening of independence (Karppinen & Moe, 2016), transparency, accountability (Moreira & Rousiley, 2009) and service to civil society (Thomas, 2016).

The most dynamic state and regional television networks are trying to embody innovation as the engine of change of their organizations. This will help PSM to renovate contents, to stimulate creativity (Turner & Lourenço, 2012), to bring back young audiences, to revitalize their brand image, to increase participation, and to improve the communication of their value. The BBC Backstages incorporates innovation through the use of Big Data and other interactions with programmes (Lin, 2015). The Norwegian NRK is experimenting with the successful format of slow television (Puijk, 2015). The Italian RAI is analysing the evolution and changes of narratives in the news (Gavrila & Morcellini, 2015), and the Spanish RTVE is assessing the convergence between innovation, promotion and audience engagement strategies (Franquet & Villa, 2014).

Public corporations like the BBC aim to redefine and redirect their programming offer towards distinctive and distinguishable products from the commercial television, and ruled by their mission to inform, educate, and entertain (DCMS, 2016). This is, however, a critical shift in focus within the competitive audiovisual arena (Harris & Chasin, 2006). The viability and stability of the new model will mainly depend on the audience´s support of the new contents and services. Understanding viewers 'behaviour and preferences is key to success.

In recent years, broadcasters have made progress on audience research, encouraged by a more scientific and objective approach in decision-making processes (Napoli, 2011). In this regard, neuroscientific methods have the

ability to identify cognitive and emotional processing (Bechara & Damasio, 2005; Vecchiato & al. 2011), which are of interest for PSM to substantiate and implement attractive and efficient products in terms of education, information and entertainment that will eventually contribute to PSM social legitimation.

1.1. Neuroeducation and television

The 20th century is characterised by multidisciplinary research. The combination of knowledge like computer science, artificial intelligence and neuroscience has opened up new spaces to understand individual neural processing in relation to the external environment. In recent years, the democratisation of technology has led to the incorporation of neuroscientific methods in the study of emotions and their impact on decision-making processes, which is of great interest for social sciences (Manes & Niro, 2015). As a result, hybrid disciplines such as Neuro-communication (Timoteo-Álvarez, 2007), Neuro-marketing or consumer Neuroscience (Hubert & Kenning, 2008), and Neuroeducation (Mora, 2013) have emerged to decode cognitive and emotional processing and to propose efficient actions in the respective action fields.

While Neuroeducation is an emerging discipline and rises difficulties when applied in practice (Sharples & Kelley, 2015), the available empiric information is relevant (Gabrieli, 2016), and will achieve its full potential in the future (Devonshire & Dommett, 2010). Meanwhile, investments are carried out to speed up the process. Research projects such as Mind, Brain and Education from Harvard and the Centre for the Future of the Mind from Oxford provide a basis for the convergence between Neuroscience and Education (Ansari, De-Smedt, & Grabner, 2012).

> Understanding a brain´s functioning and decoding how knowledge should be implemented in education is a difficult issue to deal with nowadays. However, while convergence between Neuroscience and Education is an emerging trend, there are strong reasons to foresee that this field of knowledge may play an essential role in education and public service media platforms. The qualitative leap forward made by Cognitive Neuroscience over the past decades, due to economic investments, technological advances and multidisciplinary work, has improved the knowledge of brain mechanisms that have an impact on learning processes, memory, attention and emotion.

If Neuroscience is called to mold the education in the current century, the audiovisual and technological sectors will become the main platforms to shape education in present and future society (Ferrés-i-Prats, 2014). The Johns Hopkins University Neuro-Education Initiative (NEI), states that art, through audiovisual productions, may be a powerful tool for education (Eilber, 2009). This shows a need to broaden horizons and to use informal teaching platforms like videogames and television (Fischer, Goswami, & Geake, 2010).

Television offers new formulas for the audience to access and participate, and it has the ability to make cognitive changes in our brains. Against this background, the introduction of techniques and knowledge based on Neuroscience could help broadcasters to better design contents and to attract greater attention, emotion and engagement (Steele & al., 2013).

