

Racing to Conclusions: Neuroscience in the News

The development of improved scanning technologies and increasingly sophisticated modeling software has allowed a vast expansion of theories, and knowledge, regarding the mechanisms of the human brain. Due to the public's endless curiosity concerning the inner workings of our minds and our personalities as human beings, news publications often report recent neuroscience findings in a manner which serves both to spark our curiosity in the science as well as to confirm our basic intuitions with "more objective" data. Unfortunately, it is also the case that these news publications can be misleadingly simplistic, especially when they put their own spin on the scientific finding in an attempt to craft reporting that is, or has the appearance of being, understandable, unambiguous, straight-forward, and objective. The use of functional magnetic resonance imaging (fMRI) output, and the position of unbiased, objective data that it often fills in neuroscience journalism, illustrates this point. This essay will analyze a few closely related publications: a scientific publication analyzing potential gender differences in activation and functional connectivity in the brain during computer gaming, and a popular press article based on that original scientific publication.

The scientific publication "Gender differences in the mesocorticolimbic system during computer game-play" by Allan L. Reiss et al has the straightforward objective of using fMRI technology as a means of analyzing if, and how, neural activation patterns during video game play differ between males and females. While within the fMRI machine the subjects played a simple game that was designed to be a territorial one, where the implicit goal was to combat territorial infringement and to gain space on the computer monitor. The researchers had the

hypothesis that during game play the “mesocorticolimbic reward system would show greater activation and functional connectivity in males compared to females.”¹” The popular press article, “Men enjoy computer games ‘because of basic urge to conquer,’” by Matthew Moore for the UK Telegraph, is a short news article based on the findings of the scientific publication. A side by side analysis of these two publications will help us to gain a deeper understanding of the cultural assumptions and attitudes that are embedded in each, and allow us to learn how those assumptions shape the way that we think about neuroscience and our expectations for its future. In specific, I will argue that the UK Telegraph piece recasts the scientific publication in a tone that plays into a popular view of neuro-imaging technologies as producing unimpeachable truths, and that it is assertive with its use of seemingly intuitive, but not at all proven, implications of the research at hand. Similarly, the scientific publication itself does not reveal the limitations of current neural imaging technologies and adopts a somewhat narrow perspective, taking localization theory for granted and searching only for a somewhat pre-determined set of outcomes that are contingent upon previous similar research.

The neuroscience journalism piece that I chose to examine is a perfect illustration of the contemporary public sentiment that our brains define our being and that machine-derived measurements (in the form of fMRI scans) provide consistent, unbiased, and pertinent data constituting evidence in favor of the definitive and intuitive conclusions that the public desires. One need only begin by considering the headline and sub-headline: “Men enjoy computer games ‘because of basic urge to conquer’” and “Men’s passion for computer games stems from a deep-rooted urge to conquer, according to research that will confirm the suspicions of ‘Nintendo Wii

¹ Fumiko Hoefft, Christa L. Watson, Shelli R. Kesler, Keith E. Bettinger, Allan L. Reiss. “Gender differences in the mesocorticolimbic system during computer game-play.” *Journal of Psychiatric Research*. 42.4 (2008): 253

widows' across the country" to understand this point. Although one expects that it is a function of popular news reporting to summarize events and findings so that they grab attention, economize on newsprint and in some instances entertain, popular journalism is not often noted for its attention to complexity or nuance, especially in areas where its readership, to say nothing of its reporting staff, does not have the background to understand or consider such complications. In this instance the mere length of the article, at barely one page, is a clue that a lot of information will be missing.

An observant reader will quickly notice that the Telegraph article takes significant liberties in reporting the findings of the scientific publication that it is based on. Phrases like "the more opponents they vanquish and points they score, the more stimulated [the mesocorticolimbic] region becomes" are totally unfounded by the underlying research at hand². The participants were playing a single-player game within the fMRI machine, and nothing was mentioned about its competitiveness in the scientific publication; instead, its implicit theme of "space infringement" might suggest that, for men, gaining space is "more rewarding relative to females."³ Perhaps even more surprising was the Telegraph's suggestion that the mesocorticolimbic "parts of women's brains are much less likely to be triggered by sessions on the Sony Playstation, Nintendo Wii, or Xbox."⁴ To hammer that point home, the article includes a large color picture of two men playing the Nintendo Wii – a situation that was not discussed or even directly implied by the subject scientific research.

