Making Brain Waves in Society

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The early years of the 21st century saw an increasing prominence of neuroscientific ideas in society at large. Popular science texts that drew heavily on neuroscientific findings became routine fixtures of bestseller lists, while neuroscientific concepts and imagery made regular appearances in novels, art galleries and museums. In the media, neuroscience became a standard reference-point for explaining topical social and political issues: the global financial crisis, ascendance of ISIS and massacre on Utøya Island were just some of the events explained with reference to the relevant actors' neural processes. Campaigners against pornography, video games and social media began to employ neuroscientific concepts to paint the respective activities as dangerously addictive. Security companies advertised lie-detecting brain scans to lawyers, governments, employers and insurance companies, and brain images were admitted as evidence in courtrooms to argue that accused criminals could not control their violent impulses. Vials of oxytocin were sold as 'Liquid Trust' for use in dating and the workplace, while 2010 saw the commercial launch of 'Neuro Drinks', a range of 'drinks with a purpose' that variously claimed to target the neurochemical foundations of sleep, alertness, mood, appetite control, libido, immunity and fitness.

Many have celebrated the prospects the so-called 'neuro-revolution' offers for advances in medicine, business and politics (Lynch, 2009). However, the cultural enthusiasm for neuroscience also has its detractors. So far, the most vocal criticisms focus on the frequently incorrect or exaggerated nature of popular neuroscience claims. Yet accuracy is not the only – nor necessarily the most important – standard by which popular neuroscience can be appraised. In his recent book, Christian Jarrett (2015) argues that many 'brain myths' are not merely factually incorrect, but actively harmful to those who come in contact with them; many brain myths, for example, perpetuate damaging stereotypes or ideologies. While the factual accuracy of a given neuroscientific claim can be determined by neuroscientific experts, questions about that claim's *effects* on society call out for a social psychological analysis. Social psychological theories of knowledge, communication, attitudes, emotion and behaviour are ideally positioned to conceptualise the socio-cultural ripple-effects generated as a piece of science leaves the laboratory and enters wider society. Likewise, established social scientific methodologies like surveys, interviews and textual analyses can empirically capture

the repercussions that neuroscientific ideas have for the individuals and communities who encounter them. Fortunately, over the last few years, a growing body of research has been doing just that. In this article, we review what this research tells us about the key themes that characterise popular discussion of neuroscience, and the risks and opportunities that lie therein.

Using neuroscience to encourage self-improvement

Research exploring the ways neuroscientific concepts manifest in the public sphere has highlighted the centrality of discourses concerning self-improvement. In 2012, our research group published an analysis of 3,000 articles discussing brain research that had appeared in the British press in the previous decade (O'Connor, Rees, & Joffe, 2012). Our analysis showed that in this large sample, by far the greatest preoccupation related to ways individuals could enhance or protect their brain function. Almost half of the articles, flagged by titles like *'10 Scientifically Proven Ways To Boost Your Brain'*, advised readers about lifestyle or dietary changes that would allegedly increase their neurocognitive capacity or guard against cognitive decline. Similar themes have been detected by other analyses of media coverage of neuroscience internationally (Thornton, 2011). It seems that this media trend has registered with the lay public: a recent interview study we conducted, which asked members of the public to describe their associations with 'brain research', found that respondents often mentioned 'brain-training' and expressed concern that they were failing to fully exploit their brain's potential (O'Connor & Joffe, 2015). The interviewees also echoed a well-worn media trope in frequently comparing brain enhancement to physical exercise, implying that ensuring brain health requires a continual programme of self-discipline.

What are the potential risks and benefits of this current interest in brain enhancement? So far, there is little evidence that commonly-advised brain enhancement techniques, such as playing brain-training games and eating fish oils, have substantive or sustained neurocognitive effects (e.g. Kirby et al., 2010; Owen et al., 2010). However, some have suggested that the experience of deliberately 'working on' one's brain may nonetheless have positive psychological consequences. Neuro-enhancement practices intrinsically convey an understanding of the brain as plastic and malleable to individual will. Rose (2007) and Malabou (2008) suggest that consciousness of the brain's plasticity may afford a greater sense of control over one's life. Extensive research shows that the experience of self-

determination is linked with a range of positive psychological, social and material outcomes (Deci & Ryan, 2008).

