



Received: 30 June 2017
Accepted: 25 January 2018
Published: 31 January 2018

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HEALTH PSYCHOLOGY | REVIEW ARTICLE

Public health social media communications and consumer neuroscience

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Abstract: Consumer neuroscience is an emerging discipline. Potential exists for neurological quantitative research techniques to be used for the development and analysis of public health messages due to limited numbers of successful campaigns. In some instances, highly successful public health marketing campaigns have been designed to address something greater than financial gain and have achieved exceptional reach. This results in increased public awareness using social amplification platforms. Examples of these include action-oriented social media campaigns that ask individuals to “act”, “share”, “pledge” or “challenge” on behalf of a health or social cause. Neurological and physiological techniques include functional magnetic resonance imaging, magnetoencephalography, electroencephalography, eye tracking, galvanic skin response, heart rate, facial recognition and implicit association testing. Due to nonconscious decision-making processes these techniques have the potential to identify driving forces behind individuals’ decision to become involved in health and social cause marketing campaigns that are unable to be identified with qualitative research methods. In 2014/2015 the Australian Government spent \$23.3 million Australian dollars (AUD) on health and social service marketing campaigns, with \$19.4 million AUD on health communications, and \$3.9 million AUD on social services. These figures are considered conservative as expenditure on marketing campaigns below \$250 thousand AUD is excluded. Thus, using consumer neuroscience to inform the design of future public health and social cause communications,



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Joanne M. Harris is the first PhD candidate in consumer neuroscience at Swinburne University of Technology, Melbourne, Australia, researching the use of consumer neuroscience for analysis of public health and social cause marketing communications under the supervision of A Prof Joseph Ciorciari, the former Australasian Chair of the international Neuromarketing Science and Business Association (NMSBA) and A Prof John Gountas, a leading marketing researcher in consumer thinking styles and personality from Murdoch University.

PUBLIC INTEREST STATEMENT

In 2014/2015 the Australian Government spent \$23.3 million Australian dollars on health and social service marketing campaigns, of which \$19.4 million was spent on health communications, and \$3.9 million on social services. This paper provides a review of current neuroscience studies that aim to identify the potential use of neuroscience tools to analyse public health and social cause marketing campaigns. Consumer neuroscience is an emerging field and research in this area is limited. Consequently, greater understanding of the effectiveness of the use of positive action orientations vs. fear and shock approaches to health communications is required. As a result, this research aims to inform the design of future health communications, which may help to save a life, while reducing expenditure on unsuccessful campaigns.

which may help to save a life, while reducing expenditure on unsuccessful campaigns, requires greater understanding of the effectiveness of a positive action orientation vs. a fear and shock approach.

Subjects: Behavioral Neuroscience; Cognitive Neuroscience; Social Neuroscience

Keywords: consumer neuroscience; public health communications; social media platforms

1. Introduction

This review examines consumer neuroscience, public health, social cause communications and the use of social media. The potential use of consumer neuroscience techniques to help design and inform future public service announcements (PSAs) are discussed. Key focus is on successful public health marketing campaigns designed to address something greater than financial gain that have achieved exceptional reach resulting in increased public awareness using social-amplification platforms. Further, successful “action”-oriented social media public health communications that ask individuals to “act”, “share”, “pledge” or “challenge” on behalf of a health or social cause are addressed.

Consumer neuroscience as a sub-field of cognitive neuroscience (Kenning & Linzmajer, 2011) neuroeconomics (Lee, Broderick, & Chamberlain, 2007; Smidts et al., 2014) and consumer behaviour (Kenning & Linzmajer, 2011) remains at an embryonic stage (Eser, Isin, & Tolon, 2011; Fisher, Chin, & Klitzman, 2010; Kenning & Plassmann, 2008). Consumer neuroscience is a nascent cross-disciplinary field that integrates concepts from cognitive neuroscience, marketing, economics and psychology (Hubert & Kenning, 2008; Kenning & Linzmajer, 2011, p. 557; Kenning & Plassmann, 2008; Plassmann, Yoon, Feinberg, & Shiv, 2011; Vecchiato, Cherubino, Trettel, & Babiloni, 2013). Cognitive neuroscience itself is also a relatively young inter-disciplinary field that only emerged towards the end of the 1970s (Gazzaniga, 2015).

PSAs attempt to challenge and change attitudes, which are likely to influence behaviours (Ajzen & Fishbein, 1977). The aim of PSA health messages is to educate and inform the public about risky behaviours such as, substance abuse, drinking and driving, and weight issues, by focusing on gains promoting healthier choices and encouraging “positive” social conduct (Rothman, Bartels, Wlaschin, & Salovey, 2006; Vecchiato et al., 2013). Health communication (HC) results have had varied levels of success because, evaluation and measuring their effectiveness has been difficult to determine (Hornik, 2002). The actual quantitative evaluation of PSAs has also been considered limited (Vecchiato et al., 2013) and a number of researchers suggest that health communications strategies have invariably been unsuccessful (Calvert, Gallopel-Morvan, Sauneron, & Oullier, 2010; Foxcroft, Lister-Sharp, & Lowe, 1997; Schoenbachler, Ayers, & Gordon, 2011).

The academic debate regarding the effectiveness of fear campaigns remains divided (Calvert et al., 2010; Heather, Lench & Levine, 2005; Ruiters, Abraham, & Kok, 2001; Schoenbachler et al., 2011). Consequently, there is considerable potential for the application of neurological quantitative research techniques for the development and analysis of effectiveness for public HCs and social cause messages.