The Telegraph article also falls into many of the pitfalls that Joyce discusses in her publication "Appealing Images: Magnetic Resonance Imaging and the Production of

² Moore, Matthew. "Men enjoy computer games 'because of basic urge to conquer.'" *Telegraph* 26 December, 2008. Accessed on web, on 20 February, 2010.

³"Gender differences in the mesocorticolimbic system during computer game-play," page 7

⁴ *Telegraph*, page 1

Authoritative Knowledge,” in that it uses the scans as a source of understanding and unquestionably pertinent, empirical data. Troublingly, the article does not correctly name the type of scan being used, and instead refers to the fMRI images as MRI scans. Perhaps that error speaks to the irrationality of the publics’ deep trust in modern imaging technologies; the mere fact that the scan had something to do with MRI makes it complicated and ‘scientific’ enough both to gain the publics’ approval as a useful tool and to escape their scrutiny when it is used as evidence in support of a certain, seemingly rational, hypothesis. The Telegraph article provides a few examples of how fMRI images can be portrayed as relevant knowledge, in and of themselves. At the end of the first sentence, for instance, the article reads “playing on computer consoles activates.... scans have shown.”⁵ As Joyce points out, ascribing non-human machines agency is indicative of the trust that we place in their outputs: “in cultural narratives, MRI is given an almost magical power; the distinction between machine and image is often blurred as MRI speaks, reveals, and expresses knowledge.”⁶ A study published in Science Daily demonstrates the degree to which the public conflates brain images with a higher understanding of brain function and more trustworthy science, with researchers finding that people tended to agree more with the conclusions of scientific articles that included brain images than with those that did not⁷.

The consequence of such an unimpeachably positive view of fMRI machines and the data that they process and output is that it tends to obscure the fact that the machines, as complicated and expensive as they may be, do only what the technicians program them to do, and look only for presumed indicators of brain activity that they can measure, at resolutions that they can

⁵ *Telegraph*, page 1

⁶ Joyce, Kelly (June 2005). "Appealing Images: Magnetic Resonance Imaging and the Production of Authoritative Knowledge" *Social Studies of Science*, 35(3), 443

⁷ Colorado State University (8 October 2007). "Brain Images Make Cognitive Research More Believable." *Science Daily*, page 2

handle. The “pretty pictures hide the sausage factory,” as Aguirre remarks⁸. In that sense, articles like the UK Telegraph one can serve to reinforce a mistaken perception of fMRI data, which in turn creates an ever-growing appetite for more publications of that sort, and for more scientific publications such as “Gender differences in the mesocorticolimbic system during computer game-play” upon which to base the popular media publications.

The introduction of the scientific publication already hints that the scientists have a bias in their research: they look for increased brain activity within the male mesocorticolimbic region, and take such increased activity as an implicit explanation as to why males might prefer video games over females. The researchers initially chose to move down a path previously trodden, and in doing so they implicitly ignored other possibilities and accepted and reinforced earlier reported findings: “The nucleus accumbens (NAc), amygdale (AMYG) and orbitofrontal cortex (OFC) were chosen as regions of interest (ROIs) based on information from previous studies of video game playing, reward and addiction...”⁹ Although their research shows “novel evidence” for gender differences in brain activity during computer game-play, it is also “consistent with the growing literature describing gender differences in brain function, e.g. [while] viewing...sexual stimuli... emotional films... humor processing... and during rest...”¹⁰ Similarly, remarks like “Supporting our *a priori* hypotheses, significant gender differences in brain activation and task-specific functional connectivity were observed within the mesocorticolimbic reward circuitry, with males generally exhibiting greater activation and connectivity” illustrate how their work supported their admitted inclinations and spoke of the “mesocorticolimbic reward circuitry” as if it were an established and well-understood mechanism.¹¹

⁸ Lehrer, Jonah (17 August 2008). "Picturing our thoughts." *Boston Globe*, page 3

⁹ “Gender differences in the mesocorticolimbic system during computer game-play,” page 255

¹⁰ “Gender differences in the mesocorticolimbic system during computer game-play,” page 257-258

¹¹ “Gender differences in the mesocorticolimbic system during computer game-play,” page 256

Perhaps such leaps of faith are fueled by the assumption that “fMRI enables us to capture a ‘visual proof’ of brain activity, despite the enormous complexities of data acquisition and image processing.¹²” Such “neuro-realism,” as Racine, Bar-Ilan, and Illes call it in their publication “fMRI in the Public Eye” is more prevalent in the public domain than in the scientific community, but should not be overlooked when analyzing scientific publications. The inclusion of colored fMRI images along with references to them stating how such images “showed greater activation for males compared to females” serves to illustrate this point. Furthermore, it is not made clear to the reader that these images, superimposed onto a grayscale human brain, are all *average* values – even the gray brain image beneath the color is an average. The often overlooked reality is that significant structural differences often exist between the brains of any two “normal” people, making it less intuitive to map features onto brains, as these researchers have done¹³.