However, this valorisation of individual autonomy also has a darker side. Many social psychologists have drawn attention to the role played by individualistic values in solidifying inequalities and obscuring the influence of socio-structural factors on individuals' life-outcomes (Joffe & Staerklé, 2007; Sampson, 1988). The brain enhancement trend coheres with a cultural context in which individuals are afforded sole responsibility for their future health, wealth and well-being. Thornton (2011) contends that appeals for brain-training ultimately function to trap people in "endless projects of self-optimization in which individuals are responsible for continuously working on their own brains to produce themselves as better parents, workers, and citizens" (p. 2). The worry is that exposure to constant appeals to 'work on' one's brain will generate endemic guilt and anxiety about the insufficiency of one's efforts, and that cases of neuropathology will ultimately come to be seen as the individual's own fault. In a society facing increasing rates of dementia and psychiatric disorder, this will compound the difficulties of these already vulnerable populations.

Individual responsibility for neurocognitive productivity may also place particular pressures on parents. Research shows that brain enhancement ideas frequently appear in popular parenting literature (Thornton, 2011), where parents are told they can boost their child's IQ by adopting certain nutritional, recreational or socio-emotional practices. This advice is often socially loaded: women who work outside the home, opt not to breastfeed, or fail to heed warnings about 'neurotoxins' during pregnancy are frequently condemned as irresponsible or uncaring mothers (O'Connor & Joffe, 2013). Claims regarding the lasting neurobiological effects of early experiences have been enthusiastically adopted by policy-makers (Macvarish, Lee, & Lowe, 2014). In Britain, a 2011 governmental report backed by all political parties drew heavily on neuroscientific evidence to emphasise the moral and economic imperative of early intervention in the children of 'problem families', which would allegedly reduce teenage pregnancy, substance abuse, crime and unemployment (see Figure 1). Early intervention initiatives can indeed yield many positive results for families. However, they can also serve political agendas by situating the causes of social problems within parental failings, rather than structural issues of poverty and inequality. Since framing debate in terms of shrunken infant brains affords an emotive urgency and scientific gloss to these policy

agendas, neuroscientific ideas can be used to justify the withdrawal of social support systems and the stigmatisation of disadvantaged communities.

It is, however, important not to be overly deterministic about the potentially negative repercussions of the media focus on brain enhancement. Recent studies show that while people often bring up these ideas when conversing about neuroscience, relatively few actually engage in brain enhancement practices (O'Connor & Joffe, 2015). Despite their strong media and policy presence, appeals for brain enhancement are not experienced as sufficiently compelling to have affected day-to-day behaviour. One exception is in universities, where there is increasing concern about student use of artificial cognitive enhancers: yet even here, the proportion of students who use such measures is under 10% (Singh, Bard & Jackson, 2014). Worries that brain enhancement discourses are feeding an increasingly competitive, individualistic society may therefore be somewhat premature. Nevertheless, a critical perspective on the ways brain enhancement can be drawn into socio-political agendas remains necessary. Given the limited evidence of the effectiveness of brain enhancement exercises, there is also an opportunity cost to consider: most people's leisure hours are limited, and time spent playing brain-training computer games is time *not* spent in activities with demonstrable benefits for physical and psychological health, such as exercising or connecting with loved ones.

Using neuroscience to underline group differences

A further theme evident in research exploring the ways neuroscientific concepts manifest in society at large is the use of neuroscience to underline and explain differences between social categories. In the media, many of the group divisions that exist in our society – relating to variables such as gender, sexuality, criminality and mental illness – are frequently traced to these groups' possession of distinct neural characteristics (O'Connor et al., 2012). This theme is exemplified in the ubiquitous phrase "the [*female/gay/depressed/criminal*] brain", which implies the existence of a homogeneous brain 'type' that is universally shared by all members of that category. Popular neuroscience can thus purvey essentialist representations of social groups as biological 'kinds' (O'Connor & Joffe, 2014a).

