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What is 'neuromarketing'? A discussion and agenda for future research

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Abstract

Recent years have seen advances in neuroimaging to such an extent that neuroscientists are able to directly study the frequency, location, and timing of neuronal activity to an unprecedented degree. However, marketing science has remained largely unaware of such advances and their huge potential. In fact, the application of neuroimaging to market research – what has come to be called 'neuromarketing' – has caused considerable controversy within neuroscience circles in recent times. This paper is an attempt to widen the scope of neuromarketing beyond commercial brand and consumer behaviour applications, to include a wider conceptualisation of marketing science. Drawing from general neuroscience and neuroeconomics, neuromarketing as a field of study is defined, and some future research directions are suggested.

Keywords: Neuroscience; Neuromarketing; Neuroeconomics; Marketing; Neuroimaging

1. Introduction

Recent years have seen an explosion in the abilities of neuroscientists to directly study cortical activity in terms of frequency, time, and space. The psychological and physiological sciences have been quick to apply such techniques to make startling advances in our understanding of the brain and cognition. However, most social sciences have yet to adopt neuroimaging as a standard tool or procedure for research. In particular, while economics has begun to utilise neuroimaging techniques in its research – resulting in the creation of 'neuroeconomics' (e.g. Braeutigam, 2005; Kenning and Plassmann, 2005; Rustichini, 2005) – marketing science has been far slower to wake up to the benefits of imaging research, despite both fields of study sharing many common concerns regarding decision making and exchange.

There are a number of possible reasons for the lack of take-up of brain imaging methodologies in marketing science. From the perspective of the marketing academic, neuroscience and cognitive psychology in general can be intimidating subjects. Furthermore, many marketing academics may see imaging techniques as simply 'unattainable' to them in their own departments. However, this is generally not the case, as most business academics work within the context of a larger university with considerable facilities for brain imaging. Even if instruments such as positron emission tomography (PET), magnetoencephalography (MEG), or functional magnetic resonance imaging (fMRI) are unavailable, electroencephalography (EEG) and galvanic skin response (GSR) technology will likely be. However, the lack of knowledge of even the existence of such techniques leads to a situation where they are not considered as potential avenues of exploration.

One possible solution to this is cross-school or departmental collaboration between business and neuroscience research groups — both in terms of project design and procedure. However, from the perspective of the neuroscience researcher, there also appear to be some barriers to collaboration. In particular, while neuroeconomics appears to have raised nary a ripple of moral concern, recent opinions on 'neuromarketing' within the neuroscience literature have strongly questioned the ethics of applying imaging techniques to the purpose of "finding the 'buy button in the brain' and …creating advertising campaigns that we will be unable to resist" (see the July 2004 Editorial of Nature Neuroscience, p. 683). Emotive language such as this does little to further the possibility of academic collaboration between marketing and neuroscience researchers. Furthermore, it seems such views are reasonably widely held

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within neuroscience research groups. This is interesting, since many of the problems investigated by neuroeconomics research are virtually identical to what a marketing researcher would recognise as part of their functional domain (cf. Braeutigam, 2005; Kenning and Plassmann, 2005; e.g. Deppe et al., 2005). Yet it is marketing, not economics, which has caused such disquiet within neuroscience circles. Unfortunately, this concern (see also the February 2004 Edition in The Lancet, p. 71) – while containing possibly more than a grain of truth – exhibits a fundamental misunderstanding of marketing science in an *academic* (rather than commercial) sense.

More specifically, without entering the long and wide-ranging debate over the scope of marketing, marketing research in business schools is essentially about understanding, explaining, and predicting individual, group, and organisational behaviour relevant to markets. Such a remit encompasses a much wider range of fields than simply how to influence consumers to buy a product. The 'buy button' would be a finding of interest to academic marketing researchers certainly, but then so would something like the 'love button' to psychological scholars. Commercial interests are of course free to apply insights from academic marketing research (as they are from psychological and economic research), but this is not *necessarily* the remit of the marketing academic. Unfortunately, the barely concealed disdain for the idea of 'neuromarketing' in the neuroscience literature is clearly based on the opinion that marketing research is a commercial activity purely designed to sell products to the public, which seems to be behind the editor of *Science*, Donald Kennedy's, concern that "brain imaging will be used in ways that infringe personal privacy to a totally unacceptable degree" (The Lancet, February 2004).