2. Background

Consumer neuroscience is at the embryonic stages of development as a field of research (Eser et al., 2011; Fisher et al., 2010; Kenning & Plassmann, 2008). Neuroeconomics, which appeared prior to neuromarketing, is generally accepted as a relevant and rigorous new branch of applied neuroscience (Lee et al., 2007). However, mainstream neuroscientists have been sceptical of neuromarketing, suggesting that there was cause for concern regarding the use of neuroimaging tools to locate the “buy button” (Lee et al., 2007). The negative attitudes towards neuromarketing is an unusual response because there is little distinction between neuroeconomics and neuromarketing. Both investigate the activation of neural structures during economic decision-making, the evaluative

information processing of risk and reward and market exchange (Kenning & Plassmann, 2005; Lee et al., 2007). Further, many of the academic journal articles on neuroeconomics are written by leading consumer neuroscience and psychology academics such as Deppe, Schwindt, Kugel, Plassmann, and Kenning (2005), Kenning and Plassmann (2005), Braeutigam (2005) and Lee et al. (2007).

Consumer neuroscience/neuromarketing is also considered to be an integral part of the NeuroPsychoEconomics genre of research. While the terms consumer neuroscience and neuromarketing are sometimes used interchangeably, there have been some attempts to make a distinction between the two. Although various neuromarketing definitions exist the most commonly cited definition (Babiloni, 2012) is that neuromarketing is “the application of neuroscientific methods to analyse and understand human behaviour in relation to markets and marketing exchanges” (Lee et al., 2007, p. 200).

NeuroPsychoEconomics would be the most appropriate term for the field of consumer neuroscience, which is a new approach to investigate decision-making as suggested by Glimcher and Rustichini (2004). The term NeuroPsychoEconomics incorporates marketing as a sub field of economics while avoiding the controversy that has surrounded the term neuromarketing. However, despite NeuroPsychoEconomics being an appropriate term that integrates neuroscience, psychology and economics, the academic literature has preferred use of the term consumer neuroscience.

Rather than suggesting different definitions, which are essentially the same, Hubert and Kenning (2008) proposed that there is a need for a distinction to be made between the terms consumer neuroscience and neuromarketing. Hubert and Kenning’s suggestion is an attempt to distance consumer neuroscience from Blakeslee’s (2004) “buy button” neuromarketing associations (Plassmann, Venkatraman, Huettel, & Yoon, 2015) and instead link neuroscience with consumer research. Hence, Hubert and Kenning (2008, p. 274) proposed that consumer neuroscience “comprises the scientific proceeding of this research approach” while neuromarketing “designates the application of the findings from consumer neuroscience within the scope of managerial practice”. The major difference between the two terms based on their application in the academic literature and industry publications is supported by several researchers (Javor, Koller, Lee, Chamberlain, & Ransmayr, 2013; Kenning & Linzmajer, 2011). The term Neuromarketing therefore, is more likely to be used by the practicing marketers for practical managerial implications and consumer neuroscience in the preferred academic nomenclature.

Consumer neuroscience as a legitimate field of academic research has achieved a degree of respect and stability. Despite consumer neuroscience’s increased credibility (Morin, 2011) scepticism remains but at times is exacerbated by extreme claims made by researchers using “reverse inference” without identifying a priori internal mental processes (Plassmann et al., 2015; Poldrack, 2011). In specific instances, reverse inference is an appropriate approach but needs to be used with caution as it provides inadequate deductive validity (Plassmann et al., 2015; Poldrack, 2011). As consumer neuroscience develops and therefore the research knowledge produced becomes more robust these negative considerations are likely to be eliminated with time.

3. The first decade of consumer neuroscience

Consumer neuroscience has reached its first decade (Plassmann et al., 2015; Smidts et al., 2014). However, significant academic studies in consumer neuroscience were conducted prior to 2004 (see Knutson, Fong, Adams, Varner, & Hommer, 2001; Rossiter, Silberstein, Harris, & Nield, 2001; Silberstein, Harris, Nield, & Pipingas, 2000; Young, 2002). Nevertheless, interest in consumer neuroscience as an emerging discipline (Kenning & Linzmajer, 2011; Kenning & Plassmann, 2008) grew substantially from 2004 onwards as indicated by a spike in Google searches, growth in academic publications, growth in new journals and development of neuromarketing research companies (Plassmann, Ramsøy, & Milosavljevic, 2012). Consumer neuroscience has since gained increasing

interest from academics and marketing practitioners (Kenning & Linzmajer, 2011; Plassmann et al., 2015; Smidts et al., 2014). Google hits of over 80,000 in 2007 indicated that the discipline had reached mainstream status (Kenning & Plassmann, 2008). These results suggest that now consumer neuroscience is recognised as a legitimate field of research, despite its controversial origins.

4. Neurological and physiological techniques

Various neurological and physiological techniques have been used in consumer neuroscience research. Functional magnetic resonance imaging (fMRI) has been the most popular technique in addition to electroencephalography (EEG), magnetoencephalography (MEG), and to a lesser degree transcranial magnetic stimulation (TMS) and positron emission tomography (PET). Physiological tools used in market research include eye tracking, galvanic skin response (GSR), heart rate (HR) and electrocardiogram (ECG), facial recognition (electromyography (EMG)) and implicit association testing (IAT). These techniques have the potential to identify the implicit driving forces behind an individual's decision to become involved in health and social cause marketing campaigns that may not be identified with qualitative research methods such as focus groups, depth interviews and quantitative surveys and experiments. Well-established qualitative and quantitative marketing research tools are not suitable to identify and quantify nonconscious consumer reactions to social media health messages and decision-making processes.

5. Public health and social cause communications

The global health expenditure in 2013 was \$7.2 trillion US dollars (USD) and is expected to increase to \$9.3 trillion USD between 2014 and 2018. In 2013, Australia's expenditure on health care was estimated to be \$172 billion (Australian dollars) (AUD) and is expected to increase to \$186.3 billion AUD between 2014 and 2018. This increase in health expenditure is a result of Australia's ageing population and population growth (Deloitte, 2015).

