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Media representations of early human development: Protecting, feeding and loving the developing brain



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ABSTRACT

The public profile of neurodevelopmental research has expanded in recent years. This paper applies social representations theory to explore how early brain development was represented in the UK print media in the first decade of the 21st century. A thematic analysis was performed on 505 newspaper articles published between 2000 and 2010 that discussed early brain development. Media coverage centred around concern with 'protecting' the prenatal brain (identifying threats to foetal neurodevelopment), 'feeding' the infant brain (indicating the patterns of nutrition that enhance brain development) and 'loving' the young child's brain (elucidating the developmental significance of emotionally nurturing family environments). The media focused almost exclusively on the role of parental action in promoting optimal neurodevelopment, rarely acknowledging wider structural, cultural or political means of supporting child development. The significance of parental care was intensified by deterministic interpretations of critical periods, which implied that inappropriate parental input would produce profound and enduring neurobiological impairments. Neurodevelopmental research was also used to promulgate normative judgements concerning the acceptability of certain gender roles and family contexts. The paper argues that media representations of neurodevelopment stress parental responsibility for shaping a child's future while relegating the contributions of genetic or wider societal factors, and examines the consequences of these representations for society and family life.

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Introduction

Research in the area of early human development has implications far beyond the scientific sphere, impinging on domains such as parenting, education, health and welfare policy. The assimilation of scientific conceptions of child development into such domains may shape perceptions, assumptions, opinions and practices. It is therefore important to map how developmental research travels into the public domain and is represented in 'real-world' social contexts. This paper examines how early brain development is represented in the public sphere, drawing on a thematic analysis of media coverage of neurodevelopmental research.

The rise of the neuroscientific frame

Societal concern about the implications of early experiences for later developmental outcomes is not a new phenomenon, stretching back (at least) to the popularisation of psychoanalysis

and attachment theory (Wall, 2010). Recent times, however, have seen a shift in the focus of popular conceptualisations of the significance of early development. Since the 1990s the public profile of the field of neuroscience has expanded dramatically, with brain research increasingly recruited as a point of reference in media and policy debate (Dumit, 2004; O'Connor, Rees, & Joffe, 2012; Pitts-Taylor, 2010; Racine, Waldman, Rosenberg, & Illes, 2010; Rose, 2007). Neuroscientific knowledge has been positioned as directly relevant to a wide range of social domains, including law, marketing, economics, ethics and politics (Abi-Rached, 2008; Frazzetto & Anker, 2009; O'Connell et al., 2011). One domain in which the voice of neuroscience has been particularly conspicuous is childrearing: over the last two decades public dialogue concerning child development has increasingly incorporated a neuroscientific dimension (Maxwell & Racine, 2012; Nadesan, 2002; Thornton, 2011; Wall, 2010).

This neuroscientific framing of development holds that early experiences inscribe themselves on a child's brain, and it is this organ that carries childhood influences forward to adulthood. This explicit preoccupation with the brain has diffused widely through public discussion of child development, with many recent best-selling parenting books - e.g. Gerhardt's (2004) *Why Love Matters: How*

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*Affection Shapes a Baby's Brain, James' (2010) How Not to F*** Them Up: The First Three Years* and *Leach's (2010) The Essential First Year* - premised on the idea that understanding the neurobiology of development is essential for promoting optimal cognitive, emotional and social outcomes. The focus on the 'neuro' has also penetrated social policy, fuelling support for an 'early intervention' approach to a host of societal problems such as teenage pregnancy, crime and substance abuse (see Fig. 1) that purportedly result from neurobiologically suboptimal early environments (Allen, 2011).

Scientific knowledge in society

The position of scientific information in ordinary social life is a central focus of social representations theory (SRT), a social

psychological theory that analyses how information produced in the 'reified universe' of science is transformed into the everyday, common-sense knowledge that shapes social attitudes, practices, policies and beliefs (Moscovici, 2008). The concern of SRT is not with evaluating the accuracy of common-sense understandings relative to expert knowledge, but rather with documenting how common-sense representations of scientific information influence ordinary social life. Science, from the point of setting research questions to selecting findings of interest, is deeply influenced by cultural values (Barnes, Bloor, & Henry, 1996; Latour & Woolgar, 1986). Further layers of meaning are acquired as scientific knowledge moves from the laboratory into the dense networks of worldviews that saturate the public sphere (Farr, 1993). SRT holds that making sense of new ideas in society hinges on two processes:

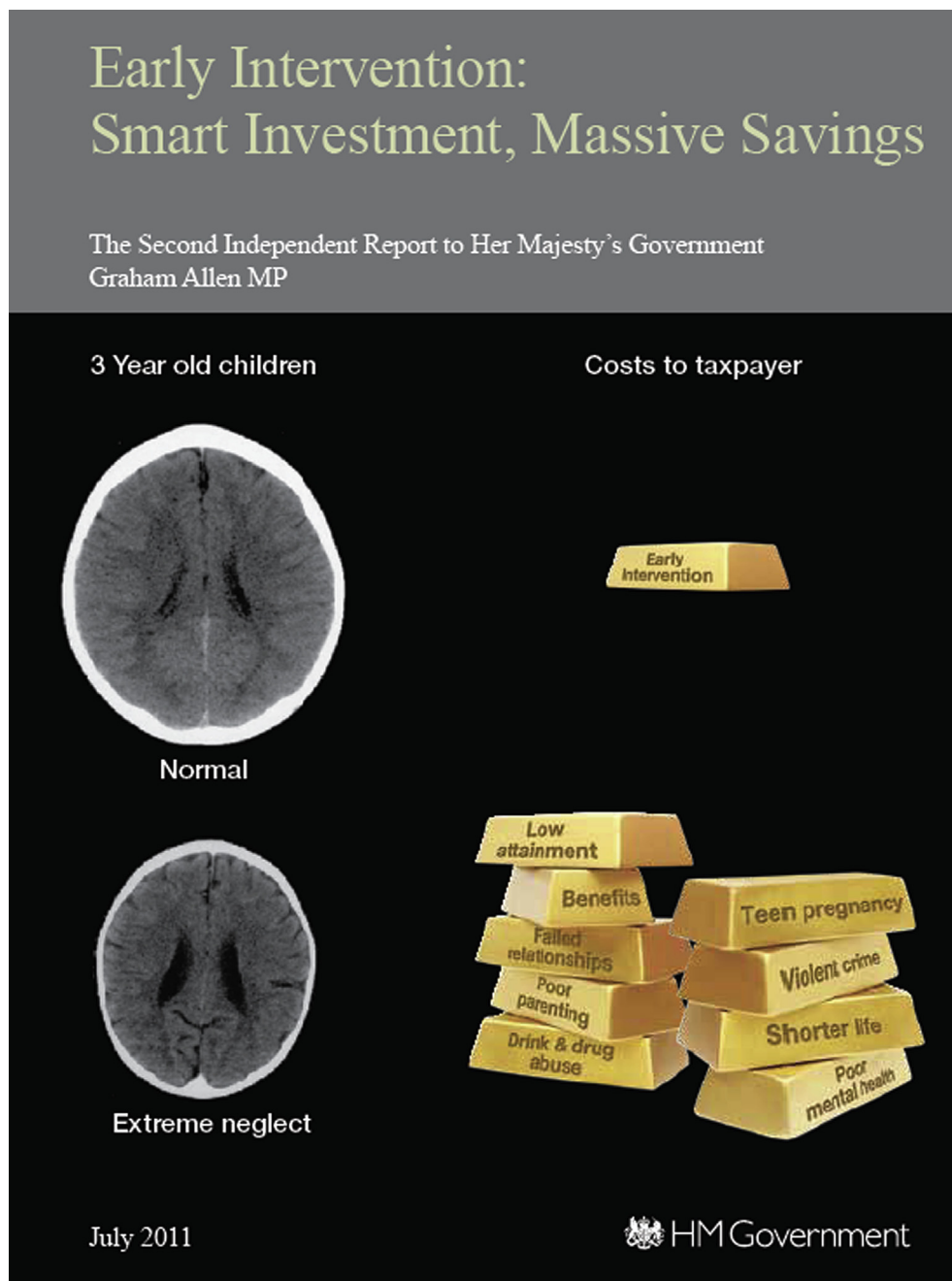


Fig. 1. Front cover of the governmental report *Early Intervention: Smart Investment, Massive Savings* (Allen, 2011).

new ideas are 'anchored' within established cultural understandings, and 'objectified' with tangible symbols, images or metaphors. Through these processes, familiar meanings are projected onto the new information and colour how it is represented.

SRT research has shown that scientific ideas that resonate with prevailing social concerns are selectively 'taken up' in public life, and the substance of these ideas adapts as they assimilate into existing cultural meaning-systems. This principle is demonstrated well by Bangerter and Heath's (2004) examination of the popular diffusion of the 'Mozart effect', the idea that classical music enhances children's intelligence. This research established that the Mozart effect received most media coverage in North American states with poorer quality primary education, suggesting that differential uptake of the idea was linked to levels of concern about early intellectual development. The study also documented how the idea's content evolved over time: while the original research article investigated the IQ performance of college students (Rauscher, Shaw, & Ky, 1993), the media gradually shifted towards discussing the Mozart effect with reference to children and newborns.

The assimilation of scientific knowledge into the fabric of everyday life can have tangible societal consequences, reproducing cultural ideologies and beliefs and influencing behaviour and policy. The public attention afforded to the Mozart effect, for instance, led the governor of Georgia to dedicate state funds to distributing classical music to all newborns (Bangerter & Heath, 2004). As neurodevelopmental ideas grow in societal prominence, it is therefore important to critically examine how they are represented in the public sphere. SRT provides a useful framework in which to do so. One key advantage lies in its sensitivity to the wider social context in which knowledge emerges, allowing the development of knowledge to be mapped to relevant cultural concerns. For example, Bangerter and Heath (2004) established that a key variable in the evolution of the Mozart effect was the age of the subjects to which it was applied: media interest in the idea's applications to college students dwindled, interest in applications to children increased steadily, and interest in applications to babies suddenly surfaced despite the complete absence of scientific research on this age-cohort. They attributed these patterns to societal concerns about promoting children's intellectual performance and about the critical nature of infancy for development. In considering how scientific ideas interact with prevailing cultural climates, SRT thereby furnishes an insight into both the content of lay thinking about science and the wider cultural concerns that permeate particular social contexts.

The cultural context of neurodevelopmental knowledge

What, then, is the wider cultural context into which the science of child development falls? The surge in public attention to the neuroscience of development has coincided with certain sociological shifts in the domain of childrearing. Beck and Beck-Gernsheim (1995) argue that while childrearing has historically been characterised by large degrees of convention and consensus, in western industrialised countries this consensus had largely been eroded by the end of the 20th century. Today's societies witness a profusion of often contradictory postulations about the 'best' ways to raise children (Beck & Beck-Gernsheim, 1995). Sociological analyses of contemporary family life have linked this uncertainty to the rise, in the late 20th century, of an 'intensive' style of parenting (Hays, 1996). The concept of intensive parenting denotes a view of childrearing as an increasingly time-, resource- and emotionally-consuming task, with the proliferation of contradictory recommendations compelling constant self-interrogation. Parents are expected to devote concerted effort to developing

children's talents and cognitive abilities and 'maximising' their potential (Lareau, 2002). Furedi (2001) adds a further layer to this analysis, contending that parenting is increasingly characterised by a 'paranoid' approach involving extreme sensitivity to potential risks and preoccupation with monitoring and sheltering children. Thus, sociological research depicts contemporary parenting as a demanding and all-consuming task.

While research suggests that moves towards intensive parenting have been widespread in western societies, intensive parenting is not universal. In particular, experiences of parenting segment along familiar gender and class lines. The demands of intensive parenting appear to fall disproportionately heavily on mothers. While one might expect that increased maternal employment has curtailed the time mothers spend with children, US data indicate that the hours mothers devoted to childcare actually increased through the late 20th century (Sayer, Bianchi, & Robinson, 2004). The cultivation of children's talents and abilities, as well as the emotional labour involved in ensuring childcare is sufficiently 'child-centred' and 'emotionally involved', tend to be construed as distinctively maternal responsibilities (Caputo, 2007; Hays, 1996; Lee, 2008; Wall, 2010). Intensive parenting also incorporates a socio-economic dimension: the sociological literature characterises intensive parenting as particularly reflective of middle-class values and opportunities (Caputo, 2007; Lareau, 2002).

Several commentators have suggested that the dual trends of intensive parenting and preoccupation with neurobiological development dovetail (Nadesan, 2002; Thornton, 2011; Wall, 2010). A representation of early childhood as neurobiologically 'critical' may intensify the imperative to perform the 'right' type of parenting, implying that without appropriate input at a particular stage, a child's brain development (and consequent cognitive, emotional and social capacities) will be irreversibly disrupted. Furthermore, a culture that strives to identify the optimal ways of raising children may find neuroscientific knowledge distinctly appealing, promising to unambiguously demonstrate the 'real' effects of parenting practices on developmental outcomes. This synergy between intensive parenting and a focus on neurodevelopment, however, remains to be empirically substantiated.