Many welcome the advent of neuroscientific explanations of social difference, due to their perceived ability to ameliorate stigma. For instance, mental health charities strongly campaign for greater public awareness of the biological roots of mental illness, because they assume that this will foster more tolerant attitudes. Research shows that this expectation is

shared by people with psychiatric diagnoses, for whom neuroscientific explanations can be critically important resources in sustaining positive personal and social identities (Buchman et al., 2013). Neuroscientific explanations have also been recruited to justify arguments for less punitive responses to crime and addiction, and to support the 'born this way' narrative of sexual orientation, which has historically been a key plank of the gay rights movement. Endorsing biological theories of sexuality does indeed correlate with more positive attitudes towards sexual minorities (Haslam & Levy, 2006).

Anti-stigma campaigners' hope that neuroscientific advances will prove a panacea for fighting social prejudices, however, may be unrealistic. The psychological essentialism literature has amassed an impressive body of research showing that for many social categories, such as gender, race and obesity, biological explanations consistently promote stereotyping, prejudice and discrimination (Dar-Nimrod & Heine, 2011). The literature shows more positive effects in relation to biological theories of mental illness and sexual orientation, yet even these are not unambiguous. While biological explanations of mental illness do reduce blame for inappropriate behaviour, they also increase fear, perceived dangerousness, harsh treatment and social distance (Read, Haslam, Sayce, & Davies, 2006). Representations of homosexuality as biologically determined can be used to purvey an image of sexual minorities as intrinsically disordered (Kahn & Fingerhut, 2011). In the criminal justice system, neuroscientific explanations are not consistently linked with more compassionate responses to deviance: in some contexts, neuroscientific explanations can increase rather than decrease punitive attitudes and sentencing decisions (Saks, Schweitzer, Aharoni, & Kiehl, 2014). Neuroscientific explanations of difference may therefore be a double-edged sword when it comes to intergroup relations.

The ambiguous effects of neuroscience on stigma should not come as a surprise to anyone familiar with the attitude change literature. Decades of research show that gaining new knowledge is a poor predictor of attitude or behaviour change (Ajzen, Joyce, Sheikh, & Cote, 2011). Indeed, due to the motivated nature of human reasoning, incoming scientific information is often reconstructed so that it supports, rather than challenges, existing values and beliefs (Kahan, Jenkins-Smith, & Braman, 2011). This was vividly illustrated by a recent study we conducted, which analysed how representations of a particular study of sex differences in brain structure evolved as the study moved from the initial journal article, through a university press release, into the traditional media and online commentary (O'Connor & Joffe, 2014b). Our analysis documented how aspects of the research that

resonated with traditional gender stereotypes were preferentially emphasised by the press release, media accounts, and the researchers themselves in their interviews with journalists. Furthermore, elements of stereotypes not mentioned in the original research report, such as women's greater affinity for parenting and 'multitasking', were reconstituted in media coverage as the key 'findings' of the study. Our results suggested that scientific research on sex difference offers an opportunity for society to rehearse and reinforce prevailing gender stereotypes, which then benefit from the air of science that brain-information bestows. Thus, due to the human propensity to interpret external information in line with existing socio-emotional commitments, neuroscientific explanations of social difference may engrain rather than challenge existing group divisions.