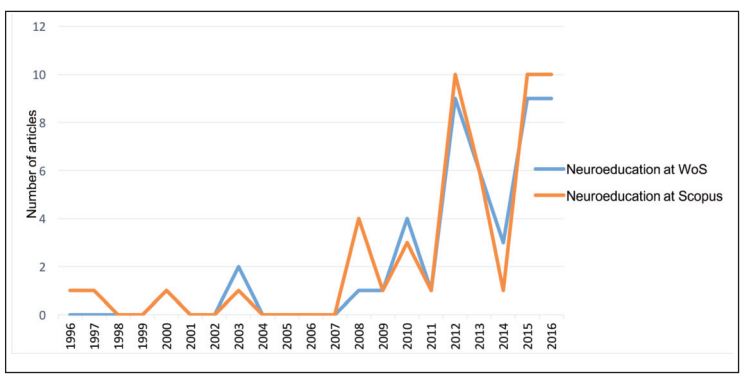
Also, the exploitation of emotions and empathy –essential pillars of education– (Kort, Reilly, & Picard, 2001), makes television an ideal platform to implement fundamental theories in Neuroeducation. The goal of the article is to show how public service media organizations are introducing neuroscience methods to develop and test contents. Given the social commitment of these organizations towards their audience, the research addresses the potential of these techniques on educational contents.

2. Materials and methods

Recent studies point out the direct impact of emotions on learning processes and the capacity of Neuroscience to innovate in education (Immordino-Yang & Damasio, 2007). Information and Communication Technologies (ICT) provide original formulas to connect emotionally with audiences, encouraging new theoretical and methodological approaches (Serrano-Puche, 2015) and their effective inclusion in learning processes (Wellings & Levine, 2009).

Fostering Neuroscience in education is relatively new and uncommon (Graphic 1). For as long as the records have existed, the Scopus database has identified 52 articles on "Neuroeducation" while the Web of Science has listed 46. Both databases include three references on "audiovisual neuro-marketing", while none of them refers to television as a platform for Neuroeducation. Nevertheless, interest in Neuroscience is present in many of PSM´s annual reports.

The aim of this research is to offer the state of the art on the introduction of neuroscientific methods in audiences and television contents research by European PSM. Likewise, taking into account the PSM´s refrain from educating, special attention is paid to the role of Neuroscience in learning processes (Neuroeducation) and educational programmes for television.



Graphic 1. Evolution of publications on "Neuroeducation".

Qualitative methods have been used to carry out this work. First, a documentary analysis was conducted on innovation, taking as source annual reports and corporate websites of the EU-28 regional and state public broadcasters (n=100). Also, an exploratory analysis and interviews to a panel of experts on public television, neuro-marketing specialists and neuroscientists (n=22) has been undertaken (Table 1). Contacts concluded when they found saturation on answers. The questionnaires had both closed and open-ended questions with a scale from 0 to 10. The design of the questionnaires for each group of the contacted panellists was based on previous experience regarding Neuroscience techniques in the Spanish audiovisual sector.

The contact of experts was developed in three stages. The first stage consisted in requesting the collaboration of academic experts and professionals in PSM belonging to the Global PSM Experts Network (https://globalpsmexperts.net/), with the aim of getting a preliminary diagnosis of the state and the main challenges of PSM in Europe. The second stage addressed the state of the art with the collaboration of international consultants, who are

Table 1. Panel of experts

Expert	Institution	Specialisation
Dr Susana Martínez-Conde	Suny Donwstate Medical Center, University of New York	Neuroscientist specialised in visual perception
Dr Luis Martínez-Otero	Neuroscience Institute, Alicante	Neuroscientist specialised in visual system
Dr Fernando del Valle-Inclán Alsina	University of A Coruña	Expert in experimental psychology, attention and short-term memory
Dr Roberto C. Agís-Balboa	Hospital Álvaro Cunqueiro	Neuroscientist specialised in epigenetic
Dr Cristina de Balanzó	Walnut Unlimited (United Kingdom)	Neuro-marketing Consultant
Mév Bertrand	Neuro-Insight (United Kingdom)	
Duncan Smith	MindLab (United Kingdom)	
Arnaud Petre	Brain Impact (Belgium)	
Dr Thomas Zoëga Ramsøy	Neurons Inc. (Denmark)	
Philipp Reiter	Eye Square FmbH (Germany)	
Jarkki Kotola	Exakti Intelligence Oy (Finland)	
Unknown representative	Incore GmbH (Germany)	
	Ottosunove (Italy)	
	German Consultant	
	French Consultant	
Expert Global-PSM-Experts-Network 1	University researcher	PSM Spain
Expert Global-PSM-Experts-Network 2		PSM Poland
Expert Global-PSM-Experts-Network 3	Media professional	PSM Europe
Expert Global-PSM-Experts-Network 4	University researcher	PSM United Kingdom
Expert Global-PSM-Experts-Network 5		PSM Spain
Expert Global-PSM-Experts-Network 6		PSM Europe
Expert Global-PSM-Experts-Network 7		PSM Spain (Catalonia)

members of the Neuro-marketing Science & Business Association (NMSBA). This group revealed the Neuro-marketing research practices used by public broadcasters (method, objectives and object of study), and assessed its future viability in the media arena.