The Australian Government spent a total of \$107.1 million AUD on marketing campaigns in the 2014/15 financial period (Commonwealth of Australia, 2015). This figure includes the \$5.1 million AUD spent on marketing campaigns that targeted ethnic groups, and \$1.4 million AUD on Indigenous communications. These figures can be considered conservative as they do not include funds spent on marketing campaigns below \$AUD250 thousand (Commonwealth of Australia, 2015).

In total, in 2014/15, \$23.3 million AUD was spent on health and social service marketing campaigns in Australia, with \$19.4 million AUD on health communications, and \$3.9 million AUD on social services marketing campaigns (Commonwealth of Australia, 2015). The \$19.4 million AUD spent on health communications comprised five marketing campaigns of which two received nearly \$9 and \$7 million AUD compared to three other campaigns worth between \$1.9 million AUD and \$0.3 million AUD (Commonwealth of Australia, 2015). The two health campaigns with highest marketing spend were the Ice National Drugs Campaign at \$6.9 million AUD; and National Tobacco at \$8.7 million AUD (Commonwealth of Australia, 2015).

6. Changing behaviour through preventive and intervention communication strategies

Public health marketing communications that aim to change behaviour can be divided into two categories: (1) preventive or (2) implementing an intervention.

6.1. Preventive

A preventive communication strategy attempts to discourage individuals from undertaking harmful, risky or unhealthy behaviour such as taking up smoking, drugs, alcohol, binge drinking, gambling, speeding and driving under the influence of various substances.

Traditional preventative approaches are primarily aimed towards individual behaviour change (Loss, Lindacher, & Curbach, 2014).

Public health marketing communications adopting a preventative approach are predominantly aimed at adolescents who may be likely to consider or intend to engage in or undertake certain risky behaviours. Early adolescence often involves consideration of and decision-making regarding experimentation with various substances such as alcohol, cigarettes and drugs (Atkin, 1990). A preventative study conducted in the UK found that antismoking public health messages using social norm-based appeals that highlighted the risk of social disapproval were the most effective in terms of discouraging smoking amongst adolescents (Pechmann, Zhao, Goldberg, & Reibling, 2003). However, many public health communications aimed towards favourable behavioural change amongst adolescents in relations to substance use have been largely considered unsuccessful (Schoenbachler et al., 2011).

6.2. Interventions

There are two types of public health communication strategies used to support individuals to change behaviour. First, there are public health communications that aim to encourage individuals to make donations to charities, causes or not for profit organisations. Second, there are two types of marketing appeals: (1) intervention attempts to change current undesirable, harmful, risky or unhealthy behaviour and (2) campaigns to proactively encourage healthy behaviour.

7. Donations to charities

Public health communications often encourage individuals to make donations to health-related charities or causes. Examples include the ice-bucket challenge (2014) which aimed to raise money for Motor Neuron Disease, or the development of the “ACT” button (2013) that aimed at fighting world poverty. Moll et al.’s (2006) neurophysiological fMRI study found different brain regions were activated according to the type of decision and perception of financial reward/cost. This study indicates how the decision-making process was also affected by participants’ support and opposition to controversial causes such as euthanasia and abortion. However, the number of neurological studies of health communications is limited. Instead, much research addresses neurological approaches to health conditions such as predicting relapse in smokers and addiction rather than analysis of existing health communications (for example, Chua et al., 2011; Janes et al., 2010; Koob, Sanna, & Bloom, 1998; Wong, Harrison, & Harvell, 2015). As a result, there are three separate but inter-related bodies of research: (1) use of neuroscience to analyse health communications; (2) use of neuroscience to analyse health conditions and; (3) analysis of impact of PSAs in relation to health conditions not using neuroscience (see Table 1).

8. Changing harmful or adopting healthy behaviour

PSAs that use interventions attempting to change current undesirable, risky or unhealthy behaviour include appeals that encourage individuals to give up harmful activities.

Alternatively, PSAs encourage individuals to participate in healthy activities like driving safely, eating a balanced diet and engaging in regular exercise. Increasingly, a contextual approach has been adopted for PSAs, which also considers interventions in terms of social processes and structures (Loss et al., 2014). Therefore, social media PSAs operate as an appropriate channel to understand the interactions effectiveness within the cyber social context.

9. Social media

Initially, social media was rapidly embraced by commercial enterprises while health organisations were slow adopters (Bennett & Glasgow, 2009) only embracing social networking sites (SNSs) around the end of the 2000s (Capurro et al., 2014). However, the potential of the internet and social media for PSAs and interventions have since been realised with social media increasingly being used to conduct public health campaigns (Dumbrell & Steele, 2015) aimed at influencing behavioural change (Hanna, Rohm, & Crittenden, 2011). Consequently, SNS are increasingly used in health communications (Capurro et al., 2014).

Table 1. Neural correlates of fMRI study on decision-making and charitable donations