Popular accounts of early brain development

Little published research delineates how the science of child development manifests in the public sphere. Psychologists Thompson and Nelson (2001) provide a useful review of media coverage of early brain development, concluding that the media tend to exaggerate the extent of knowledge about the developing brain, inflate the importance of the first three years by not acknowledging the life-long nature of brain development, and overemphasise the developmental significance of parental care relative to other influences. These concerns are echoed by Bruer (1999) and Maxwell and Racine (2012), who contend that popular recommendations for responsive early childcare are often unsupported by the neuroscientific evidence they invoke and risk generating unnecessary parental stress by 'raising the stakes' of childcare decisions.

In a more sociological analysis of popular portrayals of early brain development, Thornton (2011) draws on Foucauldian theory to argue that by representing parenting behaviours as exerting measurable effects on children's neurobiology, popular parenting advice books reconstitute parenting into a technical programme amenable to monitoring and intervention. Thornton observes that a recurrent theme in contemporary mothering advice literature is an appeal to go 'back to basics', emphasising the neurobiological benefits of consistent maternal love and affection. While this is portrayed as liberating

women to simply do 'what comes naturally', Thornton presents it as ultimately oppressive, impelling mothers to regulate their emotional lives. In characterising the joy and fulfillment that 'naturally' accompany motherhood as important elements of a neurobiologically nurturing environment, parenting manuals imply that women with divergent emotional experiences are providing their children with suboptimal neurodevelopmental conditions. Thornton's analysis suggests that popular representations of neuroscientific research can be funnelled into normative messages about how people should think, feel and behave in particular social roles.

While the work of Thompson and Nelson (2001), Maxwell and Racine (2012) and Thornton (2011) is instructive, it is somewhat limited by a lack of methodological systematicity. Their analyses of popular coverage of early neurodevelopment do not report detailed information about the particular material inspected or the analytic techniques applied. Further, these commentaries do not directly address the issue of variability in popular representations of neurodevelopment. Social representations are rarely monolithic and it is important to be sensitive to inconsistencies and variations that exist within them (Jovchelovitch, 2007). It is possible, for example, that coverage of neurodevelopmental research varies systematically across publication outlets, such that different audiences routinely encounter different representations of early brain development. Additionally, it is worth considering whether (as in Bangerter & Heath, 2004) the meanings attached to neurodevelopmental information fluctuate according to the developmental stage under discussion, i.e. whether the developing brain is that of a foetus, infant, or young child. A comprehensive analysis of social representations of neurodevelopment demands attention to such nuances.

The aim of this paper is to map the social representations of early neurodevelopment that prevail in the popular press. The paper draws on data collected during a larger project on representations of neuroscience in the UK print media (O'Connor et al., 2012). The subset of data that related to a child population was extracted and analysed qualitatively to identify the major thematic patterns through which the media portrayed neurodevelopment. Via this analysis, the paper aims to cast light on how scientific ideas about brain development manifest in the contemporary public sphere.

Method

Data collection

Nexis UK, a database that stores newspaper content, was used to retrieve the articles for the larger project on media representations of neuroscience. The database was searched for articles published between 1 January 2000 and 31 December 2010 that contained a 'major mention' (i.e. term present in headline, lead paragraph or indexing) of either of the terms 'brain' or 'neurosci!' (the truncation of a term with an exclamation mark instructs the search programme to retrieve all variations of the root term, e.g. 'neuroscience', 'neuroscientist'). In order to limit the amount of irrelevant articles retrieved due to vernacular use of the word 'brain' (e.g. 'brain drain', 'brain teaser'), articles had to additionally contain the term 'research' in the same paragraph. The search was circumscribed to six national UK daily newspapers. These comprise the three broadsheets (*Daily Telegraph*, *Times*, *Guardian*) and three tabloids (*Daily Mail*, *Sun*, *Mirror*) with the highest circulation figures (National Readership Survey, 2012) and span the political spectrum from right to left of centre. Duplicated articles and articles not relating to media coverage of neuroscience research (e.g. obituaries, television listings) were removed, leaving an overall data corpus of 2931 articles.

The retrieved articles were imported into the data analysis programme ATLAS.ti. A content analysis was performed (Krippendorff, 2004), with all articles coded to indicate their subject matter and the population(s) to which they applied the neuroscientific ideas. A more detailed report of the analysis of the entire dataset can be found in O'Connor et al. (2012). The content analysis categorised 505 articles (17% of the whole sample) as discussing brain research that was explicitly relevant to a child population. This paper concentrates on analysing this subset of the main data corpus.

Fig. 2 displays the number of articles relating to children published in each year. This graph shows a general upward trend in the number of articles published, with article number and year significantly positively correlated, $r(9) = .69$, $p < .05$. Figures peaked in 2006 and dropped somewhat after this with a particularly noticeable decline in 2009, but showed a resurgence in 2010.

The sample contained articles from three broadsheets, the typical reading material of higher socio-economic groups, and three tabloids, generally associated with a more working class readership (Chan & Goldthorpe, 2007). Tabloids devoted a greater amount of their neuroscience coverage to articles about children, which comprised 20% ($n = 274$) of all tabloid articles in the sample and 15% ($n = 231$) of all broadsheet articles (the whole dataset contained 1372 tabloid articles and 1559 broadsheet articles). This difference was statistically significant, $\chi^2(1, N = 2931) = 13.591$, $p < .001$.

Thematic analysis

Thematic analysis was employed to analyse the 505 articles. Thematic analysis is a qualitative technique designed to identify the patterns of meaning present in a dataset (Boyatzis, 1998; Joffe, 2011), and as such is appropriate for examining how the popular media make sense of scientific ideas about early brain development. Initially, all 505 articles were read through to identify recurring ideas and patterns in how neurodevelopment was discussed. This informed the development of a coding frame. Codes were developed in an inductive, bottom-up manner to capture the main features of media representations of brain development. Codes reflected both the manifest content of media articles (e.g. 'Threat from alcohol', 'Breastfeeding – enhance brain') and meanings present at a more latent level (e.g. 'Determinism', 'Blame of parent'). Using ATLAS.ti, all articles were coded according to the coding frame.

This analysis was shaped by a concern with partialling out how neurodevelopment was represented across the different stages of childhood. Therefore in addition to coding articles' substantive content, articles were also coded to reflect the period of development to which neuroscientific ideas were applied. Articles discussed neuroscientific ideas within the context of three periods of development: the *prenatal* period (pregnancy and foetal development), *infancy* (the first months of life), and *early to middle childhood* (from the toddler years onwards). The terms as used here signify general stages rather than specific age ranges, as articles often gave only vague indications of the age of the children to which they applied. ATLAS.ti's tool for detecting the co-occurrence of particular codes was used to ascertain the codes that were most frequently applied to each of the three developmental periods. Inspection of the codes that clustered around each developmental period suggested that each of the three periods was characterised by a dominant theme.

