

Social Representations of Brain Research: Exploring Public (Dis)engagement With Contemporary Neuroscience

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Abstract

Recent years have seen a major expansion of the position of neuroscience in the mass media, public policy, and legal dialogue. Drawing on interviews with 48 London residents, this article examines how people with no prior involvement with neuroscience make sense of the concept of “brain research.” Thematic analysis of the data furnished little evidence that neuroscience has meaningfully infiltrated lay thinking. Respondents consigned brain knowledge to the “other world” of science, which was seen as a decidedly separate social milieu. They envisioned that the only route by which they might become alert to brain information would be if they developed a neurological illness. This article considers the social and psychological dynamics that shape neuroscience’s dissipation into public consciousness.

Keywords

neuroscience, brain, social representations, dys-appearance, interviews, thematic analysis

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Introduction

The early years of the 21st century were distinguished by an intensification of the public prominence of neuroscientific ideas, which became favored points of reference within popular media as well as applied fields such as education, law, economics, and public policy. Although the potential social implications of this cultural trend have been widely discussed, little empirical research has investigated how lay publics have engaged with this influx of neuroscientific information. This article seeks to redress this gap, reporting the results of an interview study examining the social representations of brain research that have consolidated among the British public.

The Rise of Neuroscience

The designation of the 1990s as the “Decade of the Brain” precipitated a major expansion of the neurosciences, both in the volume of research produced and in the epistemic authority it commanded. As neuroscience’s scientific standing rose, so did its public profile: studies confirm that media coverage of brain research has increased dramatically in recent years (O’Connor, Rees, & Joffe, 2012; Racine, Waldman, Rosenberg, & Illes, 2010). This media content spans a diverse array of subjects, from advice on improving neurocognitive function to explanations of psychosocial phenomena such as personality, sexuality and morality, and applications to educational, familial, economic and legal contexts. Neuroscience’s currency in today’s public sphere is thus both strong and wide-reaching.

The increasing public prominence of neuroscience has elicited much attention from sociologists, anthropologists, and cultural commentators, many of whom frame it as a profound cultural shift. These scholars argue that we are entering a “neuro age” in which contemporary neuroscience is inciting radical revisions of commonsense understandings of behavior, personhood, and society. Traditional conceptions of the autonomous, free-thinking individual are positioned as under threat by the specters of “neurochemical selves” (Rose, 2007), “cerebral subjects” (Ortega, 2009) and “brainhood” (Vidal, 2009). While the prospect of brain-based identities invites divergent responses, enthusiasts and critics of these developments converge in painting neuroscience as a uniquely significant force in contemporary public consciousness.

Claims for the revolutionary import of neuroscience, however, are often rather speculative, rarely invoking empirical evidence that documents the

social and psychological repercussions of neuroscientific ideas (O'Connor & Joffe, 2013). An empirically grounded perspective on these developments is crucial, as it cannot be assumed that neuroscience filters into public consciousness in linear, predictable ways. Scientific ideas that reach the public sphere encounter active audiences who reconstruct information according to preexisting worldviews, identities, and agendas (Joffe & Haarhoff, 2002; Littlejohn & Foss, 2010). While analysis of media content elucidates how scientific ideas move from the laboratory to the public sphere, it cannot reveal how the material is taken up by lay audiences. Direct research with members of the public is necessary to illuminate how the neuroscientific ideas aired in the media resonate within naturalistic thought and conversation.

Neuroscience in Public Consciousness

While research investigating lay uptake of neuroscientific ideas has been slow to accumulate, the research that does exist casts doubt on claims of neuroscience's transformative social effects. Two recent studies propose that despite neuroscience's prominence in the media, members of the public are largely indifferent to brain research. In Pickersgill, Cunningham-Burley, and Martin's (2011) focus groups involving both scientists and laypeople, while participants declared interest in neuroscience, few employed neuroscientific ideas to understand their day-to-day experiences. Pickersgill et al. characterize the brain as an object of "mundane significance": something that is recognized as objectively important but which remains remote from everyday life. Choudhury, McKinney, and Merten (2012) identify a similar duality in their focus groups with adolescents, who deemed research on the "teen brain" abstractly important, but irrelevant to their self-understanding. These studies undermine the contention that neuroscientific concepts have pervasively infiltrated commonsense thinking.

However, research with clinical populations reveals a different picture of lay engagement with neuroscience. For those diagnosed with psychological disorders such as depression or attention deficit hyperactivity disorder, neuroscience can provide a compelling framework for self-understanding (Buchman, Borgelt, Whiteley, & Illes, 2013; Singh, 2013a). Neuroscientific explanations are welcomed by many mentally unwell individuals, often as a means of validating the "reality" of their disorder. Importantly, however, when these neuroscientific understandings of disorders consolidate, they do not operate in an exclusive, absolute manner. Rather, for these populations

neurobiological explanations form just one facet of multidimensional models of disorders that integrate numerous causal factors (Buchman et al., 2013; Bröer & Heerings, 2013; Meurk, Carter, Hall, & Lucke, 2014). Neuroscientific explanations are used flexibly and instrumentally, selectively marshaled when they serve social- and self-identity needs (Singh, 2013a).

The disparities between clinical and nonclinical populations may imply that personal engagement with brain science is contingent on direct experience of brain disorder. This accords with the work of Leder (1990), who characterizes the phenomenology of embodiment in terms of two processes: “disappearance” and “dys-appearance.” Leder (1990) argues that the essential marker of a healthy body is its inconspicuousness. As attention is directed into the world, the body itself fades from one’s perceptual field: it “disappears” from conscious awareness. Leder declares that disappearance is particularly pertinent to one’s internal organs, which have limited sensory receptors and cannot be observed by any other sensory modality. As such, organs like the brain do not ordinarily surface as focal objects of contemplation. Leder suggests that the primary means by which this oblivion to the body is ruptured is the experience of pain, discomfort, or disease. The ordinary disappearance of the body is therein replaced by the body’s “dys-appearance,” which Leder defines as the surfacing of the body as the focus of attention but in a “dys” state. Therefore, when the body does breach awareness, it is as a source of threat, suffering, and constraint.