Theme	Reference	Neural correlates and theoretical frameworks	Research findings
Decision-making	Rilling and Sanfey (2011)	Amygdala, dorsal anterior cingulate cortex (dACC), vmPFC	Decision-making, fear of betrayal, inequity aversion, social pain, envy, trust
	Hare, Camerer, Knöepfle, O'Doherty, and Rangel (2010)	Ventral medial prefrontal cortex (vmPFC)	Charitable donations and decision-making
	Moll et al. (2006), Andreoni (1990)	Mesolimbic reward system including dorsal and ventral striatum, and ventral tegmental area	Decision to make charitable donations. These neural areas also activated when individuals received monetary rewards (Moll et al., 2006) reinforcing the concept of "warm glow" associated with giving (Andreoni, 1990)
Altruism	Moll et al. (2006)	Medial orbitofrontal and subgenual areas in addition to lateral orbitofrontal regions	Activated for decisions to give or oppose donations to certain charities involved in societal causes
		Anterior prefrontal cortex and Ventral striatum and Septal nuclei brain structures	Activated with decisions during donations favouring altruism over self-interested material gains. Further investigation revealed difference between which brain regions activated during receipt of purely financial reward compared to costly or non-costly charitable donation i.e. during experiment participants received monetary reward for making donation or made donation in addition to an additional cost to their funds
		Mesolimbic reward system	Activated for financial reward combined with non-costly donation
		Subgenual area, in particular posterior medial orbitofrontal cortex, ventral cingulate cortex (BA 25) and septal areas	Activated for costly and non-costly decisions
		Lateral orbitofrontal cortex (lOFC) (BA 11/47), dorsolateral cortex and anterior insula	Activated for opposition to costly and non-costly donations
Prediction	Tankersley, Stowe, and Huettel (2007)	Posterior superior temporal cortex (pSTC), especially RH	Activation of pSTC predicts behaviours associated with altruism and assistance (but not empathy)
	Chua et al. (2011)	dmPFC	Prediction of quitting amongst smokers based on neural correlates using smoking cessation health communications
Prevention	Janes et al. (2010)	Dorsal anterior cingulate cortex (dACC)	Likelihood of smoking relapse
	Calvert et al. (2010)	Nucleus accumbens, dopamine neuro transmitters, right prefrontal cortex (right hemisphere), orbito and dorsal lateral prefrontal cortex	Review of use of neuroscience to inform smoking prevention approaches, disgust, satisfied/deprived smokers, rituals
	Oullier, Cialdini, Thaler, and Mullainathan (2010)	Behavioural economics	Public health PSA improvements, prevention, organ donations, wastage, road safety, smoking, nutrition, hygiene

(Continued)

Table 1. (Continued)

Theme	Reference	Neural correlates and theoretical frameworks	Research findings
Value	Bartra, McGuire, and Kable (2013) Levy and Glimcher (2012) Kable and Glimcher (2009)	Ventromedial prefrontal cortex (vmPFC), dorsal medial prefrontal cortex (dmPFC), posterior cingulate cortex (PCC), striatum, anterior insula, thalamus Ventromedial prefrontal cortex (vmPFC)/orbitofrontal cortex (OFC) vmPFC, striatum, lateral prefrontal cortex, parietal cortex	Subjective value, decision-making, positive/negative valence Choice and rewards Review of valuation and choice circuit studies in decision-making
Addiction	Koob et al. (1998) Wong et al. (2015)	Dopaminergic system, nigrostriatal system, substantia nigra, corpus striatum; mesocorticolimbic dopamine system, ventral tegmental area (VTA), nucleus accumbens, amygdala, frontal cortex Psychological reactance theory	Addiction, nicotine, cocaine, marijuana, reward/non-reward pathways, withdrawal relapse, neuroadaptation Anti-smoking PSAs and smokers' responses, addiction, second-hand smoke, cessation

Despite the increase in public health and social cause marketing communications using social media sites the number of studies investigating the effectiveness of delivery is limited (Dumbrell & Steele, 2015; Gold et al., 2012). As a result, little is known about user participation characteristics, engagement, dissemination of information or patterns of temporal engagement (Dumbrell & Steele, 2015). This has made it difficult to evaluate the effectiveness and know which social media tools are the most suitable for intervention approaches of health communications (Gold et al., 2012). The paucity of research findings suggest that little is known about the key factors affecting successful public health and social cause communications on social media.

10. Successful public health communication campaigns on social media

The majority of health communications aim to raise awareness about a specific health issue or social cause. These are referred to as cause-related marketing (CRM) (Liu, 2013; Liu & Ko, 2010). SNSs enable users to interact, communicate and disseminate information collaboratively. Further, social media rapidly monitors public communications, interaction and opinion using SNSs which have the potential to investigate public health initiatives (Capurro et al., 2014).

One measure for social media campaigns' success is high levels of reach and a significant increase in donations, donors or the receipt of prestigious advertising awards. Marketing campaigns for charities have traditionally used a rational or emotion-based message (Ferrier, 2014). Additional research indicates that consumers' social cause contributions are motivated by pleasure/pain/guilt (Barone, Miyazaki, & Kimberly, 2000).

Increasingly, social media campaigns can be highly successful in achieving a vast reach. In some instances, over a billion individuals became involved (see Dumbrell & Steele, 2015) who as part of a campaign were asked to do something for a health organisation or social cause. The organisation's social media strategy was to request people to do something very easy such as spread the message on social media about a humanitarian initiative or social cause in order to increase awareness and possibly make a small donation of as little as \$1 or \$5. In some cases, these social media campaigns have gone viral. In these instances, successful health communication and social media marketing campaigns results have exceeded organisers expectations in terms of social media responses, reach, increased revenue and spin offs that have been able to motivate consumers to "act", "share", "pledge" or "challenge" on behalf of a health or social cause (see Table 2).

Research has shown that consumer neuroscience and the use of neuroscience techniques may be even more pertinent for not-for-profit health and social cause communications than for commercial organisations. Research conducted by Diekstra & Swets from DOW consultants analysed the Dutch not-for-profit institute Fonds Psychische Gezondheid's campaign "Erder is Better" (translation: "The sooner, the better") designed to improve mental health (Diekstra & Swets, 2016). fMRI results showed that while the ad was stored in long-term memory research participants' responses were adverse and caused negative emotional associations such as anger, disgust and fear (Diekstra & Swets, 2016). Further, the researchers suggested that there was the possibility that these negative associations, emotions and responses to mental health advertisements had the potential to be negatively reinforced or exacerbated by future health marketing campaigns (Diekstra & Swets, 2016). Thus, the researchers suggested the use of neuroimaging tools to analyse health communications may be of even more importance for not-for-profit organisations than for profit-oriented enterprises (Diekstra & Swets, 2016).