Results

Articles focussing on early to middle childhood comprised the greatest proportion (53%) of the sample (perhaps not surprising given that this period encompasses the widest age-range). The

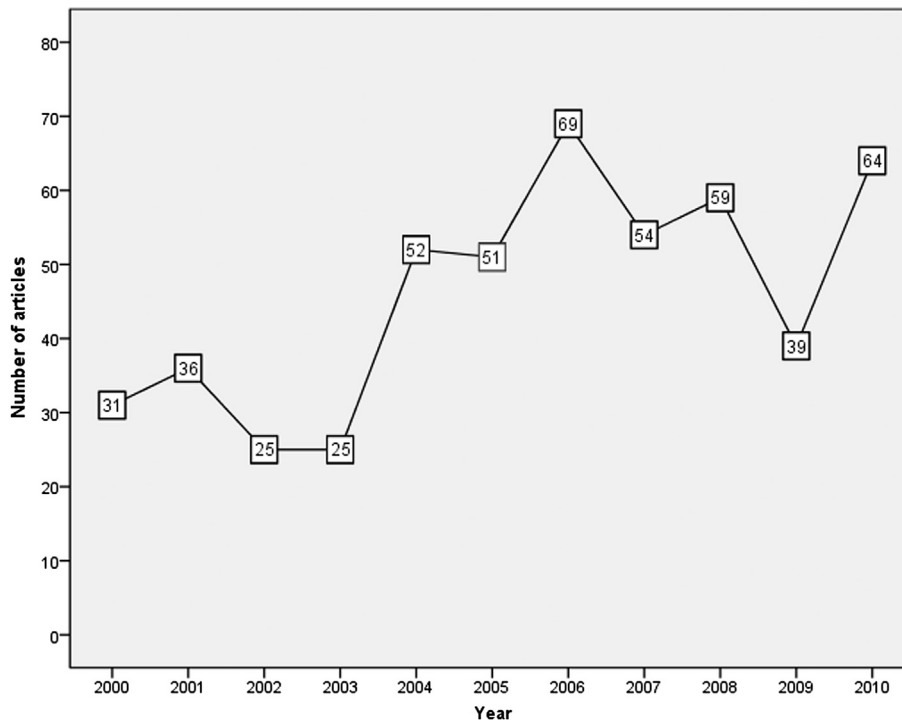


Fig. 2. Number of articles relating to children per year.

prenatal period was the subject of 39% of articles and infancy 8%. The focus in the prenatal period was on protecting the child's brain, alerting the public to hazards pregnant women should avoid to ensure healthy foetal neurodevelopment. Within discussions of infancy, the primary concern was identifying the patterns of nutrition that would enhance brain development. Finally, media portrayal of early to middle childhood was dominated by a focus on the family environment, particularly the emotional qualities of the parent–child relationship.

Theme 1: protecting the prenatal brain

The primary preoccupation within discussion of prenatal brain development was with indicating potential sources of threat to the developing nervous system. Foetal neurodevelopment was represented as a fragile process that could be easily disrupted. Disruption during the prenatal stage was held to have profound, irreversible consequences for the child's lifelong brain function.

The media represented the prenatal period as a critical stage for the development of an extremely wide range of cognitive, emotional and behavioural capabilities. Diverse phenomena, ranging from psychiatric disorders and obesity to alcoholism, romantic success and sexual orientation, were presented as direct consequences of prenatal events. Considerable coverage was given to research that suggested that intra-uterine conditions influenced 'naughtiness' in childhood and elevated risk of antisocial behaviour in adulthood. Another very salient purported consequence of the prenatal environment was intelligence, with many articles displaying concern about potential risks to intellectual development.

Pregnant women can impair their unborn tot's IQ by eating liquorice, researchers have warned. (*Sun*, 7 October 2009)

Given such profound consequences, vigilance was demanded in relation to factors that might disrupt foetal development. Discussion of threats to foetal brain development was usually packaged

within advice (or sometimes explicit directives) to pregnant women to modify their behaviour. Much of the discussion of pregnancy involved identifying foodstuffs that may pose a risk to the developing brain. Pregnant women were advised to avoid ingesting a wide range of substances, including certain meats, caffeine, and tap-water. The most frequent targets of alarm were alcohol and nicotine. Readers were repeatedly informed that even small amounts of alcohol could have enduring effects on unborn children's brains. Mothers who neglected to eliminate such substances from their bodies ran the risk of permanently altering their baby's brain structure and increasing vulnerability to a wide range of cognitive and behavioural problems.

Pregnant women are warned today that a single drinking binge can be enough to permanently damage their babies. The findings come just days after the *Daily Mail* published research showing that mothers-to-be who drink as little as four glasses of wine a week can harm unborn children. The latest study by scientists in the United States shows alcohol can cause millions of developing brain cells to self-destruct. It is further evidence that youngsters born to women who drink while pregnant are at risk of learning disabilities and other problems. (*Daily Mail*, 11 February 2000)

Another major source of threat to foetal brain development stemmed from the mother's external environment. Many articles functioned to alert pregnant women to risks posed by chemicals present in everyday substances like cleaning products, hair-dye or toothpaste. Industrial pollution was implicated in contaminating the soil and air with toxic chemicals, and potential risks from the radiation discharged by mobile phones were discussed extensively.

Mums-to-be run a greater risk of having a naughty child if they regularly use a mobile when pregnant, a study says today. Medics believe that microwave radiation emitted by the handsets could wreak unseen damage on an unborn baby's brain, leading to behavioural problems. (*Sun*, 7 December 2010)

As well as issuing from pregnant women's nutritional intake and external environment, risk was also attributed to women's internal emotional life. Maternal experiences like stress, anxiety and anger were represented as neurochemical hazards to unborn babies. Articles repeatedly asserted that healthy foetal development hinged on achieving a tranquil, relaxed pregnancy.

Uptight mums can pass on stress to their unborn babies, experts claimed yesterday. And it could have a major impact on a child's behaviour and brain function in later life. (*Mirror*, 31 May 2007)

Theme 2: feeding the infant brain

Media reporting of infant brain development was dominated by discussion of early nutrition, which was portrayed as having repercussions for brain development that reverberated throughout the life course.

The most prominent topic within media coverage of infant brain development was breastfeeding. Breastfeeding was portrayed in a very positive light. Research that associated breastfeeding with positive developmental outcomes was widely reported, producing a representational field that positioned breastfeeding as directly causal of a broad range of phenomena – enhancing intelligence, educational performance, vision and happiness while preventing obesity, antisocial behaviour and fussy eating. This came closely attached to imputations of parental responsibility: those who chose not to breastfeed were represented as wilfully relinquishing the opportunity to 'do the best' for their children.