Existing research thus intimates that brain information is ordinarily absent from day-to-day consciousness, but this can be altered by experiencing neuropathology. However, firm conclusions regarding the role of neuroscience in lay society remain elusive, as most existing research focuses on groups deemed a priori to have a particular investment in neuroscience, usually via clinical diagnosis. The Choudhury et al. (2012) and Pickersgill et al. (2011) studies are notable exceptions; however, the former concentrated specifically on eight adolescents’ responses to the idea of a teen brain, while Pickersgill et al.’s (2011) sample was composed of neuroscientists, patients, or members of professions the researchers saw as relevant to brain research. Such samples represent what Michael (2009) terms *publics-in-particular*, that is, populations who have “an identifiable stake in particular scientific or technological issues” (p. 623), as opposed to the more undifferentiated *public-in-general*. The latter model is often criticized for unduly reifying “the public” as a monolithic entity, obscuring the heterogeneity of its component

individuals and groups. It remains important, however, to understand how brain science is construed by those *without* a predefined stake in neuroscience research, given that this position likely reflects the vast majority of the general population. While noninvested individuals are unlikely to maintain structured bodies of factual knowledge about contemporary neuroscience, the spontaneous, intuitive meanings they draw from neuroscientific ideas illuminate the pathways along which neuroscientific concepts assimilate into a culture, and therefore merit empirical attention. The current research sought to elucidate this everyday “sense making” through a series of interviews in which lay Britons articulated their immediate associations with the concept of brain research.

Theoretical and Methodological Approach

Theoretically, the interview study is guided by the social psychological framework of social representations theory (SRT). The concept of social representation refers to the network of ideas and values that constitute a “lay theory” about a given topic. While SRT research investigates a diverse range of social, political, and economic phenomena, traditionally a key objective has been to theorize the position occupied by scientific information in everyday social life. Moscovici (1961/2008), the founder of SRT, argues that a distinguishing feature of modern society is the reliance of common sense on ideas emanating from science, rather than religious or political dictum. Successive SRT theorists have reiterated the centrality of science in contemporary society, contending that as the political agenda becomes increasingly preoccupied with technoscientific issues (e.g., climate change, Internet security, bioengineering), ordinary citizens are motivated to develop a “vernacular science knowledge” that facilitates participation in public debates (Wagner, 2007).

SRT holds that vernacular science knowledge does not simply reproduce scientific expertise, as it is woven into prevailing networks of cultural values, identities, and beliefs. New scientific information accommodates into familiar cultural meanings via two processes: *anchoring* and *objectification*. Anchoring is an act of classification that locates an unfamiliar phenomenon relative to a culture’s established repertoire of categories, while objectification refers to the concretization of the novel phenomenon with tangible symbols, images, and metaphors. For example, in the 1990s genetic engineering was anchored in the notion of “cloning” and objectified in the figure of “Dolly the sheep” (Bauer & Gaskell, 1999). The anchors and objectifications drawn from established cultural repertoires invariably carry social, emotional, and conative associations,

which are projected onto the new phenomenon. Anchoring and objectification therefore guide how people orient to new ideas. For instance, Smith and Joffe (2009) show how the media imagery that objectifies climate change, such as polar bears stranded on melting ice or “freak” local flooding, positions climate change as either distant or close in temporal, physical, and social space, thereby modulating the extent of personal engagement with the issue.

Epistemologically, SRT represents a form of “weak” social constructionism: it accepts the existence of an external reality but posits that people’s access to that reality is always mediated by cultural categories and values. In counterpoint to the “deficit model” of public understanding of science (Irwin & Wynne, 1996), SRT analyzes knowledge not in terms of its correspondence with a universally “correct” logic but in terms of its social psychological significance for the communities that produce it. It posits that in digesting scientific information, people’s primary concern is not with veridically accessing “brute reality” but in constructing a representation of the world that satisfies social, emotional, and pragmatic imperatives (Jovchelovitch, 2008).

A concern with capturing this bottom-up process of knowledge construction informed the design of the present study, which rejected predetermined interview schedules in favor of an open structure that was optimally receptive to unique or unexpected ideas. The research adopted the free association Grid Elaboration Method (GEM), an interview technique that has illuminated social representations of a range of scientific and health phenomena (Joffe, 2012; Joffe & Elsey, in press). This method reconstitutes free association, a technique historically associated with psychoanalytic clinical practice, into a research tool. The progression of the interview is dictated by the flow of associations that the respondent spontaneously produces in response to the topic of interest, with minimal intercession by the interviewer. As the data elicited are entirely participant generated, it facilitates a glimpse into how people mobilize their naturalistic chains of association in apprehending a given topic. In assuming this approach, the research sought to provide a rich and ecologically valid account of how laypeople make sense of the topic of brain research.

Method

Sample Recruitment and Composition

This research took place in the United Kingdom, which is one of the world’s major producers of neuroscience research (Wellcome Trust, 2011)

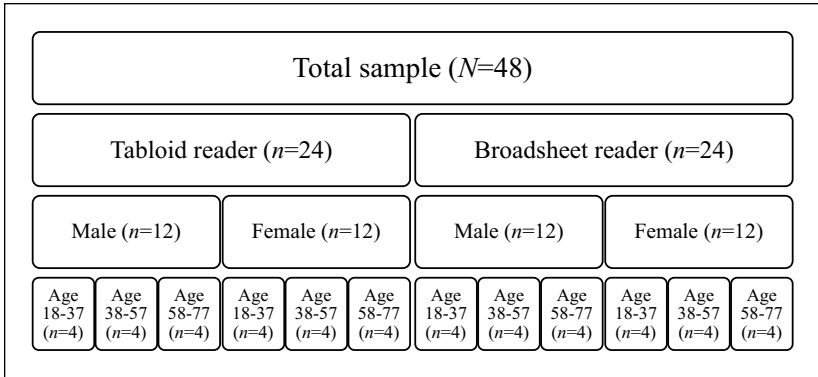


Figure 1. Sample composition.

and whose national media afford considerable attention to neuroscientific ideas (O'Connor et al., 2012). Data consisted of interviews with 48 individuals living in greater London. A research recruitment company was contracted to secure a demographically stratified sample according to the criteria in Figure 1. Newspaper readership formed one selection criterion, with half of participants ordinarily reading tabloids and half identifying as broadsheet readers. This provided insight into participants' most likely sites of contact with neuroscientific information and also ensured that the sample was socioeconomically diverse, since in the United Kingdom broadsheets are associated with higher and tabloids with lower socioeconomic readerships (Chan & Goldthorpe, 2007). The sample was also balanced according to age and gender. No participant had formal education in neuroscience or psychology.