The study is complemented by in-depth interviews with Neuroscience experts, focused on the ability and suitability of Neuroscience to design educational TV contents that are effective for learning processes, the potential of transmedia and social television to improve learning processes, brain plasticity and the attention deficit, and the required protocols to develop this symbiosis.

Table 2. Main challenges of European Public Service Media

	Mean	Standard deviation
Audience fragmentation	8.2857	2.21467
Improvement of quality content	5.8571	3.33809
Content adapted to audience	6.0000	1.41421
Attracting young audiences	8.1429	2.47848
Attracting global audiences	4.1429	2.60951
Attracting investment	6.0000	3.16228
Improving the efficiency of ad spaces	1.8571	2.26779
Legitimating the public service	8.8571	1.67616
Producing public service competitive content	8.0000	2.51661
Producing contents distinguishable from competence	7.5714	3.04725
Producing entertainment of better quality	6.2857	3.72891
Becoming a news benchmark	8.7143	2.36039

3. Analysis and results

Public service broadcasters in Europe are in the midst of a transition crisis, due to digitisation (Iosifidis, 2011; Cunningham, 2015; Brevini, 2015; Trappel, 2016) and the weakening of their legitimacy (Camacho, 2005). PSM experts consulted (n=7) stated that the main challenges are the need to renew and recover lost and not-reached audiences and to produce public service contents to renew PSM´s legitimacy and their leading position (Table 2).

The future of PSM depends on their ability to adapt themselves to the new media and social context. Becoming an information referent is the solution that reached the greater consensus among the consulted experts (Table 3). While entertainment has a strong acceptance among users, the production of more efficient and attractive educational contents is a competitive advantage, plus it is a way to strengthen public legitimacy.

As it is considered that most of the problems faced by PSM depend on their engagement with users of interactive services, questions have aroused concerning the utility of audience research as a tool to produce contents able to satisfy their needs. While there is consensus on the utility of PSM, results show that these organizations have a general lack of knowledge about Neuroscience methods. Among the main reasons are the existence of many others quantitative research methods such as Big Data, the lack of knowledge about the benefits of Neuroscience methods, the belief that Neuro-marketing does not generate enough value for money, and the assumption that traditional techniques are already appropriate. There is an estimation, however, that this methodology will experience a medium-term increase among PSM, mainly due to its wider dissemination and the price reduction.

3.1. Neuroscience in European Public Service Media

In order to determine the reach of Neuroscience methodology among European PSM, Neuro-marketing consultants (n=11) have participated in the study. Each company has estimated the level of integration of this type of research in their respective countries. Findings show that Neuroscience techniques in PSM from Finland, France and Belgium have little or no presence. However, countries such as Denmark, United Kingdom, Italy and Germany use these techniques at a middle level. The future implementation of these studies is positive for all analysed countries. It is expected that Belgium and France are the most developed countries in this regard within a 5-year period because of its poor implementation today. Finland and Germany will slightly increase its use, while the United Kingdom and Denmark, where Neuroscience methods have a lot of presence, will remain at the same level. In Italy, its use will decrease slightly. The reasoning behind this positive trend is, according to consultants, as follows:

Questions have been raised regarding the introduction of Neuromarketing in Europe. Accordingly, it is considered that its use by European public service media is medium. It should be noted that representatives from Finland, Belgium, Italy and France estimate a greater presence in Europe than in their countries. The trend is reversed in the United Kingdom and part of the German panel, while in Denmark and the rest of the German panel there is a link between Europe and their countries. In general, this methodology is expected to grow in Europe in the next five years. Interviewed Neuromarketing consultants meet the following profile. At least three out of eleven companies have public service media organizations and public-service commercial broadcasters as customers. All of them serve national public service

Table 3. Contents to overcome the legitimacy crisis

Contents	Mean	Standard deviation
Educational	5.7143	1.25357
Entertainment	6.2857	3.72891
Informational	8.7143	2.36039

media or public-service commercial broadcasters (100%). Most of these clients are concentrated in one consultant. The workload represents between 1%-10% for 75% of consultants, while the remaining spend between 20% and 25% of their time. These services have been outsourced in the BBC (British Broadcaster Corporation); DR (Danmarks Radio); NRK (Norwegian Broadcast Company); ARD (Arbeitsgemeinschaft der öffentlich-rechtlichen Rundfunkanstalten der Bundesrepublik Deutschland); ZDF (Zweites Deutsches Fernsehen); and Channel 4 and TV2 Denmark, British and Danish public channels with a commercial purpose.