This note is aimed at providing a scholarly perspective on the emerging and controversial field of 'neuromarketing'. In doing so, we aim to define what we feel neuromarketing itself is, as well as provide a brief overview of the prior work in the area. Following this, we will set out a number of key issues within marketing research which neuroimaging is likely to help provide insight into. These problems are intended to highlight how collaboration between neuroimaging and marketing researchers can advance our knowledge of many key areas pertaining not only to consumer choice, but how we interact, relate, and behave in the context of markets and organisations. Our aim is not to set boundaries on what can and cannot be investigated in such a context, but to try to encourage and inspire thought about how neuroimaging can enhance our understanding of what is – for good or ill – an unavoidable part of contemporary society.

2. Exploring and delineating the scope of neuromarketing

In recent times, 'neuromarketing' has come to mean the application of neuroimaging techniques to sell products, or to — as *The Lancet* puts it "dazzle potential clients with snazzy imaging technology" (February 2004, p. 71). A number of agencies have emerged offering neuroimaging (particularly fMRI) solutions to commercial marketing problems. In the US, BrightHouse has developed a particularly high profile, while in the UK Neurosense and Neuroco have also recently opened for business. Furthermore, the Centre for Experimental Consumer Psychology at University of Wales (Bangor) collaborates with many consumer goods firms, including Unilever. Unfortunately, much of the output of such centers is commercially sensitive, meaning that there is little information available about what they actually *do*, even though newspapers and other outlets find such ideas compelling. Nevertheless, neuromarketing agencies have been involved in work as diverse as evaluating car preferences for DaimlerChrysler (Erk et al.'s published output of which is referred to below), the relationship between smells and colors of food products, and which advertising media are most likely to be successful in delivering different types of messages.

It is evident that the idea of evaluating the neurological correlates of consumer behaviour has caused considerable excitement within the marketing profession (e.g. Marketing Week, 2005; Mucha, 2005). Articles such as these, and the aforementioned editorials in the neuroscience literature, give the impression that neuromarketing is solely the application of neuroimaging to consumer behaviour, and how we respond to brands and advertisements. Yet even a cursory glance at the academic literature will show the scope of marketing research to be considerably broader than the response to products, brands and advertising, and even consumer behaviour in general. Any definition of neuromarketing must take into account this diversity of research. Neuroeconomics defines itself as "the application of neuroscientific methods to analyze and understand economically relevant behaviour" (Kenning and Plassmann, 2005, p. 344). Following this lead, neuromarketing as a field of study can simply be defined as the application of neuroscientific methods to analyze and understand human behaviour in relation to markets and marketing exchanges. Such a definition has two main upshots: firstly, it moves consideration of neuromarketing away from being solely the use of neuroimaging by commercial interests for their benefit; secondly, the scope of neuromarketing research is widened from solely consumer behaviour, to include many more avenues of interest, such as inter and intra-organisational research, which are common in the marketing research literature.

The contribution neuroscientific methods can make to understanding of marketing-relevant human behaviour is likely to be considerable. The advantages of physiological measurement for marketing have been noted for at least two decades (e.g. Weinstein et al., 1984). In particular, the self-assessment measures commonly used in marketing research rely totally on the ability and willingness of the respondent to accurately report their attitudes and/or prior behaviours (Petty and Cacioppo, 1983). Physiological responses, however, can be collected when respondents are directly participating in the behaviour, are difficult for subjects to control (although not difficult to affect), and although there are individual differences in physiological responding, variations in social situations and stimuli have also been shown to have a powerful effect across individuals (Cacioppo and Petty, 1985). As seen above though, neuromarketing has not been without critics and, even within academic

circles, concerns have been raised over the ability of neurological methods to adequately take into account the panoply of relevant variables in marketing theories (e.g. Stewart, 1984; 1985).

Despite its vast potential, it is clear that prior applications of neuroimaging within the marketing literature have been solely focussed on brands and consumer behaviour. In particular, EEG has been used to explore reactions to TV advertisements in a number of ways. For example, Young (2002) explored whether specific moments within ads are primarily responsible for brand development and attention. Memory and information processing have also been of interest, with Rossiter et al. (2001) using EEG to show that certain visual scenes – showing fastest activation in left frontal cortices – are also better recognised. In the neuroscience literature, Ioannides et al. (2000) and Ambler et al. (2000) report the results of MEG experiments showing how cognitive and affective advertisements elicit activity in different cortical centers. Taken together, such findings suggest that different aspects or types of advertising generate significantly different types of brain activity, possibly leading to differences in recall and/or other measures of ad effectiveness. Yet such research is piecemeal at present.