Interview procedure

Ethical approval was granted by University College London. Interviews took place in central London between May and October 2012. Participants were not told the topic of the research before their interview.

In accordance with the GEM technique, interviews began by giving participants a grid of four empty boxes and asking them to write or draw the first four ideas that came to mind on hearing the term *brain research*.¹ Figure 2 displays an example of a completed grid.

What are the first four ideas that come to mind when you hear the term 'brain research'?

Please express what comes to mind using words and/or drawings, putting each idea in a single box. There are no correct or incorrect answers, I am simply interested in what you associate with brain research.





 <p>BRAIN</p>	<p>MIND. SPIRIT ABSTRACT. CASHMONEY BY ATOMS</p>
 <p>(ROB) TESTWORK</p>	 <p>UNMOUSE.</p> 

Figure 2. Example of completed free association grid.

The subsequent verbal interview was structured around the responses to this task, with participants asked to expand on the ideas they had introduced in each box. The interviewer encouraged further elaboration through general prompt questions (e.g., “Could you tell me more about that?”). To help elicit concrete examples of previous encounters with neuroscience, towards the

end of the interview respondents were also asked whether they had ever come across information about brain research in the media.

Some trepidation was common at the beginning of the interviews, with certain respondents feeling ill-equipped to speak about the topic. To minimize the inhibition associated with speaking about an “expert” field, respondents were informed that there were no correct or incorrect answers and that as the interviewer was not a neuroscience expert, she would not know whether respondents’ impressions were scientifically accurate. This promoted a more relaxed, informal atmosphere.

Interviews lasted between 18 and 54 minutes, with an average duration of 34 minutes. On finishing, respondents were debriefed and received a modest payment for participation. Audio recordings of all interviews were transcribed and imported into the ATLAS.ti software package for analysis.

Data Analysis

Interview data were analyzed via thematic analysis (Braun & Clarke, 2006; Joffe, 2012). Transcripts were inspected to detect salient concepts and patterns, which were gradually incorporated into a coding frame that captured the key features of the textual material. Code development involved both inductive and deductive strategies, so that the coding frame was informed by existing literature as well as responsive to unexpected emerging patterns. To establish the coding frame’s reliability, two researchers independently applied it to the same four interviews. Their coding patterns were compared, and the coding frame was revised on this basis. Once the coding frame was finalized, the two coders applied it to an additional 12 interviews. Comparing their coding with Cohen’s kappa analyses yielded an average reliability value of .6, indicating “substantial” agreement (Landis & Koch, 1977).

When all transcripts were fully coded, a frequency table was produced indicating the proportion of interviews in which each code appeared. This revealed the patterns that traversed the data set. To broaden the analytic focus to the level of themes, ATLAS.ti’s query tool was used to identify codes that were linked in the data—for example, pairs of codes that frequently co-occurred or followed each other. Additionally, the substantive content of each code (i.e., its corresponding quotations) was examined to distinguish conceptual links between codes. These interrogations of the data unearthed particular networks of codes that clustered together to form themes.

Table 1. Summary of Key Features of Themes.

1. The brain is a domain of science	<ul style="list-style-type: none"> • Nominal expression of interest (88%) but not personally salient (71%) • Anchored in science: objectified in scientific instruments (46%), images of scientists (33%), classrooms (19%), animal research (25%) • Distance from science (42%) feeds both hostility (31%) and admiration (25%)
2. The brain is something that goes wrong	<ul style="list-style-type: none"> • Brain strongly associated with pathology (98%): both neurological (92%) and psychological (60%) • Brain research anchored in medicine (60%) and surgery (63%) • Dys-appearance: attention to brain/neuroscience contingent on experience of neuropathology (25%)
3. The brain is a resource subject to individual control	<ul style="list-style-type: none"> • Suggestion that neurocognitive capacity can be altered by individual lifestyle choices (83%) • Desire to improve brain function (44%) • Belief that only a minority of the brain is used (29%)
4. The brain is a source of human variation	<ul style="list-style-type: none"> • Interindividual variation (54%) and own individuality (38%) attributed to brain • Neurobiological attributions occur alongside environmental attributions (52%) • Brain explanations strongest for abnormal or threatening abilities/behavior—e.g., criminality (33%), genius (21%)

Note: Percentage figures indicate the proportion of interviews in which the relevant code occurred.

Results

Four themes were identified in the data. Engagement with brain research was premised on representations of the brain as (1) a domain of science, (2) something that goes wrong, (3) a resource subject to individual control, and (4) a source of human variation.² The key features of all themes are summarized in Table 1. It is important to note that themes did not materialize in an exclusive, either/or manner: most interviewees drew on multiple themes, which slipped in and out of focus as discussion evolved.

Since this article is primarily concerned with exploring the immediate, spontaneous processes by which respondents made sense of brain research, it will focus on the first two themes. In terms of typical interview sequence, these tended to dominate the early stages of the interviews, capturing respondents' attempts to define the concept of brain research and orient themselves toward it.

The latter two themes emerged upon more extended reflection on brain research, which for most participants was a novel exercise. As such, the immediate associations detailed by the first two themes offer more direct insight into neuroscience's resonance in participants' "gut" or default patterns of representation.

Theme 1: The Brain Is a Domain of Science

The first theme presents the finding that although respondents described brain research as interesting, it occupied a negligible space in their day-to-day thought and conversation. With brain research absent from their own experience, participants strove to categorize it within the social arena. A variety of anchoring and objectification processes funneled the brain into the domain of science, which was positioned as a sharply separate "other world." This theme outlines participants' representations of this scientific sphere and charts the ways in which respondents oriented themselves to the other world of science.

The Brain in Everyday Life: Interesting but Inconspicuous. The most prevalent single code in the data, materializing in 42 (88%) interviews, was a professed interest in brain-related ideas. Though this prevalence may suggest that neuroscientific issues appealed to people's imaginations, these expressions of interest should be understood in light of the interviews' interpersonal context, wherein respondents may have wished to affirm the conversational agenda set by the researcher. Most expressions of interest amounted to rather superficial, offhand statements that brain research was "quite interesting." This evidently did not reflect an enduring preoccupation with brain research beyond the interview context: for many, discussing brain research was an entirely novel experience. Most respondents ($n = 34$; 71%) took pains to convey that neuroscience was not salient in their day-to-day life: it was "just not really on my radar."