Another study showed that consumers attitudes towards the use of neuromarketing were favourable for not for profit organisations but not so for profit-orientated companies (Flores, Baruca, & Saldivar, 2014). These results suggest there is a significant opportunity for the application of neurological quantitative research tools for the development and analysis of public health and social cause messages using social media.

Table 2. Examples of successful health communications and social media marketing campaigns

Marketing campaign	Year	Overview	Results	Celebrity involvement emotion +ve/-ve spin offs
ManUp	2016	Encouraged men to speak up about their emotions in attempt to increase awareness and help prevent suicide in young men aged between 15 and 44	<ul style="list-style-type: none"> • 22,414 Facebook likes • 22,386 followers (@ 14 December 2016) 	<ul style="list-style-type: none"> • Public figure Guy Worland, an Australian radio announcer with Triple M • +ve emotion • Made into a 3-part documentary series with and the Australian Broadcasting Commission (ABC), funded by Movember and the University of Melbourne • Documentary reached 333,000 viewers • Consumer generated offshoots such as ManUp SpeakUp www.manup.org.au • twitter 526 followers, 2281 likes, 550 tweets @16 December 2016
World health day	2014	Twitter used to conduct global public health campaign for World Health Day 2014	<ul style="list-style-type: none"> • 93 million accounts reached globally (Dumbrell & Steele, 2015) • Tweeters focused on dissemination of information rather than making casual or humorous tweets (Dumbrell & Steele, 2015) 	<ul style="list-style-type: none"> • Due to large following of celebrity or public figure tweets achieved reach of 93 million global accounts requiring only minimal tweets from campaign organisers (Dumbrell & Steele, 2015)
UNICEF top project	2014	<ul style="list-style-type: none"> • Droga5 and UNICEF • Challenged individuals to refrain from using their phones for as long as possible • In exchange UNICEF sponsors made donation for every 10 min a registered individual did not use their cell phone in order to provide a day's clean water for a needy child (Droga5, 2014) 	<ul style="list-style-type: none"> • Campaign asked individuals to "reflect on what it means to be without water by giving up access to something far less vital: cell phones" (Droga5, 2014) • Campaign appealed to individual's sense of humanity, care, kindness and compassion 	<ul style="list-style-type: none"> • Celebrities used for earlier Tap Project campaigns
Ice-bucket challenge	2014	Motor Neuron Disease (MND)	<ul style="list-style-type: none"> • Raised an estimated \$220 million USD globally • Over \$3 million AUD in Australia (Motor Neuron Disease, 2016) • Total income increased significantly for 2014/15 at \$1,769,505 compared to \$194,941 previous year (Motor Neuron Disease, 2016) • Facebook fans increase from 2,700 to 7,000 (Motor Neuron Disease, 2016) • MND Australia newsletter subscribers increased by 5,000 (Motor Neuron Disease, 2016) 	

(Continued)

Table 2. (Continued)

Marketing campaign	Year	Overview	Results	Celebrity involvement emotion +ve/-ve spin offs
World humanitarian day	2012	<ul style="list-style-type: none"> • 19 August 2012 by Droga 5, United Nations and Beyoncé • Aimed to increase awareness of worldwide humanitarian needs • Asked people to do something good for another person to celebrate World Humanitarian Day • Increased awareness of 19 August as World Humanitarian Day (Droga5, 2012b) 	<ul style="list-style-type: none"> • Campaign appealed to individual's sense of hope, compassion, humanity, kindness. • Social reach of 1,029,763,492 (Droga5, 2012b) • Enabled individuals to pledge support, do something good for someone else, and spread a global message of hope on social media (Droga5, 2012b) 	<ul style="list-style-type: none"> • Beyoncé
Help, I want to save a life	2012	<ul style="list-style-type: none"> • Aimed to reduce entry barrier and increase number of bone marrow registrations (Droga5, 2012a) • Health Communication appealed to individual's humanity, kindness, care and goodwill • TED Conference launched the campaign in 2012 (D&AD, 2012) 	<ul style="list-style-type: none"> • Achieved unexpected campaign success and results • Tripled bone marrow registrations (D&AD, 2012) • Increased bandage sales by 1900% (D&AD, 2012) • Increased global brand awareness (D&AD, 2012) • Campaign won two Gold Lion awards (D&AD, 2012) • Campaign won Cannes Grand Prix for Good award (D&AD, 2012) 	<ul style="list-style-type: none"> • Stanford Graduate School of Business incorporated campaign into its curriculum (D&AD, 2012)

11. Conclusion

Neurological techniques are additional market research tools that can provide insight into individuals' decision-making. Qualitative research methods such as self-reported depth interviews (Davidson, 2004) and focus groups are often biased (Vecchiato, Kong, Maglione, & Wei, 2011), subjective (Kenning & Linzmajer, 2011), influenced by interviewers (Vecchiato et al., 2011) and unable to identify individuals' nonconscious or implicit decision-making processes. As consumer neuroscience is an emergent field of research (Eser et al., 2011; Kenning & Plassmann, 2008) there are a limited number of studies using neuroscience tools to analyse public health and social cause marketing communications. As a result, there is considerable scope for the application of neurological quantitative research tools for the development and analysis of public health messages and television advertisements using social media platforms. Consumer neuroscience research offers the potential to provide significant contributions towards the future design of health and social cause communications. In addition, the application of consumer neuroscience techniques can test the effects of fear and shock messages vs. positive self-growth emotional messages. Consumer neuroscience is capable of analysing the effectiveness of different types of messages for health and social cause campaigns. Consumer neuroscience research methodologies can contribute towards the development of more reliable conceptual models about promoting prosocial healthy behaviours and avoid-ing harmful behaviours.