Using neuroscience as a rhetorical tool

A final theme that runs throughout popular uptake of brain research relates to the use of neuroscience for rhetorical purposes. Early experimental research suggested that neuroscientific words and imagery have a persuasive effect that was termed a 'seductive allure': attaching irrelevant neuro-stimuli to an article made readers judge that article as more convincing (McCabe & Castel, 2009; Weisberg, Keil, Goodstein, Rawson, & Gray, 2009). Neuroscience's persuasive power outstrips that of other scientific fields: there is apparently something distinctively compelling about brain-based explanations (Fernandez-Duque, Evans, Christian, & Hodges, 2015). Our media analyses showed that this rhetorical advantage is extensively exploited in media dialogue (O'Connor et al., 2012). In our media data, the basic content of the brain information introduced was often superficial: it was put to explanatory effect and boasted the 'feel' of an explanation, but its actual explanatory power was weak. For instance, observing that children's neural activity changes while playing video games is not surprising, since any activity necessarily has unique neurochemical correlates. Yet this finding (and the fMRI images that illustrate it) can be effectively deployed to argue that modern technology is defiling the minds of today's youth. Racine, Bar-Ilan, & Illes (2005) coined the term 'neurorealism' to describe the process by which neuroscience research is used to validate a certain view of the world. For instance, neuroscientific evidence might be recruited to prove that prisoners 'really are' intrinsically depraved, or that religious experiences 'really do' lead people to higher mental planes. In pointing to neural correlates of a phenomenon, writers can portray themselves as dispassionate observers demonstrating the simple fact of their worldview's basis in the natural order. The result is that research is used to support thinly disguised ideological arguments and predetermined policy agendas.

Thus, neuroscience's ability to imbue arguments with objective, scientific authority make it an effective vessel for propagating beliefs, values and ideologies. This is worrying, since those who exploit neuroscience's rhetorical power for commercial or political gain jeopardise the public's relationship with science more broadly. Public trust in science currently remains high, despite ongoing high-profile controversies over issues like MMR vaccination and climate change (Ipsos MORI, 2014). However, this trust is precarious: for many people, science also invokes a sense of fear and intimidation. People without a scientific background tend to be acutely conscious of the disparity in knowledge (and hence power) between themselves and apparent scientific experts (O'Connor & Joffe, 2014c). As a consequence of this imbalance, they typically defer to those who speak about science in an authoritative manner, even when the scientific argument is equivocal or under-developed. Rhetorical uses of neuroscience could therefore deter people from contributing to public debates or manipulate them into supporting agendas that are against their interest. Political exploitation of neuroscience thus has far-reaching implications for the quality of democracies and public spheres.

It is, however, important not to overstate the risks inherent in neuroscience's rhetorical power. The original experimental evidence of neuroscience's 'seductive allure' has proven challenging to replicate (Farah & Hook, 2013). Emerging research suggests that the seductive allure may indeed exist, but in an extremely context-dependent way (Scurich & Shniderman, 2014). Specifically, people who already agree with a given proposition show the neuroimage-credibility effect when the neuroimage supports their own opinion, but those affiliated with opposing positions do not. Thus, it should not be assumed that laypeople will automatically capitulate to arguments that appeal to 'neurorealism'. When the argument is one in which they have a prior investment, laypeople are capable of marshalling resistance and counterarguments, or indeed re-appropriating the same scientific principle to suit their own purposes. For instance, findings of sex differences in brain structure can be recruited to support both religious and feminist conceptions of gender, by construing the brain differences as 'proof' of the power of either divine design or cultural role-divisions (O'Connor & Joffe, 2014b).

Finally, it is important to remember that despite the extensive media coverage, for many if not most of the lay public, neuroscience remains mere background noise in everyday life. Many people do not notice its prominence in the media, and certainly do not actively seek its input in their day-to-day activity (O'Connor & Joffe, 2014c). Until placed in a position where

neuroscience suddenly becomes personally relevant (for instance, when one develops a brain disorder), neuroscience's direct influence on everyday thought and behaviour may be limited. In analysing neuroscience's social implications, it is important not to overestimate the sway it holds over the lay public: indeed, doing so would ironically perpetuate the very 'neuro-hype' that is under criticism (Pickersgill, 2013).