Science of the brain? I haven't a clue. Nothing at all. I'd be lying if I said there was. You know, I've been a bus driver for many years, I was a salesman for many many years and I don't know, it's, it's, I mean I've never, ever, ever given it a thought. (Male, tabloid reader, 38-57 age-group)

Participants often attributed their unawareness of brain research to its low profile in wider society. They generally did not see brain research as prominent in the media. Almost twice as many respondents asserted that they never or rarely encountered it in the media ($n = 27$; 56%) than described media coverage as occasional or regular ($n = 15$; 31%). The 15 who acknowledged

media coverage of neuroscience had not intensively engaged with it: they described media coverage in vague terms and struggled to recall concrete examples of stories they had encountered. Neuroscience information was quickly forgotten: as one respondent put it, "It's something you might occasionally read an article about and say, gosh, that's interesting, and then turn over the page."

Brain awareness was therefore not "forced" on participants by encountering neuroscientific information in the external world, and neither did it spring from subjective experience of their own body. People repeatedly referred to the automatic, unconscious nature of the brain's operations ($n = 15$; 31%). Because neurobiological processes "just happen," conscious reflection on brain function was seen as unnecessary. Indeed, some participants portrayed explicit contemplation of the brain's operations as cognitively or existentially uncomfortable, provoking a sense of strangeness that "hurts my head" and "clutters" immediate task performance. Respondents did not see their self-proclaimed ignorance of what was happening "inside them" as problematic, and in everyday life they were rarely troubled by the gaps in their understanding.

Anchoring and Objectification: Funneling the Brain Toward "Science." The unfamiliarity of the neuroscience field brought anchoring and objectification processes to the fore. With brain research absent from participants' local realities, an immediate task when confronted with the concept was to categorize the sphere of life to which it belonged. For many, the word *brain* immediately evoked the more general concept of *science*.

That train of thought came through just the word "brain" as well, you know. It's really scientific, our brains, you know. And how they work and . . . what else? Yeah, automatically I would just think the word "science" really. (Female, broadsheet reader, 18-37 age-group)

While the association of brain research with science is rather self-evident, what is interesting is not the association in itself but *how* the anchoring of brain in science shaped people's assumptions about what brain research entailed. First, the categorization of brain as "science" reminded people of the science education they had experienced in school. Nine (19%) people explicitly attributed their understandings of the brain to the classroom, and many more ($n = 35$; 73%) conceptualized the brain in terms of "textbook" facts (e.g., its connection to the spinal cord) that likely originated in school science lessons. For certain people, formal education had been the primary or sole means of contact with the scientific domain, and this formed their understanding of what science is and does.

When I first hear like “science” I always go back to school, and like in science lessons with the test tubes and everything like that. So it’s just a bit, I’m not too sure in like what science really, really is if you get what I mean. Because I’ve always gone back to like the picture in my head of like test tubes and my science teacher and things, Bunsen burners and all that stuff. (Female, broadsheet reader, 18-37 age-group)

The anchoring of brain research in science also aroused ideas of research on animal subjects, mentioned by one quarter of participants ($n = 12$; 25%). This concept was presented in quite visual terms, with several describing images of rats or monkeys in technological contraptions. This was how participants pictured the quotidian of brain research.

Brain research I understand, an image of, I don’t know, a monkey or a dog with like the top of their head off and electrodes and stuff on their brain. (Male, broadsheet reader, 18-37 age-group)

The image of “electrodes” in the above quote is emblematic of a widespread objectification of neuroscience in imagery of research instruments, which materialized in almost half of interviews ($n = 22$; 46%). Often these were stereotypical features of science classrooms, such as Bunsen burners and beakers. Other instruments mentioned included scalpels, microscopes, and “helmets” that encased the skull. Seven (15%) participants explicitly named the technology of fMRI (functional magnetic resonance imaging), with a further nine (19%) referring to a more generic “brain scan.” The “scientific,” technical nature of such instruments held a truth value for some participants, connoting an objective, accurate depiction of the subject.

If he’s working with people that are doing it in a scientific way, however that’s done, you know in labs or something or using, using equipment and probably have things strapped to people’s arms or brains or something, so you would think it’s got some element of truth to it. (Female, broadsheet reader, 38-57 age-group)

The other salient objectification, materializing in one third of interviews, was a very formulaic visual image of the person of the scientist ($n = 16$; 33%). This image hinged on the core element of a white lab coat, with the coated individual usually situated in a laboratory, surrounded by instruments and machinery. The figure was almost invariably male and was sometimes personified by well-known scientific characters such as Einstein or “the Weetos guy” (the bespectacled elderly professor who advertises breakfast cereal).

It does conjure up images of, you know, strange men in white coats (Female, broadsheet reader, 38-57 age-group)

Thus, the categorization of brain research as “science” elicited a range of associations involving school, animal research, and scientific imagery. Through processes of anchoring and objectification, these emblems of science were transposed onto representations of brain research.

The Positioning of Self in Relation to Science. The classification of brain-related topics, actors, or activities as science meant that participants’ established attitudes to science molded their emerging orientations to brain research. The most dominant mode of relating to science—and thus to neuroscience—was dissociation. “Science” was positioned as a decidedly separate social milieu in which there was no question of self-participation. The designation of a stimulus as scientific elicited an immediate, patterned response of disengagement from the object in question.

I might have seen it on the news or something, you know, some report of some description. But because they probably mentioned the word “science,” or “We’re going to go now to our science correspondent Mr. Lala,” that’s probably when I go, okay, it’s time for me to make a cup of tea. (Male, tabloid reader, 38-57 age-group)

Feelings of alienation were explicitly expressed by 20 (42%) participants, revealing a sharp us-them divide between lay and scientific populations. For much of the sample, the domain of science was incontrovertibly “other,” involving an entirely unfamiliar and “completely alien” set of understandings, aims, and abilities.

There’s these guys going off and doing this stuff and they understand it but we don’t understand it so much. [. . .] from tabloid newspapers in particular that you’d have words like “boffins” being used. And that sort of thing makes people think, woah, other people. (Male, tabloid reader, 18-37 age-group)

Identity dynamics were therefore strongly implicated in (dis)engagement with brain research. The ability or inclination to engage with brain knowledge was seen to hinge on what “type” of person one was—namely, whether one was “scientific” and “academic.” Respondents avoided brain information because they self-identified as nonscientific, thereby designating the brain beyond their sphere of relevance, interest, and competence.