Consumer choice-making has also proved a popular subject for neuroimaging research, although it has yet to find its way into the marketing literature. Braeutigam et al. (2001, 2004) for example have explored the difference between predictable and unpredictable choices, where predictability can be related to both the frequency of prior usage of the item, and the time gap between the choice and exposure to marketing stimuli. This research suggests that different brain regions are activated according to choice predictability, with unpredictable choices eliciting activity in regions associated with silent vocalisation and judgement of rewards. Gender differences were also found. Interestingly, recent research has suggested that a variety of brain areas are associated with pleasure and rewards (e.g. Senior, 2003), and a number of these areas have been implicated in prior research. Erk et al. (2002) found that objects of high social value (sports cars) resulted in higher reward center activity (orbitofrontal cortices, anterior congulate regions, occipital cortices) than lesser-valued objects such as small cars. Finally, in a study which received substantial attention, McClure et al. (2004) discovered that there was a higher preference for Coke over Pepsi, and also the recruitment of emotion and affect-related areas of the brain (hippocampus and dorsolateral prefrontal cortex), when respondents were told they were drinking Coke. However, blind testing suggested no such thing. Such work reinforces the complexity of choice-making, as well as the value of emotional, situational, and informational resources.

3. Some directions for scholarly neuromarketing research

Research in marketing is considerably broader than simply exploring end consumers and their decision making though. The following section is aimed at giving a flavour of the types of questions deemed important by marketing scholars, where neuroimaging techniques may prove illuminating. The importance of such areas is evidenced by their appearance in the calls for research by institutes such as the *Marketing Science Institute* and the *Institute for the Study of Business Markets*, as well as in calls for papers by numerous top-level marketing academic journals. We give special attention to non-consumer level questions in an attempt to broaden the scope of debate as to the application of neuroimaging to marketing research. Interestingly, many of these questions have been investigated in the context of neuroeconomics, yet marketing research has much to offer in such areas, among others.

3.1. Trust

Trust is an issue which has been increasing in prominence within marketing for the last decade. However, while consumer trust in brands and products is of course vital, marketing research has investigated trust on many other levels. Inter-organisational dealings such as joint ventures, strategic alliances, and business-to-business buyer/seller dyads depend on mutual trust between parties. On one hand, consumer trust in marketing claims is crucial if they are to be believed, and ultimately lead to purchase behaviour from consumers. The social utility of trust is clear when one considers that firms selling 'fair trade', 'organic', or other socially beneficial products must rely on consumer trust in their claims for success. Furthermore, in an organisational context, relationships depend on mutual trust between the parties. Without trust, opportunistic behaviour dominates interactions, negating the possibility of long-term relationships between parties and again leading to a suboptimal situation for all. Marketing research has commonly conceptualised trust as more than a simple rational economic calculation (Morgan and Hunt, 1994), and it seems likely that neuroscientific methods can provide considerable insight into the nature and development of trust.

Neuroeconomic research has begun to investigate concepts of trust beyond rationality in recent times (King-Casas et al., 2005). Neuromarketing research can also be insightful to the investigation of trust. First and foremost, it is clear that – despite the centrality of trust to marketing relationships at a number of levels – controversies over the very nature of trust still exist (e.g. Ali and Birley, 1998; Geyskens et al., 1998). Neuroimaging is likely to offer considerable insight here. Research suggests that the caudate nucleus, which is often active when learning about stimuli–response relations, is involved in experimental games requiring some kind of trust (King-Casas et al., 2005). Yet is trust a simple response to a repeated positive stimulus, or something more? More interestingly, is the trust a buyer says they have in a seller, or a consumer in a product claim, similar in terms of the nature and location of brain activity to the trust that individual says they have in a close friend or family member? In particular, measuring both the spatial and temporal characteristics of neuronal activity may be important — for example does trust in an advertising claim or new business partner require increased information processing effort and time than trust in a long-term friend? This will have important implications as to the nature of trust. Furthermore, is consumer trust in claims relating to a product similar to a

purchasing agent's trust in a contract with a supplier, and in turn is this of the same nature as the purchasing agent's trust in the individual sales executive they have negotiated with? Can trust be transferred from an organisation to a representative of that organisation? Finally, does trust evolve throughout the course of an inter-organisational relationship, or with continuing loyalty of a consumer to a single brand? Is 'trust' ever truly existent in short-term marketing relationships? Exploring and understanding such questions about the nature of trust will then lead to greater ability to explore the antecedent factors to trust, and an ability to enhance firms' ability to build trust with customers and collaborators for mutually beneficial outcomes.