Acknowledgements

Sincere thanks to Dr Nives Zubcevic-Basic for suggestions and insight. Dr Nives Zubcevic-Basic, Senior Lecturer, Marketing; Director, Master of Marketing, Swinburne Business School, Faculty of Business and Law, Swinburne University of Technology, Melbourne, Australia.

Funding

This work was supported by Faculty of Health, Arts and Design, Swinburne University of Technology, to attend the 2016 Neuromarketing World Forum, which assisted with the development of this paper.

Competing interests

The authors declare no competing interest.

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Citation information

Cite this article as: Public health social media communications and consumer neuroscience, Joanne M. Harris, Joseph Ciorciari & John Gountas, *Cogent Psychology* (2018), 5: 1434058.

References

Ajzen, I., & Fishbein, M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychological Bulletin*, 84(5), 888–918. <https://doi.org/10.1037/0033-2909.84.5.888>
Andreoni, J. (1990). Impure altruism and donations to public goods: A theory of warm-glow giving. *The Economic Journal*, 464–477. <https://doi.org/10.2307/2234133>
Atkin, C. K. (1990). Effects of televised alcohol messages on teenage drinking patterns. *Journal of Adolescent Health*

Care, 11(1), 10–24. [https://doi.org/10.1016/0197-0070\(90\)90125-L](https://doi.org/10.1016/0197-0070(90)90125-L)

Babiloni, F. (2012). Consumer neuroscience: A new area of study for biomedical engineers. *IEEE Pulse*, 3(3), 21–23. <https://doi.org/10.1109/MPUL.2012.2189166>

Barone, M. J., Miyazaki, A. D., & Kimberly, T. (2000). The influence of cause-related marketing on consumer choice: Does one good turn deserve another? *Journal of the Academy of Marketing Science*, 28(2), 248–262. <https://doi.org/10.1177/0092070300282006>

Bartra, O., McGuire, J. T., & Kable, J. W. (2013). The valuation system: A coordinate-based meta-analysis of BOLD fMRI experiments examining neural correlates of subjective value. *NeuroImage*, 76, 412–427. <https://doi.org/10.1016/j.neuroimage.2013.02.063>

Bennett, G. G., & Glasgow, R. E. (2009). The delivery of public health interventions via the internet: Actualizing their potential. *Annual Review of Public Health*, 30, 273–292. <https://doi.org/10.1146/annurev.publhealth.031308.100235>

Braeutigam, S. (2005). Neuroeconomics – From neural systems to economic behaviour. *Brain Research Bulletin*, 67(5), 355–360. <https://doi.org/10.1016/j.brainresbull.2005.06.009>

Calvert, G., Gallopel-Morvan, K., Sauneron, S., & Oullier, O. (2010). In the smoker's head: Neuroscience and smoking prevention. In Oullier, O., & Sauneron, S. (eds.). *Improving public health prevention with behavioural, cognitive and neuroscience* (pp. 74–93, Chap. 7). Paris: La Documentation Française. Retrieved from http://oullier.free.fr/files/2010_Calvert-Gallopel-Morvan-Sauneron-Oullier_Neuroscience-Prevention-Public-Health_Prevention-Public-Health-Neuroscience-Book_Antismoking-Tobacco.pdf

Capurro, D., Cole, K., Echavarría, M. I., Joe, J., Neogi, T., & Turner, A. M. (2014). The use of social networking sites for public health practice and research: A systematic review. *Journal of Medical Internet Research*, 16(3), e79. <https://doi.org/10.2196/jmir.2679>

Chua, H. F., Ho, S. S., Jasinska, A. J., Polk, T. A., Welsh, R. C., Liberzon, I., & Strecher, V. J. (2011). Self-related neural response to tailored smoking-cessation messages predicts quitting. *Nature*, 20(1), 1.

Commonwealth of Australia. (2015). *Campaign advertising by Australian government departments and agencies – Annual report 2014–15*. Canberra: Department of Finance, Governance and Resource Management.