I can't say that I really look at it very closely, because as I said, you know, I'm not a very scientific person. (Male, broadsheet reader, 58-77 age-group)

The separation of self from science was underpinned by acute sensitivity to differentials in knowledge. Self-proclamations of ignorance occurred in 81% of interviews ($n = 39$), on average three times in each interview. People repeatedly qualified their statements with reminders of their relative lack of knowledge, suggesting that this invalidated their perspective.

I don't know if I'm right in saying that but I feel that. But you know it's quite scary 'cause I shouldn't be saying that without even, without having studied it. [. . .] I've no right to say it in the sense that I say, well, I know that now because I have a BSc in blah blah blah. I, you know, I haven't done any of that. I'm just from the university of life. (Female, broadsheet reader, 38-57 age-group)

Rather than a topic they could legitimately debate, the brain was the exclusive preserve of an intellectual elite. The perceived complexity of the relevant knowledge precluded lay participation: unfamiliar, dense, and technical language flagged scientific content as "not for me." The confusion experienced on encountering inaccessible information was demoralizing and contributed toward a withdrawal from the scientific sphere.

You just, like I say, blind people with science, don't you. And then it becomes a subject that you just don't understand. With me, I just switch off. I'm not understanding what you're talking about here, so I just switch off. (Male, tabloid reader, 38-57 age-group)

The sense of an informational gulf between self and science therefore had a mutually reinforcing relationship with a *social* gulf between self and science. Scientific information was seen as so complex that those who comprehended it must be an entirely different category of person. For instance, one woman asked incredulously, "Where do these people come from, that actually understand these things?" implying that they could not "come from" the world she herself inhabited.

For certain participants, this estrangement fed resentment or fear of the scientific sphere. Fifteen (31%) people voiced suspicion about scientific activity, wary about financial or political agendas or the use of science to manipulate the public. However, it would be misleading to characterize this as the sole or dominant attitude toward science. The exalted position of science gave rise to homage as well as hostility, with one quarter of participants professing admiration for scientists. Employing vocabulary such as "extraordinary,"

“noble,” and “special,” descriptions of scientists were tinged with idealization and even deification.

Anything to do with the brain, anything to do with medical research, any sort of—you literally are your life in their hands and you need the help and you, you expect them to be gods. You expect them to be able to do certain things. You do expect them to be, know more than you. Otherwise we’d all be doctors and scientists and engineers and you know, we’re not. (Female, broadsheet reader, 58-77 age-group)

The last two sentences of the above extract convey the principle that scientists’ *difference* from the self could, for some people, function as an important foundation for trust. This participant believed that scientists could be trusted precisely because they are “more than you.” Several argued that scientists’ lengthy and stringent training regimes guaranteed their competence and dedication. Thus, in some interviews the distanced position of science functioned as a badge of credibility rather than cause for suspicion.

You trust them because it’s, is it like 11 years or something? It’s a long time so it kind of, it really stretches it out so the people who are doctors really are professional people, they know what they’re doing, you can trust these people. [. . .] I think with it being such a stringent process you’re kind of forced to trust them. (Male, tabloid reader, 18-37 age-group)

Thus, the widespread sense of estrangement from science showed a dual-sided valence. While some expressed antipathy toward science, for others science’s distanced position fostered an image of admirable beings who conducted work that outstripped the capacities of normal minds.

Theme 2: The Brain Is Something That Goes Wrong

Though the brain was ordinarily absent from participants’ mental landscapes, there was one route by which this habitual inattention could be ruptured. The second theme articulates the finding that for many, neurological *pathology* was the only aspect of brain research that held clear personal relevance. This foregrounding of pathology constituted the brain as a vulnerable, anxiety-provoking organ and anchored brain research in the domain of medicine.

The Brain Is a Negatively Valenced Concept. When participants began to speak about the brain, many of their immediate associations revolved around its potential to malfunction. Pathology was a near-universally acknowledged feature of brain research, mentioned in all but one

interview ($n = 47$; 98%). As will be outlined shortly, both neurological and psychological forms of pathology were discussed, with the former attracting more attention.

Much content within this theme was grounded in respondents' own life experiences, with 37 (77%) people referring to pathological conditions experienced by themselves or acquaintances. This personal experience of pathology was the primary—and for some, the only—route by which they envisioned becoming mindful of brain knowledge. While allusions to this quality of “dys-appearance” appeared throughout most of the sample, one quarter of participants ($n = 12$; 25%) self-reflexively acknowledged the importance of illness in mediating awareness of the brain, explicitly stating that brain disease would be necessary to shock them into acknowledging the brain's role in their lives.

Science of the brain is almost something that you find out about if there's something wrong with you. You know. You might have a medical issue. So that's when your GP might open up, you know, this chasm of information about the science of the brain and you've then got to try and understand it. (Male, tabloid reader, 38-57 age-group)

As the healthy, normally functioning brain did not ordinarily enter conscious awareness, when the brain was considered it was primarily a source of pain and debilitation. Representations of the brain were therefore heavily loaded toward the negative. For many, the word *brain* immediately evoked associations of illness and its unpleasant emotional connotations.

Not pleasant inference. More or less. Because it's the brain. Then that's a bit scary. [. . .] So, you know, just, just an initial thought. Thought oh, brains, hospital, no. (Female, broadsheet reader, 58-77 age-group)

Thus, the brain's tendency to “dys-appear” resulted in a near-exclusive association of “brain” with pathology, which tainted the organ with an unpleasant emotional residue.

Anchoring and Objectification: Funneling the Brain Toward Medicine. Just as the brain was seen primarily as a locus of pathology, brain *research* was anchored in the medical domain. The association with medicine, formed by 29 (60%) people, was often immediate and spontaneous. Many conceived of brain research as an intrinsically medical enterprise, which occurred in a hospital and was exclusively oriented toward disease or disability.