Mothers who breast-feed their children for less than three months may be preventing them from reaching their full intellectual potential, researchers say today. (*Daily Telegraph*, 22 August 2001)

The benefits of breastfeeding related not only to positive physiological outcomes conferred by its nutritional qualities, but also to favourable consequences for the mother–child relationship. Considerable coverage was given to research linking breastfeeding to increased production of maternal oxytocin, which newspapers dubbed the 'love hormone' or 'cuddle hormone'. Breastfeeding was positioned as critical for the development of an intimate, loving relationship between mother and child.

Childcare experts have long known that the closeness and intimacy of breastfeeding strengthens maternal affection. But a study out today has discovered that the action of a baby suckling actually changes how the mother's brain behaves. This results in a massive rush of the 'love hormone' oxytocin in women's brains. (*Daily Mail*, 18 July 2008)

A notable feature of discussions of breastfeeding was the frequent deployment of the idea of 'naturalness'. Articles that encouraged women to breastfeed often sidelined description of breast-milk's nutritional benefits in favour of simply emphasising its 'natural' quality. Natural in this context meant that it was not subjected to human or mechanical interference, and was consequently a wholesome, pure and risk-free substance. Breast-milk was valorised as the epitome of 'how things should be', portrayed as perfectly crafted by nature to provide the optimal conditions for development.

It gives the child the right package of essential ingredients for both brain and physical development. (*Daily Mail*, 26 September 2000)

Emphasising the natural quality of breast-milk came attached to disapprobation of its 'unnatural' counterpoint: formula milk. Formula milk was disfavoured partly for its believed nutritional

inferiority and partly for its symbolic associations: industrially produced formula milk was overlain with symbolic connotations of artificiality and impurity. At times, the force of this symbolic association seemed to overshadow that of its material nutritional qualities. This was particularly apparent in media antagonism to suggestions that formula's nutritional value could be technologically enhanced, with aversion to the idea of 'tampering' with infants' milk outweighing the prospect of material nutritional benefit.

Formula milk designed to give babies lifelong protection against obesity is being developed by scientists. The product would be supplemented with leptin, a hormone which has been shown to control hunger (...) Critics said using a hormone to programme children's brains was 'scary' and they accused the scientists behind the idea of trying to cash in on fears about obesity (*Daily Mail*, 23 April 2007)

Notably absent from the data was any advice directed at mothers who, for personal or medical reasons, do not breastfeed. Breastfeeding was portrayed as the exclusive route towards optimal neurodevelopment. This was rarely moderated or qualified, and there was no reference to ways in which non-breastfeeding mothers could compensate for lost developmental advantages.

Theme 3: loving the young child's brain

The most distinctive aspect of media coverage of early to middle childhood was extensive discussion of the neurodevelopmental significance of the family environment, particularly its emotional dimensions. This theme represented the parent–child relationship as a critical determinant of the child's brain development, and thereby of their psychological and social capacities.

A number of key qualities defined the parent–child relationship that was seen to facilitate optimal brain development, the most salient of which was love. Love was represented as a tangible resource that had a demonstrable effect on a child's neurobiology.

How can love possibly affect a child's brain? Surely it is too vague a concept to have an impact on its physical structure? Recent research in the neurosciences and in biochemistry suggests otherwise. (*Times*, 3 July 2004)

Optimal brain development was promoted when love was demonstrated to the child through regular physical affection and attentiveness. Normal neurobiological development required caregivers who devoted considerable time to engaging the child in meaningful and reciprocal exchanges.

Depriving young children of cuddles and attention subtly changes how their brains develop and in later life can leave them anxious and poor at forming relationships, according to a study published today. (*Guardian*, 22 November 2005)

Play was presented as a primary activity through which children's cognitive and social futures were forged, and parents were encouraged to ensure they spent sufficient time playing with their children. Discussion of the importance of play was often accompanied by reference to television, which was positioned as the antithesis of the positive stimulation that play offered. Articles often adopted a disapproving tone when discussing parents who permit children to spend extended periods watching television, implying that they are failing to provide their children with a sufficiently neurologically stimulating environment.

The fact is that watching TV is passive. A two-way exchange between an adult and a child will use much more of their brain – looking, thinking, reacting and responding, not just sitting back and staring at a flickering screen. Unbelievably, some

children starting nursery appear never to have had a one-to-one conversation with anyone at all (...) Watching the box requires only a very small part of children's brains – and it develops an equally small part. (*Mirror*, 8 December 2003)

The media based recommendations for parenting practice on claims that specific activities had enduring developmental consequences. Parents were warned not to forego bedtime stories because “abandoning ‘one to one’ contact with children at the end of the day can leave mental scars which may lead to poor performance at school and even delinquency” (*Daily Mail*, 2 November 2000). Shouting at children could “significantly and permanently alter the structure of their brains” (*Guardian*, 21 March 2001). Training a child to sleep separately from parents provoked “similar brain activity to one in physical pain” (*Daily Mail*, 15 May 2006). Leaving a child to cry produced “high cortisol levels [that] are ‘toxic’ to the developing brain” (*Daily Mail*, 23 April 2010). The media thus represented day-to-day childcare practice as a high-stakes domain.

The importance of a loving and nurturing family environment was underscored by repeated demonstrations of the neurodevelopmental consequences of its obverse – neglectful or abusive parenting. Children were rhetorically grouped into two categories: the ‘loved’ and the ‘unloved’. There was considerable media interest in reporting research showing that these two groups exhibited distinctly different neurobiological features.

He and other scientists have found that the brains of unloved and neglected children look different, and respond differently, too (...) Early abuse or even unintentional poor parenting, the professor believes, can be as serious and enduring as a head injury. (*Times*, 21 May 2007)

Who, then, were these ‘unloved’ children? Variations in the quality of childcare were regularly mapped onto different sectors of society, with certain social groups painted as deficient carers of children. Many of the comparisons between loved and unloved children simultaneously operated as comparisons between middle class and economically disadvantaged children, with families in poor economic circumstances portrayed as providing an emotionally as well as materially deprived context for child development.

Duncan Smith has suggested that children who “witness a lot of abuse”, or whose mothers have “different, multiple partners” will have brains that develop at a quite different rate from other children. In his most recent comments, he appeared to go one step further, making a link between brain size and poverty and crime. (*Guardian*, 10 April 2010)

Non-traditional family structures – particularly single-parent and separated-parent families – also emerged as targets of neuroscientifically-infused criticism.