3.2. Pricing

Pricing is a key tool used by organisations in the positioning of their products. Commensurate with this, much marketing research has investigated the effects of price on consumers (Bijmolt et al., 2005). Despite the amount of academic knowledge available, companies appear to use little of it when setting prices, leading to suboptimal situations for both consumers and firms. Understanding the psychology of pricing is of crucial importance if firms are to make optimal decisions and in fact has considerable utility in a broader sense. Pricing research has implications for how we understand information processing in any decision context where resources and information are scarce and costs must be weighed against benefits. Recent behavioural research for example has explored errors made by consumers when they process prices ending in 0.99 rather than a whole number — suggesting that individuals pay less attention to later numbers in a sequence (Bizer and Schindler, 2005). Other research has begun to investigate the social role of price, and how individual differences can influence how prices are perceived (Amaldoss and Jain, 2005).

At this stage however, almost all pricing research is behavioural in nature, and relies on 'assumptions' about what actually occurs when individuals process pricing information. In fact, pricing seems to lend itself almost perfectly to neuroimaging research. For example, simultaneously exploring the temporal and spatial nature of brain activity may help us understand exactly why prices such as '$4.99' are perceived as significantly cheaper than those such as '$5.00'. Do individuals really ignore the final two digits, or are they processed in a different manner or at a later time — for example only when detailed comparative decisions must be made? Furthermore, do time or other pressures influence the processing of prices? Also, neuroimaging looks likely to provide considerable insight into the nature of price information. Is the price of products a purely rational piece of information, or does it have emotional and/or reward-based connotations? It seems likely that the price of a basic product such as sugar is very different in nature from the price of a conspicuous product such as a Nike sports shoe, or a Porsche sports car, which should be evidenced in changes in the location of brain activity when these prices are viewed alongside their associations. Research such as this will allow us not only to understand how prices are processed, but will afford insight into all situations where seemingly rational information is processed in decision-making situations.

3.3. Negotiation

With exchange being such a central concept in marketing, negotiations are of critical importance. For example, consumers are often in situations where they must negotiate prices or other benefits with marketing operatives — especially for big ticket items such as cars, houses, and the like. Negotiation though is an unpleasant experience for many consumers, so much so that some organisations differentiate themselves by explicitly stating 'no negotiation' (Trocchia, 2004). Inter-organisational negotiations are also a key contributor to the efficient functioning of markets, whether they be for strategic alliances, short-term collaborations, or even manufacturer–supplier negotiations.

Game theory has proven of considerable interest in economic and marketing research when examining interactions in situations where differing payoffs exist which are known to participants (e.g. Welling and Kamann, 2001). Game theoretic models have also proven useful in the evolution of neuroeconomic research (Braeutigam, 2005; Kenning and Plassmann, 2005; Rustichini, 2005). Neuroeconomic research on games can offer considerable insight into cortical activity in decision making (Rustichini, 2005). However, they tend to be focussed on competitive/cooperative behaviour (McAfee and McMillan, 1996) rather than the negotiation processes which may lead to behaviour. Unfortunately, the marketing literature currently provides little insight into the underlying processes which lie behind negotiating behaviour, and how others evaluate various negotiation strategies (Trocchia, 2004).

By contrast, neuroimaging research has already begun to investigate negotiating behaviour. Specifically, evidence suggests that emotion as well as rational cognition is a major influence on negotiating behaviour, especially when offers are considered to be unfair (Sanfey et al., 2003). In a marketing context, research such as this looks likely to help understand when and how consumers (as well as organisational agents) are likely to let their emotions override their rationality in negotiating prices or other deals. This may ultimately help consumers get a better deal and reduce those times when we look back with regret at a purchase. Other (fMRI) research has suggested that those who cooperate in an exchange are more likely to exhibit activity in the areas associated with our understanding of others' intentions (McCabe et al., 2001). Extending such research using newer multi-modal methods may further enhance our ability to understand exactly why people do or do not cooperate, even in situations where it may be optimal. For example, what situations cause us to ignore other people's benefits and solely focus on our own, or vice versa? Exploring differential brain activity in both a temporal and spatial sense may provide insight here. Furthermore, what areas or types of cortical activity are associated with risky negotiating tactics or negotiation tactics deliberately intended to harm another party? Investigating the neuronal activity underlying such suboptimal behaviours may allow us to reduce their likelihood and increase mutually beneficial outcomes to negotiation.