Brain research is probably mostly like medical stuff to be honest. To my, in my opinion that's what I think it is. Medication, medical things. (Female, tabloid reader, 18-37 age-group)

The interviews revealed a particularly striking conflation of the fields *brain research* and *brain surgery*, reference to which occurred in 30 (63%) interviews. Equally, the terms *brain scientist* or *brain researcher* were used interchangeably with *brain surgeon* or *doctor*. Numerous participants assumed that surgery would be the primary occupation of brain researchers.

I thought of brain surgery. As soon as you said brain research, I don't know, I just thought of someone picking at a brain, like dissecting, figuring what parts are what. (Female, broadsheet reader, 18-37 age-group)

With this invocation of surgery, the unfamiliar domain of contemporary brain research was anchored in an old, accustomed field, whose characteristics shaped participants' developing conceptions of brain research. For instance, neurosurgery was generally described using vocabulary that indicated a sense of violation ($n = 16$; 33%). This vocabulary transferred to conceptions of brain research, which was described as "digging at," "tinkering with," or "drilling into" the brain. Additionally, as much understanding of brain surgery derived from film portrayals, brain research was objectified in vivid, sometimes quite violent, images of surgical procedures.

I just saw, you know, doctors and then the person on the operating table and then just lights, and then yeah, digging at it. (Female, broadsheet reader, 18-37 age-group)

Unease with external intervention in the brain was echoed in discussion of electroconvulsive therapy, which was mentioned by six respondents (13%). Again, this was represented in terms of violation or intrusion, variously described as "messing," "scrambling," or "tinkering" with the person's brain. Some participants described quite graphic images of people undergoing electroconvulsive therapy, which were again usually derived from television or film imagery.

It looked quite barbaric really, someone being strapped to, you know, to a hospital bed and just being given these shocks which will be quite painful. (Female, broadsheet reader, 38-57 years)

Associations with medicine were not always specific to the brain: several interviews evolved into broader discussions of medical institutions, medical professionals, and general health. Cancer was a particularly salient touchstone, mentioned in 25 (52%) interviews. Cancer was the default illness relative to which neurological pathology was appraised, and a “cure for cancer” formed a recurring trope throughout the interviews, exemplifying the rightful aim of scientific research.

Thus, representations of brain research absorbed elements of existing representations of medicine, such as its physical location (hospital), practitioners (doctors), priorities (developing cures for cancer), and material practices (invasive surgery). The anxiety attached to these attributes colored people's instinctive orientations to neuroscience.

What Can Go Wrong? Forms of pathology introduced fell into two categories: neurological conditions, mentioned by 44 (92%) participants, and psychiatric/psychological conditions, which appeared in 29 (60%) interviews. These two categories of pathology were discussed in discernibly different ways, as elaborated here.

Neurological conditions. The neurological conditions that most preoccupied people were dementia ($n = 24$; 50%), cerebrovascular conditions such as stroke and aneurysm ($n = 18$; 38%), and brain cancer ($n = 18$; 38%). Dementia, the most salient focus of concern, was repeatedly objectified in a narrative of decline that had a rather formulaic structure, with its sufferers depicted as regressing to childhood. When describing acquaintances with dementia, respondents commonly volunteered information about the person's prior life that served as evidence of their earlier vitality. This sharpened the sense of descent and intensified its poignancy.

I watched him deteriorate mentally as an old man and it was quite shocking to see a man of such intellectual prowess go down, go off completely mad, you know, it's like, oh, that's dementia for you. (Male, broadsheet reader, 38-57 age-group)

A sense of anxiety permeated discussions of neurological conditions. This fear intensified with age, with several of the older participants describing alarm at their occasional episodes of forgetfulness. Anxiety was compounded by a sense that prevalence rates of dementia were increasing, and several respondents specifically noted its visible media presence. Much of participants' fear of neurological disorder revolved around an anticipated loss of independence ($n = 10$; 21%). Loss of self-sufficiency was seen to dismantle personal dignity, with deterioration of brain function equated with disintegration of the self. Furthermore, reliance on others engendered vulnerability to manipulation.

It is a fear of mine [. . .] Just not knowing what I'm doing, if someone would take advantage of me or something like as we spoke earlier, signing all my properties over to the nurse. (Male, broadsheet reader, 38-57 age-group)

Neurological disorder was also associated with the loss of important relationships ($n = 9$; 19%). This particularly applied to memory deterioration and the specific fear of forgetting one's children, which was imagined as an inconceivable horror.

Thus, neurological disorder was not purely a matter of corporeal illness; it devoured a person's independence, relationships, and identity. As a result, discussion of neurological disorders was tinged with sharp emotional resonance of fear and dread.

Psychiatric and psychological conditions. The psychological disorders mentioned were mainly mood disorders ($n = 14$; 29%) and learning disorders ($n = 10$; 21%), along with sporadic references to addiction ($n = 7$; 15%), autism or attention deficit hyperactivity disorder ($n = 6$; 13%), schizophrenia ($n = 6$; 13%), and personality disorders ($n = 5$; 10%). Notably, psychological disorder evoked little fear relative to neurological pathology. Many assumed that psychiatric disorder was unlikely to directly affect them, unlike neurological illness, which struck indiscriminately. Instead of fear, the dominant emotive response was *sympathy* toward those affected.

I feel sorry for schizophrenics as well. [. . .] because when your brain is in pain and you know that there's something wrong with you, I think that must be quite difficult to live with. (Female, broadsheet reader, 58-77 age-group)

While sympathy reflected a benevolent stance, it did not necessarily move the sympathizer subjectively closer to mentally ill populations. Sympathy was often elicited precisely by the sense that these people were dramatically different from oneself. The emotional response was predicated on and perpetuated this perception of difference, as demonstrated by a sense of awkwardness about one's own relatively fortunate position.

I see them in the chairs being pushed along, they don't even seem to connect. You know, what is going on in their little brains? Oh gosh, I feel embarrassed for myself, for my inability to be able to communicate with them. And normally I just smile, but, 'cause what else can you do? (Female, broadsheet reader, 58-77 age-group)

Within the sample as a whole, psychiatric conditions were generally unproblematically portrayed as neurobiological in nature, with six (13%) participants invoking the notion of “chemical imbalance.” Explicit reference to environmental factors in mental illness occurred in just six (13%) interviews. These six people did not, however, deny a biological foundation, instead portraying environmental and biological processes as parallel contributors.