Modern parents seem to find the contrast between the freedom of life before children and parenthood more challenging than previous generations: satisfaction with their relationship plummets and the rows increase. Their relationships are more fragile, increasing the numbers of very young children whose parents split up. (Brain scans of babies deprived of love show just how vital it is for them to develop strong bonds with both their mothers and fathers early on.) The more times parents take new partners, the more their children are affected. The impact is cumulative; and children become ever more troubled and troublesome. (*Times*, 8 October 2009)

Neurodevelopmental research was also represented as incriminating parents with demanding careers, who were accused of sacrificing their children's welfare for professional advancement. Many articles condemned nursery care as emotionally and

neurobiologically dangerous. Discussion of work–family conflict was particularly oriented towards women, with several articles representing female participation in the labour market as a threat to children's neurological development.

For the first time in centuries, it notes, the majority of parents in the developed world are farming out the care of their children to paid workers. At the same time, neuroscientific research shows – surprise, surprise – that the architecture of the brain is formed largely through the interactions of the early years; love, it turns out, is as important for intellectual as for emotional development. So this mothering thing that my generation was taught to disdain as something we could fit in round our economically valuable, high-status, real work – and that we could get away with paying other people low wages to do – proved to be not such a side issue after all. (*Guardian*, 19 December 2008)

The role of loving parental care in neurodevelopment was often overtly politicised. Parenting patterns were described as consequential not merely for individual children, but for society as a whole. Crime was a particularly common link made: certain family environments were blamed for causing, through neurodevelopmental pathways, an ‘epidemic’ of crime and antisocial behaviour. Inappropriate parental input in the critical periods of childhood was held responsible for a ‘broken’ society.

The risk of bringing up a bully or thug is largely determined by the kind of parenting a child receives. Well-meaning parents often do not realise that the techniques they use to parent their child may actually be changing emotional chemical and stress-response systems in the child's brains [sic]. (*Daily Mail*, 25 May 2006)

A final important feature to note was the strong streak of determinism that ran through media portrayal of early to middle childhood. It was common for articles to state that without appropriately nurturing caregiver input during this stage, certain emotional or cognitive capacities would be irreversibly perverted. Without exposure to the necessary stimuli in their early years, children would be subject to lifelong socio-emotional deficits.

Perry says that the brain develops rapidly early in life, organising and functioning according to experience. So if affection isn't given from the start, love is out of its repertoire. (*Times*, 12 May 2007)

Discussion

This qualitative analysis of 505 newspaper articles identified three thematic trends in the representations of early neurodevelopment that circulate in the public sphere. Prenatal neurodevelopment was represented as a vulnerable process that required defence against a wide variety of risks. Once children were born, the focus shifted to the potential of nutritional input to enhance infant brain development. Finally, coverage of early to middle childhood concentrated on positioning loving, nurturing family experiences as critical for healthy neurological and psychological development.

Neurodevelopment and parental responsibility

A key premise of contemporary developmental science is that the network of influences on child development is multi-layered, ranging from the genetic to immediate physical, social and emotional stimuli to broad socio-political structures. Maxwell and Racine (2012), Thompson and Nelson (2001) and Thornton (2011)

contend that popular accounts of child development fail to capture this complexity, concentrating disproportionately on the importance of conscientious parental care. This study supports their appraisal. Reference to neurodevelopment occurred almost exclusively within discussions of parenting, with the media rarely drawing attention to neurodevelopmental influences that operate at levels beyond the immediate family. There was little discussion of genetic influences on brain development – perhaps surprising given the general conviction that thinking about human life in genetic terms has been widespread since the 1990s (Mauron, 2001; Nelkin & Lindee, 1995). Also overlooked was the socio-economic contingency of issues like infant nutrition; rather, such issues were framed in terms of parental choices and with only superficial reference to the layers of structural, cultural and political forces that influence child development.

It is useful to relate the media's absorption with parental influence on neurobiological development to sociological research on the intensification of the parenting role. The analysis revealed that media representations of early neurodevelopment were dominated by demands for parental vigilance against risks, appeals to revert to 'natural' ways of nourishing children and calls to apply calculated effort to regulating the parent's emotional life and relationship with their child. All of this resonates with sociological characterisations of the contemporary parenting domain (Furedi, 2001; Hays, 1996; Lee, 2008; Thornton, 2011). Media representations of early child development may reflect and potentially reinforce the social constitution of parenthood as a role that demands total dedication and constant vigilance.

Interpretation of the results requires appreciation of the distinctive position of 'the brain' in contemporary society. Commentators have argued that the image of the brain as the seat of all intellectual, emotional, behavioural and social capacities has gathered momentum in recent times (Rose, 2007; Vidal, 2009). If so, research on children's brain development is invested with particularly sharp significance: failure to provide a child with appropriate neurobiological stimulation threatens not just their physical health, but their whole personhood. The responsibility delegated to parents was further intensified by the representation of early experiences as critical determinants of later outcomes. Brain development was portrayed as wholly contingent on the early environments provided by caregivers. Upon passing childhood's critical periods, however, environmental influence on development appeared to grind to a halt – the brain that emerged from childhood was fixed for life. Thus, representations of early brain development contained a mix of extreme environment-contingent plasticity and rigid biological determinism. The later determinism imbued the early plasticity with particular urgency: parents get only one chance to maximise their child's life-long neural capacity.

Neurodevelopment and social groups

Social representations theory posits that the scientific information that circulates in public dialogue absorbs existing cultural values and beliefs (Farr, 1993). The data in this study endorsed this principle, demonstrating how scientific knowledge can reproduce the values and preconceptions of those who discuss it. This was especially evident when representations of neurodevelopment intersected with representations of social groups.

Latent preconceptions about gender were particularly apparent in the data, consistent with recent observations that popular neuroscience frequently naturalises gender stereotypes as 'hard-wired' sex differences (Fine, 2010; Jordan-Young & Rumiati, 2012). Mothers were generally positioned as the target of parenting directives, with articles often using the word 'mothers' where the

gender-neutral 'parents' would have also been appropriate. The content of the first two themes – 'protecting' and 'feeding' the developing brain – was dominated by discussion of intrinsically maternal phenomena (i.e. pregnancy and breastfeeding). The third theme, 'loving' the brain, tended to direct injunctions for emotionally engaging with children towards mothers rather than fathers or parents more generally, perhaps reflecting the cultural positioning of emotionality as a female domain (Fischer, 1993). Media coverage of brain development implicitly conveyed a view of childcare as an essentially female concern.