Conclusion

Neuroscience's prominence in contemporary public spheres shows no signs of diminishing. As neuroscience's position in society expands, it is important that its wider social and psychological implications continue to be scrutinised. Empirical research on the topic has highlighted a number of conditions that should guide consideration of this phenomenon. First, neuroscience's effects on lay populations are not linear or predictable: scientific information is mediated through complex social psychological systems that can reject, reconstruct or repurpose it. Careful research is required to uncover these patterns. Second, discussion of neuroscience's societal effects tends to focus on the ways it could transform society, yet the ways it can solidify existing features of social reality are equally deserving of attention. Evidence collected to date suggests that the most critical implications of neuroscience may lie in reinforcing, rather than revolutionising, the status quo. Finally, there is a clear role for social psychology to play in delineating the position neuroscience occupies in the contemporary public sphere. Most existing discussion of the trend comes from neuroscientists themselves, who tend to focus on the factual (in)accuracy of popular neuroscience claims. While there is certainly a place for such evaluation, establishing truth/falsehood contributes little to uncovering the substantive effects that a piece of knowledge has as it moves through society, since a scientifically sound idea can easily be used in socially destructive ways. To fully understand the promises and perils inherent in popular reconstructions of neuroscience, the theories and techniques of social psychology must be applied to unpick how the widespread circulation of neuroscientific concepts affects how we see ourselves, other people and the world around us.

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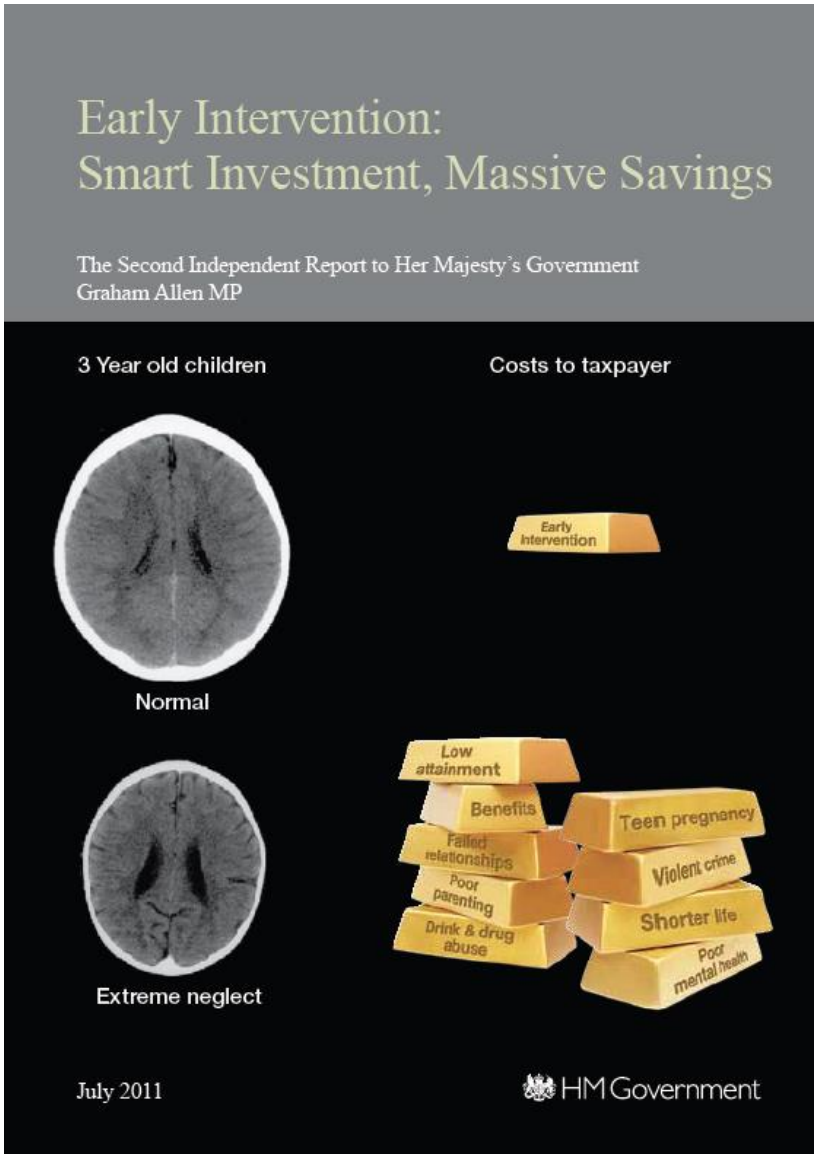

Figure 1. Front cover of the 2011 governmental report *Early Intervention: Smart Investment, Massive Savings*