Table 4. Reasons to use or not to use Neuromarketing

	Percentage
Getting better known	70.00
Proving its efficiency to produce educational, informational and entertainment content	70.00
Competitors will use it and promote its use among PSM organizations	60.00
Their techniques and data interpretation will improve	50.00
Neuromarketing will be needed to show the efficiency of advertising spaces	40.00
Price reduction	30.00
General lack of knowledge	20.00
It will be expensive	10.00
PSM will use it due to its innovative nature	10.00

Contents tested for these broadcasters are: the efficiency of advertising spaces (3 consultants); national TV series (2); entertainment programmes (2); contests and game shows (2); casting (2); foreign TV series (1); documentaries (1), and films (1). The employed techniques were: electroencephalography (EEG) (3 consultants); eye-tracking (2); galvanic skin response (2); heart rate (2); implicit association test (1); steady state topography (1); and functional magnetic resonance imaging (1). The application of behavioural economics (1) and social media psychology studies (1) are complementary studies carried out for public service media´s contents.

The state of the art was complemented with a comprehensive documentary analysis, which allowed to determine the most important strategic issues for broadcasters´ sustainability. These elements are essentially two: 1) the test of entertainment contents to adapt them to audience´s preferences; and 2) the demonstration of the effectiveness of advertising spaces to maintain the public system.

The secondary research, which consisted in a documentary analysis of the conglomerate of European organizations, shows that public broadcasters have started to experiment with techniques linked to Neuroscience with the aim of increasing competitiveness of key contents in domestic and foreign markets. According to the BBC Trust (2015), the future requires the opening up of innovative channels to meet an audience's needs and connect with it. Carrying on its tradition in experimenting with new methods of market research, the BBC introduced the first tests with neuroscience techniques. The broadcaster invested in software development in its quest to find formulas for tracking audience´s emotional and unconscious answers. CrowdEmotion, a BBC´s start-up, has been used to understand audience´s reactions and emotions to successful contents, such as the TV show "Sherlock" and the programme "Top Gear" (BBC Media Centre, 2014). The British Corporation has worked with companies engaged in technological solutions as Lightspeed GMI, that belongs to Kantar Group (MRS, 2015), Neuromarketing consultants as Neurosense (Probst, Frideres, Demetri, & Vomhof, 2014), and Synetiq, for assessing people´s emotional and cognitive response to the media (Dalesio, 2015).

In 2014, the BBC Worldwide, together with Lightspeed GMI, carried out a pilot study on the emotional responses to their products in the Australian market. Supported by psychological knowledge and by the platform Crowd-Emotion in the monitorization of micro-facial expressions, emotions were analysed and quantified in 22 BBC shows on a sample of 4,657 people. The Experience, already integrated in Anglophone markets as the United States, United Kingdom and Australia, is expected to be more widely used since it provides objective and quantifiable data, information segmented by regions and reliable information for managers and investors, and helpful development models for content creation (Market Research Society, 2015).

Thanks to technological start-ups, other benchmark public organizations have also incorporated innovative formulas in consumers´ studies. France Télévisions, together with Mensia Technologies, is entering into the monitorization of brain electrical signals to suggest and implement contents from audience's emotional state in the platform Pluzz (Fontaine, 2014). The Danish DR has experimented -in partnership with Synetiq-, with biometric techniques in TV shows, in order to adapt its offer to the preferences of that audience that contribute financially to the broadcaster´s sustainability (Dalesio, 2015). The Flemish VRT monitorized electrodermal response and introduced EEG techniques to test fiction TV shows (Deproeftuin, 2015), as well as the Spanish RTVE (Crespo-Pereira, Martínez-Fernández, García-Soidán, 2016). Neuroscientific methods are also used to test the efficiency of advertising spaces in broadcasters funded by this source. The Irish RTE, together with TNS, implemented semiometrics to register sub-conscious responses (RTE Media Sales, 2014). The technique aims at establishing asso-

ciations between words and programmes to determinate the best psychological consistency between them and advertising campaigns (RTÉ & TNS, 2004). Another case is Channel 4 that, using eye-tracking and electrodermal response, assessed the efficiency of commercial spaces in its VoD platforms against amateur content aggregators (Ellis & Greenbank, 2015).