- D&AD. (2012). *Case study: Help I want to save a life*. Retrieved from <http://www.dandad.org/en/d-ad-droga5-social-good-campaign/>
- Davidson, R. J. (2004). What does the prefrontal cortex “do” in affect: Perspectives on frontal EEG asymmetry research. *Biological Psychology*, 67(1–2), 219–234. <https://doi.org/10.1016/j.biopsycho.2004.03.008>
- Deloitte. (2015). *2015 health care outlook Australia*. Deloitte Australia, Deloitte Touche Tohmatsu Limited.
- Deppe, M., Schwindt, W., Kugel, H., Plassmann, H., & Kenning, P. (2005). Nonlinear responses within the medial prefrontal cortex reveal when specific implicit information influences economic decision making. *Journal of Neuroimaging*, 15(2), 171–182. <https://doi.org/10.1111/j.1552-6569.2005.tb00303.x>
- Diekstra, S., & Swets, D. (2016). *Neuro for non-profit: A mental health case study*. Neuromarketing Science and Business Association.
- Droga5. (2012a). *Help, I want to save a life*. Retrieved from <http://droga5.com/work/help-want-save-life>
- Droga5. (2012b, August 19). *World humanitarian day*. Retrieved from <http://droga5.com/work/175>
- Droga5. (2014). *UNICEF tap project*. Retrieved from <http://droga5.com/work/tap-project-2014>
- Dumbrell, D., & Steele, R. (2015). *#worldhealthday 2014: The anatomy of a global public health twitter campaign*. Paper presented at the 48th Annual Hawaii International Conference on System Sciences HICSS 2015, Kauai, Hawaii, USA.
- Eser, Z., Isin, F. B., & Tolon, M. (2011). Perceptions of marketing academics, neurologists, and marketing professionals about neuromarketing. *Journal of Marketing Management*, 27(7–8), 854–868. <https://doi.org/10.1080/02672571003719070>
- Fisher, C. E., Chin, L., & Klitzman, R. (2010). Defining neuromarketing: Practices and professional challenges. *Harvard Review of Psychiatry*, 18(4), 230–237. <https://doi.org/10.3109/10673229.2010.496623>
- Flores, J., Baruca, A., & Saldívar, R. (2014). Is neuromarketing ethical? Consumers say yes. Consumers say No. *Journal of Legal, Ethical and Regulatory Issues*, 17(2), 77.
- Ferrier, A. (2014). *The advertising effect: How to change behavior*. Australia & New Zealand: Oxford University Press.
- Foxcroft, D. R., Lister-Sharp, D., & Lowe, G. (1997). Alcohol misuse prevention for young people: A systematic review reveals methodological concerns and lack of reliable evidence of effectiveness. *Addiction*, 92(5), 531–537. <https://doi.org/10.1111/j.1360-0443.1997.tb02911.x>
- Gazzaniga, M. S. (2015). *Tales from Both Sides of the Brain: A Life in Neuroscience*. New York, NY: Ecco Press.
- Glimcher, P. W., & Rustichini, A. (2004). Neuroeconomics: The confluence of brain and decision. *Science*, 306(5695), 447–452. <https://doi.org/10.1126/science.1102566>
- Gold, J., Pedrana, A. E., Stooze, M. A., Chang, S., Howard, S., Asselin, J., ... Hellard, M. E. (2012). Developing health promotion interventions on social networking sites: Recommendations from the FaceSpace project. *Journal of Medical Internet Research*, 14(1), e30. <https://doi.org/10.2196/jmir.1875>
- Hanna, R., Rohm, A., & Crittenden, V. L. (2011). We're all connected: The power of the social media ecosystem. *Business Horizons*, 54(3), 265–273. <https://doi.org/10.1016/j.bushor.2011.01.007>
- Hare, T. A., Camerer, C. F., Knopfle, D. T., O'Doherty, J. P., & Rangel, A. (2010). Value computations in ventral medial prefrontal cortex during charitable decision making incorporate input from regions involved in social cognition. *The Journal of Neuroscience*, 30(2), 583–590. <https://doi.org/10.1523/JNEUROSCI.4089-09.2010>
- Hubert, M., & Kenning, P. (2008). A current overview of consumer neuroscience. *Journal of Consumer Behaviour*, 7(4–5), 272–292.
- Heather, C. Lench, H. C., & Levine, L. J. (2005). Effects of fear on risk and control judgements and memory: Implications for health promotion messages. *Cognition and Emotion*, 19(7), 1049–1069.
- Hornik, R. (2002). *Public health communication: Evidence for behavior change*. London: Routledge.
- Janes, A. C., Pizzagalli, D. A., Richardt, S., Chuzy, S., Pachas, G., Culhane, M. A., ... Kaufman, M. J. (2010). Brain reactivity to smoking cues prior to smoking cessation predicts ability to maintain tobacco abstinence. *Biological Psychiatry*, 67(8), 722–729. <https://doi.org/10.1016/j.biopsycho.2009.12.034>
- Javor, A., Koller, M., Lee, N., Chamberlain, L., & Ransmayr, G. (2013). Neuromarketing and consumer neuroscience: Contributions to neurology. *BMC Neurology*, 13(1), 815. <https://doi.org/10.1186/1471-2377-13-13>
- Kable, J. W., & Glimcher, P. W. (2009). The neurobiology of decision: Consensus and controversy. *Neuron*, 63(6), 733–745. <https://doi.org/10.1016/j.neuron.2009.09.003>
- Kenning, P., & Linzmajer, M. (2011). Consumer neuroscience: An overview of an emerging discipline with implications for consumer policy. *Journal für Verbraucherschutz und Lebensmittelsicherheit [Journal of Consumer Protection and Food Safety]*, 6(1), 111–125. <https://doi.org/10.1007/s00003-010-0652-5>
- Kenning, P., & Plassmann, H. (2005). NeuroEconomics: An overview from an economic perspective. *Brain Research Bulletin*, 67(5), 343–354. <https://doi.org/10.1016/j.brainresbull.2005.07.006>
- Kenning, P., & Plassmann, H. (2008). How neuroscience can inform consumer research. *IEEEExplore, IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 16(6), 532–538. <https://doi.org/10.1109/TNSRE.2008.2009788>
- Knutson, B., Fong, G. W., Adams, C. M., Varner, J. L., & Hommer, D. (2001). Dissociation of reward anticipation and outcome with event-related fMRI. *NeuroReport*, 12(17), 3683–3687. <https://doi.org/10.1097/00001756-200112040-00016>
- Koob, G. F., Sanna, P. P., & Bloom, F. E. (1998). Neuroscience of addiction. *Neuron*, 21(3), 467–476. [https://doi.org/10.1016/S0896-6273\(00\)80557-7](https://doi.org/10.1016/S0896-6273(00)80557-7)
- Lee, N., Broderick, A. J., & Chamberlain, L. (2007). What is ‘neuromarketing’? A discussion and agenda for future research. *International Journal of Psychophysiology*, 63(2), 199–204. <https://doi.org/10.1016/j.ijpsycho.2006.03.007>
- Levy, D. J., & Glimcher, P. W. (2012). The root of all value: A neural common currency for choice. *Current Opinion in Neurobiology*, 22(6), 1027–1038. <https://doi.org/10.1016/j.conb.2012.06.001>
- Liu, G. (2013). Impacts of instrumental versus relational centered logic on cause-related marketing decision making. *Journal of Business Ethics*, 113(2), 243–263. <https://doi.org/10.1007/s10551-012-1292-8>
- Liu, G., & Ko, W. (2010). An analysis of cause-related marketing implementation strategies through social alliance: Partnership conditions and strategic objectives. *Journal of Business Ethics*, 100, 253–281.
- Loss, J., Lindacher, V., & Curbach, J. (2014). Online social networking sites – A novel setting for health promotion? *Health & Place*, 26, 161–170. <https://doi.org/10.1016/j.healthplace.2013.12.012>
- Moll, J., Krueger, F., Zahn, R., Pardini, M., de Oliveira-Souza, R., & Grafman, J. (2006). Human fronto-mesolimbic networks guide decisions about charitable donation. *Proceedings of the National Academy of Sciences*, 103(42), 15623–15628. <https://doi.org/10.1073/pnas.0604475103>