The study also suggested that media discussion of brain development might be particularly targeted at lower socio-economic groups. The data indicated that tabloids, traditionally associated with a more working-class readership, contained more coverage of neuroscience research on child development than the 'quality' broadsheet press. This is somewhat discordant with the assumption that incorporating scientific advice into 'intensive parenting' is a particularly middle-class phenomenon (Caputo, 2007; Lareau, 2002). The current study may parallel Bangerter and Heath's (2004) research, which found that the Mozart effect was more prominent in areas with poorer quality primary education. Concern about structural and economic disadvantages may stimulate greater interest in neuroscientific insights for childrearing. If so, socio-economically disadvantaged populations may be more vulnerable to deployments of neuroscience that promote intensive, mother-centred depictions of the parenting role. This, however, remains speculative: though the tabloid-broadsheet difference in the proportion of neuroscience coverage that related to children reached statistical significance, the absolute magnitude of this difference was not striking (20% versus 15%). Further, the study did not directly examine how members of the public approach neurodevelopmental ideas. Though media representations can both reflect and shape the views of their audience, the correspondence between media and public representations is not absolute (Bauer, 2005). Further research is required to establish whether representations of and interest in early brain development deviate across socio-economic divides.

A particularly salient feature of the third theme, 'loving' the developing brain, was the use of neuroscientific ideas to place differential value on various types of family contexts. Neurodevelopmental research was employed to denounce certain sectors of society as poor caregivers: a complex of disadvantaged families, dual-earner households, and single or separated parents emerged as objectifying abusive or neglectful childrearing. Notably, all these family arrangements are often targets of ideologically-based aversion. By incorporating neuroscientific information, antagonism towards these family contexts could be reframed as reasonable responses to scientific evidence that such arrangements are demonstrably damaging to children's development. Media commentators thereby invoked the clarity of science to justify their entitlement to cast judgement on particular family structures: if scientific evidence can define what constitutes 'good' and 'bad' parenting (or, more particularly, mothering), childrearing becomes a domain into which external judgement and intervention is both legitimate and desirable. Evidence from the policy sphere indicates that active mobilisation of neuroscience to justify intervention in 'problem families' is already underway (Walsh, 2011); the current study suggests that such justifications have taken hold in the popular press, potentially influencing public acceptance of strategies of control that are selectively targeted at particular social groups.

Neuroscience in society

A key contribution of this research is its illumination of the interpenetration of science, as popularised by the mass media, and

cultural representations of parenting. In a cultural context in which parents are inundated with different messages about how to 'do the best' for children, the apparent clarity offered by scientific evidence may carry considerable appeal. Neuroscience in particular wields a certain authority: experimental research demonstrates that even logically irrelevant reference to the brain makes arguments more credible (McCabe & Castel, 2008; Weisberg, Keil, Goodstein, Rawson, & Gray, 2008). The rhetorical authority of neuroscience information amplifies the importance of uncovering any implicit normative messages it may impose on the social domains to which it is applied. In this sample for example, a veneer of scientific objectivity clothed a representation of women as the vectors of good versus bad development, with middle-class full-time mothers objectifying the good and their working or working-class counterparts the bad.

SRT proposes that new information is made comprehensible by anchoring it onto existing cultural meanings. While neurodevelopmental research is presented as promising new insights that will dramatically alter conventional wisdom about childrearing, the substantive content of media messages accorded with the suggestions of several commentators (Hagner & Borck, 2001; Rose, 2007; Vidal, 2009) that many 'new' applications of neuroscientific ideas reproduce long-established ideas and practices. For example, the idea that early experiences (especially parental relationships) set the mould for life has a long cultural and academic history, particularly resonating with psychoanalytic teachings. Further, the deployment of neuroscience as 'proof' that certain childcare arrangements were unacceptable was often underpinned by a distinct sense of nostalgia for the past. Articles drew on neurodevelopmental concepts to condemn modern societal developments (e.g. female participation in the labour market, non-traditional family structures, widespread adoption of paid childcare, formula-feeding infants) as threatening children's welfare. The 'natural' emerged as a key symbol of good childrearing and the past was valorised as a time when parents raised children 'as biology intended': in two-parent homes with a fully-present mother who devoted herself to ensuring an emotionally, behaviourally and nutritionally wholesome environment. The study highlights the importance of separating the overt content of media coverage of science from its latent meanings: the revolutionary implications claimed for neurodevelopmental knowledge belie its underlying substance.

The research also underlines the importance of attending to the nuances present within social representations of science. The analysis revealed that media content evolved according to the stage of development around which discussion centred, with media preoccupations shifting from risk to nutrition to emotion as children aged. Social representations are fluid and contingent systems of meaning that can impact on different sectors of society in different ways. A comprehensive depiction of the position of neuroscience in contemporary society requires that these contingencies are documented through careful and systematic analysis of relevant data.

Limitations and future directions

The data for this study were restricted to material published in six UK newspapers in one decade. The findings do not necessarily reflect representations of neurodevelopment in other media outlets or media coverage in other countries. The latter issue is particularly pertinent. Social representations theory proposes that as scientific information assimilates into everyday common-sense it subsumes prevailing cultural meanings; to the extent that different countries deviate culturally, representations of scientific information will also differ. Even countries with considerable linguistic and cultural similarities, such as the US and UK, can

produce very different press coverage of scientific issues (Conrad & Markens, 2001). A cross-cultural comparison of media representations of neurodevelopment would be an interesting avenue for future exploration.

A further direction for research involves directly examining the representations of child development held by lay publics, investigating how – or indeed whether – the ideas about neurodevelopment present in the media manifest in people's everyday thought and behaviour. Recent research has indicated that despite the prevalence of neuroscientific ideas in the public sphere, the brain does not necessarily figure prominently in ordinary thought and conversation (Choudhury, McKinney, & Merten, 2012; Pickersgill, Cunningham-Burley, & Martin, 2011). The importance of media representations of neuroscience for everyday life should not, therefore, be taken for granted.

Conclusions

This study found that responsibility for ensuring the protection, nourishment and care of children was placed squarely at the level of parental (primarily maternal) action, with the media largely silent on possibilities for political or societal initiatives. The importance of parental care was intensified by deterministic media interpretations of critical periods: by implying a limited time-window for promoting children's chances of a successful future, the media amplified the urgency of performing the 'correct' type of parenting. Neurodevelopmental research was also used to make normative judgements on the acceptability of certain gender roles and family contexts. Social representations of neurodevelopment can both reflect and reinforce particular cultural agendas, values and beliefs. As the science of neurodevelopment continues to dissipate through public consciousness, it is important to be aware of this and to deconstruct the impact that these representations may have in particular social contexts.