3.2. Neuroeducation and educational television

Consulted neuroscientists (n=4) define Neuroeducation as the application of knowledge about brain functions to design efficient programmes. The visual pleasure allowed by television and the basis on which stories are created (sequence, attention, emotion and memory) make this medium an interesting platform to implement Neuroeducation theoretical approaches. Should a will to bring back educational television exist, Neuroscience could open up new possibilities towards the creation of efficient educational contents (Bavelier, Green & Dye, 2010). This science, in its different areas of knowledge, would permit the research on cognitive and emotional consequences underlying the viewing (Anderson, 2007). Neuroscience could be also incorporated in early stages of production, particularly in attractive programme design and in the optimization of their presentation. To achieve this, it is essential to invest in a basic and practical research, to encourage the transfer university-enterprise and to have human teams that firmly direct and implement neuroscience and education knowledge to audiovisual production. In this regard, multidisciplinary teams and psychology will play a key role (Horvath & Donoghue, 2016).

The study explores the neural consequences of technological impact on brain plasticity (Mathiasen & Schrum, 2010) and attention deficit (Small & Vorgan, 2009). Interviewed experts refer to a theoretical approach, arguing that the more enriched and volatile is the medium, the more brain connections are created and, thus, the more the plasticity is able to be flexible and trained. In such a context, ICT introduce great possibilities. Combining traditional television with other platforms can be of great help to generate proactive behaviours that encourage learning. Interactivity, customized content, research on users´ feedback and transmedia strategies -which promotes redundancy and thus learning- could lead the way towards a more efficient public broadcaster in terms of education.

If the audience is actively questioned, ICT would have the ability to improve issues such as visual attention and response times. Videogames have been already tested in this regard (Green & Bavelier, 2003). So, if used properly, television and digital platforms could improve some attention deficits. At present, there is also uncertainty about the implementation of knowledge on formative learning.

Be that as it may, there is consensus on the potential of theory to be incorporated in education and television, in the long term. The creation of efficient contents based on Neuroscience will be possible if progress is made in the functioning of brain mechanisms associated to emotion and stories as learning drivers (McNett, 2016) and in the implementation of knowledge.

4. Discussion and conclusions

Understanding a brain´s functioning and decoding how knowledge should be implemented in education is a difficult issue to deal with nowadays (Kopton & Kenning, 2014). However, while convergence between Neuroscience and Education is an emerging trend, there are strong reasons to foresee that this field of knowledge may play an essential role in education and public service media platforms (Linebarger & Walker, 2005). The qualitative leap forward made by Cognitive Neuroscience over the past decades, due to economic investments, technological advances and multidisciplinary work (Martín-Rodríguez, Cardoso-Pereira, Bonifácio, & Barroso, & Martín, 2004), has improved the knowledge of brain mechanisms that have an impact on learning processes, memory, attention and emotion. Results show the benefits of using neuroscientific techniques in the design and test of audiovisual contents, and the potential of ICT in learning processes in stimulating touch-sensitive, kinesics (Pérez, 2008), customized and interactive experiences (Pérez, 2008). The study has not found an educational project in European television that has used neuroscientific methods. This is a notable finding, as it could be an ideal tool to renew public service media´s legitimacy through the production of contents oriented to entertain, inform and educate.

The trend of PSM to compete under the principles of commercial television and to give priority to entertainment over public service contents is reflected in research based on neuroscience methods. Almost a dozen European public service media organizations have introduced this methodology in entertainment (TV programmes and shows) and advertising spaces with the aim of enhancing competitiveness in key markets. This also indicates the significance given to these products and ad spaces -at the expense of educational contents- for the viability of public broadcasters in the current media arena.

The expected increase of this type of audience research points, in the medium and long term, to the standardization of Neuroscience knowledge for the optimization of public and commercial broadcasters´ management. Over the next years, demand will determine the viability of this methodology in testing and designing products and the strategic value of tested contents. Future work should establish a comparative framework between public and commercial television and assess the usefulness of Neuromarketing techniques in broadcasting.

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