3.4. Marketing and society: ethics

The last decade has seen an explosion of interest in the impact of various marketing activities on society, with particular focus on ethical issues within marketing. This interest has not been restricted to marketing research, but also from disciplines like communications, sociology, politics, and not least psychology. Most obvious of these areas has been advertising's impact. Ethics in marketing is not solely concerned with the impact of advertising messages on society though. Other scholars have concerned themselves with the impact of globalisation of markets, such as fair trade and ethical production. Research has also begun to consider the idea that consumers may be harmed by a constant bombardment of marketing, with overconsumption and purchase addiction being one possible result. In sales research, much research has explored unethical selling activities and the negative outcomes of such tactics.

Neuroimaging is likely to contribute to marketing ethics in many ways of which there is space to explore here but a few. First of all, research into advertising effectiveness – which has caused so much consternation in neuroscientific circles – can contribute more than just finding the aforementioned 'buy button' in the brain. In fact, exploring exactly what elements of an advertisement are critical to awareness, attitudes and evaluations of products, and whether these differ for different groups, should *reduce* firms' reliance on the 'blunt instruments' of blanket coverage, shock tactics, or sexual imagery. The application of neuroscience to marketing may form a basis for understanding how human beings create, store, recall, and relate to information such as brands in everyday life. Furthermore, it may be possible to discover whether certain aspects of advertisements and marketing activities trigger negative effects, such as overconsumption. Exploring why certain individuals become compulsive credit-users could provide outcomes of considerable social utility — are there differential locations and/or times of brain activity when a purchase is made or marketing message is viewed between those who are compulsive overpurchasers and those who maintain more appropriate levels of spending? Finally, in the sales arena, can we differentiate between the brain activity of salespeople who apply highly ethical principles to their interactions, and those who would employ less ethical action? Are less ethical individuals more likely to fixate on short-term payoffs for themselves? Neuroeconomic research has investigated altruism, suggesting that cooperation is linked to activation of reward areas (Rilling et al., 2002). However, are these same areas activated when unethical salespeople for example perform an unethical act? Investigations into such problems could in fact be amongst the most compelling within neuromarketing.

4. Concluding remarks

While neuromarketing has only recently begun to concern neuroscientists, this article has shown that neuroscientific techniques have been used on an ad-hoc basis to investigate marketing problems in an academic sense for a number of years. Furthermore, the recent interest in neuroeconomics was shown to have considerable overlap with the domain of marketing research. We have tried to show here that the popular neuroscientific perception of neuromarketing as unethical, fundamentally flawed, and potentially harmful, should not mistakenly be applied to scholarly marketing research. Instead, we see no reason why marketing research should not be able to benefit from neuroimaging at least as much, if not more, than economics research has begun to. Indeed, the field of neuromarketing should be considered as a legitimate and important area for future research, which will allow us to more fully understand human behaviour in an extremely important context. Applying neuroimaging to marketing research problems should allow us to understand far more clearly the impact of marketing techniques, as well as gain insight into key problems concerning business relationships, answers to which have previously remained elusive.

That said, it must be stressed that neuroimaging research itself is constantly evolving, both in terms of technology as well as insights into exactly what activity and processes in various areas of the brain actually mean. For example, as technology evolves we are able to measure frequency, temporal, and spatial characteristics of brain activity more accurately and in a complimentary fashion, potentially leading to new insight into what were previously well-accepted brain functions and areas of activity. A field such as neuromarketing adds what could be called a 'layer of theory' on top of the actual cortical activity measure. It should not be forgotten that this layer of theory is essentially subjective and cannot directly 'prove' a posited relationship between marketing constructs. Nevertheless, better and more objective measurement and observation, as can be provided by neuroimaging in many cases, allows us to get closer to understanding what really happens in response to marketing stimuli, and in marketing-relevant situations.

The purpose of this article was to provide a perspective on neuromarketing which was concerned not with commercial applications, but with developing a greater understanding of a critical area of contemporary human society. While we understand the concern amongst neuroscientists regarding inappropriate application of their techniques, we looked to show that neuromarketing itself can be a valid field of study, and a rich source of problems to be investigated using insight from neuroimaging. We hoped to stimulate greater attention to neuromarketing issues within both neuroimaging and marketing research groups, as well as to expand the scope of debate and discussion on neuromarketing and other applications of neuroimaging. Both fields have much to learn from each other's perspective, and scholarly neuromarketing research, conducted in a collaborative and non-judgemental spirit, is likely to offer us much insight into how humans behave during what is a large part of our modern lives.

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