Affirming the biological etiology of psychological dysfunction held particular import for five (10%) individuals who divulged direct experience of mental disorder. The very emotional narratives produced by these individuals revealed the distinctly personal meanings of brain ideas within contexts of psychological distress. Respondents described the time of diagnosis, when their difficulties were newly classified as brain disorder, as a critical transition point in their lives, which provoked sharp shifts in their self-understanding. Its main effect was to remove their psychological tribulations from the self, reconstituting them as something that had happened *to* them rather than something they had caused.

I became severely depressed. But of course, as I didn't know that the explanation was purely chemical, I took it as this is my life and these are my real feelings. [. . .] Well they were my real feelings, but they were chemically induced as opposed to a result of my life. They were a result of my body if you like. Affecting my brain, as in my chemistry. [. . .] But it [diagnosis] was like a light, somebody had pulled one of those lights in a bathroom, click click. Everything changed and history changed. (Male, broadsheet reader, 58-77 age-group)

These individuals were acutely aware of the contested nature of psychiatric illness and felt that defining it as neurological would legitimize it, safeguarding their social status and access to services. However, despite this strong endorsement of a “brain disorder” understanding of mental illness, they also worried that indiscriminate assignment of the “brain disorder” label would dilute its authenticating power. Some attempted to “police the boundaries” of their diagnostic category by arbitrating between legitimate and illegitimate cases of psychiatric dysfunction. For example, one man expressed anger at “people who jump on this bandwagon and pretend that they’ve got a mental illness when they don’t, just ‘cause they don’t want to go to work,” feeling that this “ruins it for the rest of the people that genuinely, you know, cannot go to work.” The authenticating implications of a brain disorder classification were therefore not entirely secure: its boundaries required active policing to ensure that exemplars who could undermine its credibility were excluded.

A final point to note is that individuals with direct experience of psychiatric dysfunction were more sensitized to brain ideas generally. Pathology

made the brain personally relevant and increased motivation to learn about it. People with psychiatric difficulties actively sought and earnestly endorsed the classification of “brain disorder,” using it to internally represent and externally articulate their experience. In this sense, direct experience of mental health problems represented the primary context in the data in which neuroscientific ideas had meaningfully infiltrated self-perception and social relations.

Discussion

The most immediately striking feature of this study was the stark absence of neuroscientific concepts from ordinary repertoires of common sense. Most interviewees were oblivious to media coverage of neuroscience and strongly asserted that the brain did not surface as an object of thought or conversation in their daily lives. This substantiates previous research attesting to the remoteness of nonclinical neuroscience from ordinary subjectivities (Choudhury et al., 2012; Pickersgill et al., 2011). It seems that despite neuroscience’s prominence within public institutions such as the mass media, contemporary brain research has yet to seriously penetrate the conceptual repertoires of lay citizens.

Typically, the opening stages of the interviews were characterized by brief periods of bafflement, as respondents registered the unfamiliar topic that confronted them. Consistent with the tenets of SRT, the processes of anchoring and objectification were pivotal in enabling participants to break through this disorientation. Most respondents acted immediately to anchor brain research in established social categories, most prominently science and medicine. Respondents relied on these classifications to develop a conception of what brain research *is* and to orient themselves to it in social space. For instance, a representation of brain research as science was objectified in the figures of eccentric, white-coated men who tinkered with strange instruments in sterile laboratories. This constituted brain research as distant and “other.” Meanwhile, a representation of brain research as medicine was objectified in imagery of invasive, painful surgical procedures, which elicited a sense of violation and apprehension. Anchoring and objectification processes thereby enriched the initially obscure category of brain research with epistemic, emotive, and social content, which often served to position brain research as a domain from which the self was excluded due to want of knowledge, interest, or personal relevance.

The centrality of anchoring and objectification highlights the extent to which public reception of unfamiliar scientific concepts is premised on already-existing features of social and subjective realities. In particular, these

data suggest that public engagement with neuroscience is shaped by two parameters: the position the wider institution of science holds in contemporary society and the role of dys-appearance in embodied experience.

The Position of Science in Contemporary Society

In these interviews, established repertoires of relating to “science” in general drove spontaneous responses toward “brain research” in particular. Most participants strongly identified as “not scientific,” positioning themselves sharply outside the scientific world. The concept of brain research was overlaid on this self-science distinction, such that ascribing brain research to science simultaneously designated it as “not me.” The distancing of science was consolidated by alienating, stereotypical descriptions of its actors, who were embodied by icons such as white coats, strange instruments, and eccentric hairstyles (Haynes, 2003; Petkova & Boyadjieva, 1994; Van Gorp, Rommes, & Emons, 2014). The analysis suggested that social estrangement from the scientific domain deterred people from engaging with its conceptual products. The research thus highlights the “gatekeeping” role that identity plays in engagement with science (Breakwell, 2001; Joffe & Farr, 1996). In day-to-day life, active engagement in representational work hinges on the designation of a given phenomenon as relevant to the self; if it is immediately delegated to an alien social sphere, it does not find resonance in ordinary thought and conversation.

It is important to note that the disinclination to personally engage with knowledge designated “scientific” did not always reflect antipathy toward science. While some antagonism was evident, so too was idealization of science and its actors. This accords with research on stereotype content, which shows that representations of out-groups often contain a mixture of pejorative and complimentary content (Fiske, Cuddy, Glick, & Xu, 2002). *Both* hostility and homage, however, were premised on a common positioning of science as socially “other.” Even those who lauded neuroscientists’ intellect and dedication showed little interest in acquainting themselves with the information they produced.

The data therefore challenge the postulate, often endorsed by SRT theorists, that science occupies a uniquely significant position in contemporary common-sense (Farr, 1993; Moscovici, 1961/2008; Wagner, 2007). On the contrary, the designation of information as scientific may alienate large swathes of the population. As a result, even when scientific developments provoke media coverage as consistent as that of neuroscience, their percolation into ordinary subjectivities does not inevitably ensue. This should not be cast as a necessarily dysfunctional outcome. Given the SRT premise that common sense is fundamentally oriented toward satisfying social, emotional,

and pragmatic imperatives, perhaps neuroscientific knowledge simply does not currently serve any compelling psychosocial functions. As personal and political landscapes change over time, so too might the pertinence of brain science to everyday lives.