References

- Abi-Rached, J. M. (2008). The implications of the new brain sciences. *EMBO Reports*, 9, 1158–1162.
- Allen, G. (2011). *Early intervention: Smart investment, massive savings*. London: Cabinet Office.
- Bangerter, A., & Heath, C. (2004). The Mozart effect: tracking the evolution of a scientific legend. *British Journal of Social Psychology*, 43, 605–623.
- Barnes, B., Bloor, D., & Henry, J. (1996). *Scientific knowledge: A sociological analysis*. London: Athlone Press.
- Bauer, M. W. (2005). Public perceptions and mass media in the biotechnology controversy. *International Journal of Public Opinion Research*, 17, 5–22.
- Beck, U., & Beck-Gernsheim, E. (1995). *The normal chaos of love*. Cambridge: Polity Press.
- Boyatzis, R. E. (1998). *Transforming qualitative information: Thematic analysis and code development*. Thousand Oaks: Sage.
- Bruer, J. T. (1999). *The myth of the first three years*. New York: The Free Press.
- Caputo, V. (2007). She's from a 'good family'. *Childhood*, 14, 173–192.
- Chan, T. W., & Goldthorpe, J. H. (2007). Social status and newspaper readership. *American Journal of Sociology*, 112, 1095–1134.
- Choudhury, S., McKinney, K. A., & Merten, M. (2012). Rebellious against the brain: public engagement with the 'neurological adolescent'. *Social Science & Medicine*, 74, 565–573.
- Conrad, P., & Markens, S. (2001). Constructing the 'gay gene' in the news: optimism and skepticism in the US and British press. *Health*, 5, 373–400.
- Dumit, J. (2004). *Picturing personhood: Brain scans and biomedical identity*. Princeton: Princeton University Press.
- Farr, R. M. (1993). Common sense, science and social representations. *Public Understanding of Science*, 2, 189–204.
- Fine, C. (2010). *Delusions of gender*. London: Icon Books.
- Fischer, A. H. (1993). Sex differences in emotionality: fact or stereotype? *Feminism & Psychology*, 3, 303–318.
- Frazzetto, G., & Anker, S. (2009). Neuroculture. *Nature Reviews Neuroscience*, 10, 815–821.
- Furedi, F. (2001). *Paranoid parenting*. London: Penguin.
- Gerhardt, S. (2004). *Why love matters: How affection shapes a baby's brain*. London: Routledge.
- Hagner, M., & Borck, C. (2001). Mindful practices: on the neurosciences in the twentieth century. *Science in Context*, 14, 507–510.

- Hays, S. (1996). *The cultural contradictions of motherhood*. New Haven: Yale University Press.
- James, O. (2010). *How not to f*** them up: The first three years*. London: Vermilion.
- Joffe, H. (2011). Thematic analysis. In D. Harper, & A. Thompson (Eds.), *Qualitative research methods in mental health and psychotherapy: An introduction for students and practitioners* (pp. 209–223). Chichester: Wiley-Blackwell.
- Jordan-Young, R., & Rumiati, R. (2012). Hardwired for sexism? Approaches to sex/gender in neuroscience. *Neuroethics*, 5, 305–315.
- Jovchelovitch, S. (2007). *Knowledge in context: Representations, community and culture*. Hove: Taylor & Francis.
- Krippendorff, K. (2004). *Content analysis: An introduction to its methodology* (2nd ed.). London: Sage.
- Lareau, A. (2002). Invisible inequality: social class and childrearing in black families and white families. *American Sociological Review*, 67, 747–776.
- Latour, B., & Woolgar, S. (1986). *Laboratory life: The construction of scientific facts* (2nd ed.). Princeton: Princeton University Press.
- Leach, P. (2010). *The essential first year*. London: Dorling Kindersley.
- Lee, E. J. (2008). Living with risk in the age of 'intensive motherhood': maternal identity and infant feeding. *Health, Risk & Society*, 10, 467–477.
- Mauron, A. (2001). Is the genome the secular equivalent of the soul? *Science*, 291, 831–832.
- Maxwell, B., & Racine, E. (2012). Does the neuroscience research on early stress justify responsive childcare? Examining interwoven epistemological and ethical challenges. *Neuroethics*, 5, 159–172.
- McCabe, D. P., & Castel, A. D. (2008). Seeing is believing: the effect of brain images on judgments of scientific reasoning. *Cognition*, 107, 343–352.
- Moscovici, S. (2008). *Psychoanalysis: Its image and its public* (D. Macey, Trans.). Cambridge: Polity Press.
- Nadesan, M. H. (2002). Engineering the entrepreneurial infant: brain science, infant development toys, and governmentality. *Cultural Studies*, 16, 401–432.
- National Readership Survey. (2012). *Latest top line readership*. Retrieved 13 March 2012 from <http://www.nrs.co.uk/toplinereadership.html>.
- Nelkin, D., & Linde, M. S. (1995). *The DNA mystique: The gene as cultural icon*. New York: WH Freeman.
- O'Connell, G., De Wilde, J., Haley, J., Shuler, K., Schafer, B., Sandercock, P., et al. (2011). The brain, the science and the media. *EMBO Reports*, 12, 630–636.
- O'Connor, C., Rees, G., & Joffe, H. (2012). Neuroscience in the public sphere. *Neuron*, 74, 220–226.
- Pickersgill, M., Cunningham-Burley, S., & Martin, P. (2011). Constituting neurologic subjects: neuroscience, subjectivity and the mundane significance of the brain. *Subjectivity*, 4, 346–365.
- Pitts-Taylor, V. (2010). The plastic brain: neoliberalism and the neuronal self. *Health*, 14, 635–652.
- Racine, E., Waldman, S., Rosenberg, J., & Illes, J. (2010). Contemporary neuroscience in the media. *Social Science & Medicine*, 71, 725–733.
- Rauscher, F. H., Shaw, G. L., & Ky, K. N. (1993). Music and spatial task performance. *Nature*, 365, 611.
- Rose, N. (2007). *The politics of life itself: Biomedicine, power, and subjectivity in the twenty-first century*. Princeton: Princeton University Press.
- Sayer, L. C., Bianchi, S. M., & Robinson, J. P. (2004). Are parents investing less in children? Trends in mothers' and fathers' time with children. *American Journal of Sociology*, 110, 1–43.
- Thompson, R. A., & Nelson, C. A. (2001). Developmental science and the media – early brain development. *American Psychologist*, 56, 5–15.
- Thornton, D. J. (2011). Neuroscience, affect, and the entrepreneurialization of motherhood. *Communication and Critical/Cultural Studies*, 8, 399–424.
- Vidal, F. (2009). Brainhood, anthropological figure of modernity. *History of the Human Sciences*, 22, 5–36.
- Wall, G. (2010). Mothers' experiences with intensive parenting and brain development discourse. *Women's Studies International Forum*, 33, 253–263.
- Walsh, C. (2011). Youth justice and neuroscience: a dual-use dilemma. *British Journal of Criminology*, 51, 21–39.
- Weisberg, D. S., Keil, F. C., Goodstein, J., Rawson, E., & Gray, J. R. (2008). The seductive allure of neuroscience explanations. *Journal of Cognitive Neuroscience*, 20, 470–477.