- Morin, C. (2011). Neuromarketing: The new science of consumer behavior. *Society*, 48(2), 131–135. <https://doi.org/10.1007/s12115-010-9408-1>
- Motor Neuron Disease. (2016). *Annual review 2014–2015*. Retrieved from <https://www.mndaust.asn.au/About-us/Annual-reviews/review.aspx>
- Oullier, O., Cialdini, R., Thaler, R. H., & Mullainathan, S. (2010). Improving public health prevention with a nudge. *Economic Perspectives*, 6(2), 117–136.
- Pechmann, C., Zhao, G., Goldberg, M. E., & Reibling, E. T. (2003). What to convey in antismoking advertisements for adolescents: The use of protection motivation theory to identify effective message themes. *Journal of Marketing*, 67(2), 1–18. <https://doi.org/10.1509/jmkg.67.2.1.18607>
- Plassmann, H., Ramsøy, T. Z., & Milosavljevic, M. (2012). Branding the brain: A critical review and outlook. *Journal of Consumer Psychology*, 22(1), 18–36. <https://doi.org/10.1016/j.jcps.2011.11.010>
- Plassmann, H., Venkatraman, V., Huettel, S., & Yoon, C. (2015). Consumer neuroscience: Applications, challenges, and possible solutions. *Journal of Marketing Research*, 52(4), 427–435. <https://doi.org/10.1509/jmr.14.0048>
- Plassmann, H., Yoon, C., Feinberg, F. M., & Shiv, B. (2011). In J. N. Shetch & N. K. Malhotra (eds.), *Consumer neuroscience*. Wiley International Encyclopedia of Marketing. Chichester: John Wiley & Sons Ltd.
- Poldrack, R. A. (2011). Inferring mental states from neuroimaging data: From reverse inference to large-scale decoding. *Neuron*, 72(5), 692–697. <https://doi.org/10.1016/j.neuron.2011.11.001>
- Rilling, J. K., & Sanfey, A. G. (2011). The neuroscience of social decision-making. *Annual Review of Psychology*, 62, 23–48. <https://doi.org/10.1146/annurev.psych.121208.131647>
- Rossiter, J. R., Silberstein, R., Harris, P. G., & Nield, G. (2001). Brain-imaging detection of visual scene encoding in long-term memory for TV commercials. *Journal of Advertising Research*, 41(2), 13–21. <https://doi.org/10.2501/JAR-41-2-13-21>
- Rothman, A., Bartels, R. D., Wlaschin, J., & Salovey, P. (2006). The strategic use of gain- and loss-framed messages to promote healthy behavior: How theory can inform practice. *Journal of Communication*, 56, S202–S220. <https://doi.org/10.1111/j.1460-2466.2006.00290.x>
- Ruiter, R. A., Abraham, C., & Kok, G. (2001). Scary warnings and rational precautions: A review of the psychology of fear appeals. *Psychology and Health*, 16(6), 613–630. <https://doi.org/10.1080/08870440108405863>
- Schoenbachler, D. D., Ayers, D. J., & Gordon, G. L. (2011). Adolescent response to anti-drug public service announcements: A segmentation approach. *Journal of Applied Business Research*, 12(2), 9–21.
- Silberstein, R. B., Harris, P. G., Nield, G. A., & Pipingas, A. (2000). Frontal steady-state potential changes predict long-term recognition memory performance. *International Journal of Psychophysiology*, 39(1), 79–85. [https://doi.org/10.1016/S0167-8760\(00\)00118-5](https://doi.org/10.1016/S0167-8760(00)00118-5)
- Smids, A., Hsu, M., Sanfey, A., Boksem, M., Ebstein, R., Huettel, S., ... Yoon, C. (2014). Advancing consumer neuroscience. *Marketing Letters*, 25(3), 257–267. doi:10.1007/s11002-014-9306-1
- Tankersley, D., Stowe, C. J., & Huettel, S. A. (2007). Altruism is associated with an increased neural response to agency. *Nature Neuroscience*, 10(2), 150–151. <https://doi.org/10.1038/nn1833>
- Vecchiato, G., Cherubino, P., Trettel, A., & Babiloni, F. (2013). *Neuroelectrical brain imaging tools for the study of the efficacy of TV advertising stimuli and their application to neuromarketing*. Berlin: Springer. <https://doi.org/10.1007/978-3-642-38064-8>
- Vecchiato, G., Kong, W., Maglione, A. G., & Wei, D. (2011). Understanding the impact of TV commercials: Electrical neuroimaging. *IEEE pulse*, 3(3), 42–47.
- Wong, N. C. H., Harrison K. J., & Harvell, L. A. (2015). Reactance and public health messages: The unintended dangers of anti-tobacco PSAs, *Studies in Media and Communication*, 3(2), 72–83. Retrieved from <http://smc.redfame.com>
- Young, C. (2002). Brain waves, picture sorts®, and branding moments. *Journal of Advertising Research*, 42(4), 42–53. <https://doi.org/10.2501/JAR-42-4-42-53>



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