The Role of Pathology in Mediating Engagement With Science

Though the data suggested that neuroscience as a whole has not pervaded ordinary common sense, the analysis exposed one key vector of engagement with neuroscientific ideas: the experience of neuropathology. Previous research (e.g., Buchman et al., 2013; Singh, 2013a) implies that brain knowledge assumes greater significance among clinical than nonclinical populations: psychiatric diagnosis may solicit explicit reflection on the brain's operations. Participants in this study seemed to intuitively grasp this, anticipating that their ordinary inattention to the brain could be breached by experience of it "going wrong." This, they felt, was the only context that would conceivably motivate engagement with neuroscientific information. Concordantly, the few individuals who divulged personal experience of psychiatric disorder were more aware of and emotionally invested in neuroscientific ideas.

The contingency of neuro awareness on pathology resonates strongly with Leder's (1990) work on the interplay between bodily disappearance and dys-appearance. According to Leder (1990), the differential attention afforded to the body's normal and pathological functioning cultivates a devaluation of the relevant body part, because it is disproportionately loaded with negative connotations. This contextualizes the responses of those participants for whom the word *brain* immediately elicited associations of worry, difficulty, and threat. The importance of pathology for triggering reflection on one's own brain also set the tone for conceptualizing the category of brain *research*, which was presumed to be a medical field whose primary function was to cure illness. This proposed effect of dys-appearance may have relevance beyond neuroscience, underpinning a wider medicalization of science in the public domain: previous research has identified medicine as paradigmatic in public conceptions of "what science is" (Bauer, 1998; Durant, Evans, & Thomas, 1992). Social representations of science may be shaped by a phenomenological tendency that weights conceptions of the body toward pathology and dysfunction.

The concept of bodily disappearance may also help account for the disjunction between the regularity of media coverage of neuroscience and its remoteness to this lay sample. Leder (1990) positions bodily disappearance as purposive rather than incidental, suggesting that it is necessary for the optimal functioning of the body (because it allows attention to focus on the external world). This raises the interesting proposition that disengagement from neuroscientific content may be

phenomenologically functional or motivated. If the phenomenological system prefers to remain oblivious to the moment-by-moment operations of the body, scientific schematisations of one's bodily processes may be expressly avoided. Indeed, some interviewees articulated a sense of discomfort in directly contemplating their brain, experiencing this as cognitively or existentially jarring. Accustomed to the brain's usual invisibility, people were uneasy with the notion of it being scientifically exposed and manipulated, describing this as violation or intrusion. Although neuroscience findings can circulate within cultural artifacts such as the media, they may experience difficulty in penetrating lay consciousness if their exposure of the brain clashes with—and disrupts the smooth functioning of—the embodied experience.

The research therefore suggests that representing a scientific topic does not solely involve digesting the information provided by outside sources such as the media. When the topic relates to human biology, one's own bodily experience can be a further font of knowledge, shaping the extent to which people engage with science, the conditions under which they do so, and the conceptual and affective content of the ensuing representations. This offers a potentially fruitful new direction for SRT, which has thus far afforded minimal attention to the embodied nature of knowledge.³ The works of phenomenological philosophers such as Merleau-Ponty, Husserl, and Sartre, as well as recent research in embodied cognition (Meier, Schnall, Schwarz, & Bargh, 2012), suggest that bodily states selectively evoke particular conceptual and affective content. A comprehensive etiology of representations should therefore consider whether they are shaped by the derivatives of corporeal experience, as well as social communication.

Limitations and Future Directions

This research represents the most comprehensive study heretofore published of how people with no preidentified investment in brain research engage with neuroscientific ideas. However, the picture it gives is not exhaustive, and many avenues for further research remain. In particular, while the qualitative design facilitated a rich and detailed insight into the processes by which participants made sense of brain research, it is impossible to gauge the extent to which the sentiments of these 48 individuals are typical of the wider population. For instance, while efforts were made to stratify the sample on a range of sociodemographic variables, all participants were Britons living in London. Given that previous research has detected cross-cultural differences in engagement with neuroscientific knowledge (Singh, 2013b), similar studies in other cultural contexts could yield interesting divergences. As an additional prospect for future research,

the interview data could inform the development of surveys administered to wider, more representative samples.

A further point to consider relates to the influence of the specific interview technique adopted on the data elicited. While the open nature of the GEM interview strategy ensures that the responses provided are spontaneous and participant-led, the lack of direction can result in diffuse, heterogeneous data. Though this befits an exploratory study, future research requiring more focused data may benefit from more direct questioning strategies or from soliciting responses to specific examples of neuroscientific concepts or imagery.

Conclusion

Looking to the future, it is possible that neuroscience will continue to expand its position in the public sphere, increasingly invoked by the media, policy makers, and cultural commentators. However, heightened public visibility should not be automatically equated with heightened personal engagement. The current research proffers the possibility of public receptivity to those aspects of neuroscientific knowledge that pertain to *clinical* phenomena. In this study, psychiatric disorders were clearly defined as neurobiological in nature, and neurological degeneration (particularly dementia) constituted an object of dread in the cultural imaginary. However, the research suggests that beyond contexts of pathology, the diffusion of neuroscientific ideas into ordinary conceptual registers faces several hurdles. Identity dynamics that detach the self from the scientific domain may prompt disengagement from neuroscientific information, which is positioned beyond the perimeter of one's own knowledge, interest, and ability. In addition, features of human embodiment mean that in the absence of pathology, the brain recedes from conscious awareness; indeed, people may actively resist contemplating their own bodily interior. As a result, neuroscientific knowledge may remain remote from everyday life. A "neuro society" may be more theoretical fantasy than lived reality.

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Notes

1. This was chosen as the prompt term instead of *neuroscience* because pilot research indicated that *neuroscience* is not a universally familiar word. In discussing the analysis in this article, the authors use *neuroscience* and *brain research* interchangeably.
2. As the open-ended design set few constraints on conversational topics, interviews often slipped between discussion of brain *research* and discussion of *the brain*. The analysis reflects this: as these two foci are intrinsically interconnected in the data, attempting to analytically decouple them would misrepresent the data collected.
3. While there is a substantial body of SRT research exploring how sociocultural processes guide interpretations of one's own and others' bodies (e.g., Herzlich, 1973; Joffe & Staerklé, 2007; Jovchelovitch & Gervais, 1999), little SRT work has considered the reverse direction of the body-society relationship—that is, how bodily experience constitutes social psychological life. For exceptions, see the work of Denise Jodelet (1984, 1993).

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