Equally troubling, the authors of the scientific publication “Gender differences in the mesocorticolimbic system during computer game-play” never provided a discussion of what exactly the “brain activation” shown in the fMRI scans meant in the real world. Instead, they followed the popular path set out for them by previous work with similar neuro-imaging technologies, and proceeded to find what they were looking for in the scans. As they reported, “...we found significant brain activation in regions typically associated with reward...and addiction, including the NAc and OFC.¹⁴” Although the scientists did provide a lengthy discussion of what the set parameters on their fMRI machine were, and what methodology was used to analyze and condense its data into a picture, they never questioned their larger assumption that fMRI images actually reference to something meaningful about our brains

¹² Racine, Eric et al. (February 2005). “fMRI in the public eye.” *Nature Reviews Neuroscience*, 6(2), 162

¹³ Breiter, Hans. “STS.010 Guest Lecture.” MIT Boston, MA. February 11, 2010.

¹⁴ “Gender differences in the mesocorticolimbic system during computer game-play,” Page 2

(namely “how” and “where” they are processing certain information). In the publication “What We Can Do and What We Cannot Do with fMRI,” Logothetis discusses what the results of fMRI scans (so-called activation maps) actually represent. Although the general public, and arguably much of the scientific community, would take it as a given and unquestioned truth that fMRI scans “unequivocally show [the relevant brain regions’] participation in the studied behavior,” the reality is not that clear¹⁵. As Lehrer points out, fMRI data is only an “indirect measurement of brain activity” in the first place – it uses changes in blood flow as a measure to inform scientists of how “bursts of electricity and squirts of neurotransmitters” (the real indicators of brain activity) might be behaving at any moment in time¹⁶.

Part of the appeal of localization and of fMRIs’ purported ability to map certain functions to specific areas of the brain may be the product of yet another commonly held thought among both the public and scientists: that the brain is like a computer, where distinct operations are computed in distinct places. Logothetis argues that although a basic computer-like, input and output model “may describe the function of a subcortical nuclei, its implementation in different areas of cortex is anything but straightforward.¹⁷” The assumption of localization within the brain, then, may not be such a sound one after all, and might harken back to days when phrenologists mapped brain functions.

It is clear that there exists a complicated relationship between the public media and the science of neuroscience, fueled by our never ending passion for understanding what goes on inside the black-boxes of our brains, and the simultaneous opinion that our brains define ourselves. Media agencies are placed in the difficult situation of describing the latest neuroscience studies and advancements in articles that are light and fun to read, and, perhaps

¹⁵ Logothetis, Nikos (12 June 2008). "What we can and cannot do with fMRI." *Nature*, 453, page 871

¹⁶ “Picturing our Thoughts,” page 3

¹⁷ "What we can and cannot do with fMRI," page 871.

most importantly, have a punch line that the reader will appreciate and want to learn more about. Perhaps those very factors influenced the Telegraph article that was the subject of this essay. Instead of a general summary of the scientific publication, the Telegraph expanded the scope of the researchers' conclusions, thereby having a more tangible and exciting impact on its readership – people who have Nintendo Wiis and argue with their wives about a “gaming addiction,” for example. The degree to which the Telegraph took fMRI data to be a pertinent and absolute measure of “brain activity” (as if the term actually had a definite meaning to begin with) was also troubling; at times the article made it sound as if the scans alone proved the research. Interestingly, an overly approving view of neuro-imaging studies was mirrored in the scientific publication, in which researchers took localization theory for granted, and engineered their testing procedure to be highly dependent on previously published fMRI work and theory. Not surprisingly, their data served to definitively “prove” just what they had hoped: that “gender differences exist in the mesocorticolimbic reward system during an implicit space-infringement task with greater activation and functional connectivity observed in males than in females.” The story was left to the Telegraph to make even more sensational.

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