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The 'first three years' movement and the infant brain: A review of critiques.

Key words

Brain; neuroscience; first three years movement; child rearing; parenting; early intervention; welfare; neoliberalism; babies' brains; child development; parent training; early years.

Abstract

This article reviews a particular aspect of the critique of the increasing focus on the brain and neuroscience; what has been termed by some, 'neuromania'. It engages with the growing literature produced in response to the 'first three years' movement: an alliance of child welfare advocates and politicians which draws on the authority of neuroscience to argue that social problems such as inequality, poverty, educational underachievement, violence and mental illness are best addressed through 'early intervention' programmes to protect or enhance emotional and cognitive aspects of children's brain development. The movement began in the USA in the early 1990s, and has become increasingly vocal and influential since then, achieving international legitimacy in the USA, Canada, New Zealand, Australia, the UK and elsewhere.

The movement, and the brain-based culture of expert-led parent training which has grown with it, has been criticized for claiming scientific authority while taking a cavalier approach to scientific method and evidence; for being overly deterministic about the early years of life; for focusing attention on individual parental failings rather than societal or structural problems; for adding to the expanding anxieties of parents and strengthening the intensification of parenting and ultimately, for redefining the parent-child relationship in biologised, instrumental and dehumanized terms.

Introduction

In 1989, the United States Congress declared the subsequent ten years to be the 'decade of the brain'. The prioritization of the brain has since become a sustained, international phenomenon: Italy, Sweden, The Netherlands and Canada announced brain decades soon after the US (Beaulieu 2001, 672) and in 1992 the European Union (EU) launched an initiative to promote neurobiological research. In 2013, the EU set up the 'Human Brain Project' (budget 1.2 billion euros) and the US committed an even larger sum (3 billion US dollars) to the 'Brain Research through Advancing Innovative Neurotechnologies' (BRAIN) project (Rose 2013). This commitment to gaining greater scientific knowledge has been welcomed for its potential to find explanations and treatments for disorders of the brain, but it has also produced disquiet. Concerns have been raised that such a powerful focus on the brain inevitably results in 'over-claiming' of how much this scientific exploration can tell us about the human condition and fears of biologised, reductionist and deterministic explanations for complex human phenomenon have been voiced. Critics have warned of the danger of over-stated 'brain claims' leaching out beyond the laboratory into other areas of social life, such as the law and crime prevention, politics and governance, and childcare and education (Satel and Lilienfeld 2013; Rose and Abi-Rached 2013; Rose and Rose 2012; Tallis 2011; Legrenzi and Umiltà 2011; Rose 2010).

The aim of this article is to explore (Tallis 2011; Legrenzi and Umiltà 2011): the literature produced in response to what Thornton (2011) has termed the 'first three years movement'. This alliance of child welfare advocates and politicians, which became increasingly vocal and influential from the early 1990s, has drawn authority from the wider excitement about neuroscience to argue that social problems such as inequality, poverty, educational underachievement, violence and mental illness are best addressed through 'early intervention' programmes to protect or enhance emotional and cognitive aspects of children's brain development (Bruer 1997, 1998a, 1998b, 1999a and 1999b; Hulbert 2004; Thornton,

The 'First Three Years': Review of critiques

2011). Such interventions tend to concentrate their efforts on changing the behaviour of parents and others involved in caring for children in the years 0 to 3 (or even earlier, during pregnancy and pre-conception).

Two figures have gained particular prominence for their early response to the promulgation of brain-based policy: the US academics Jerome Kagan and John Bruer. In 1998, Kagan, a renowned psychologist of child development, published the essay, 'The Allure of Infant Determinism', in his book *Three Seductive Ideas*. This influential essay historicizes brain claims to demonstrate the long-standing appeal of deterministic ideas about the early years of life. In 1999, John Bruer, a philosopher working in the field of cognitive neuroscience published his book, *The Myth of the First Three Years*, which achieved considerable public attention and addressed in detail the scientific basis of the brain advocates' claims. Both Kagan and Bruer questioned whether the scientific findings on which the brain advocates based their claims were actually new (and were therefore justification for a radical new approach to child-rearing) and argued that scientific research was being misinterpreted by advocates to draw unjustifiably deterministic conclusions about the significance of early childhood experiences on later life. Their work has played an important role in stimulating a critical response to the first three years movement and raised many of the critical questions which have subsequently been of interest to scholars. They will therefore be referred to throughout this paper as we move through the literature produced in their wake.

We can identify three consistent aspects to the critique of the first three years movement from the late 1990s to the present. The first to be outlined here challenges the scientific basis of the claims about infant development vigorously disseminated by advocates of brain-based policy interventions. The second calls into question the politicization of parenting and childcare as a solution to what have been more usually

The 'First Three Years': Review of critiques

seen as structurally-generated social problems such as inequality and poverty. The third critically engages with the implications of viewing the relationship between child and parent through the prism of nurturing the infant brain, in particular, the reconceptualizing of love in biological terms.

Given the multiple dimensions to the questions raised by the 'potent neurobiological meme' (Wastell and White 2012, 402) expressed within the first three years movement, it is unsurprising that critical literature has emanated from scholars across a range of disciplines: sociology, history, psychology and social psychology, media and cultural studies, and philosophy, but also neuroscience itself. We can see growing interest in this area amongst sociologists from the US, Canada, Australia and the UK, responding to the rapid dissemination and take-up of brain claims by their own national governments, and drawing on the earlier literature from the US in their analysis. While the challenge to the science of brain claims has continued, sociologists, cultural theorists and philosophers are increasingly focusing on the meaning and socio-cultural effects of the focus on the brain, often utilizing a Foucauldian framework of discourse analysis to contextualize their analysis within a critique of 'neoliberalism'.

Rather than discussing the literature by discipline or by theoretical approach, this review will discuss it thematically by working through the three aspects outlined above. We begin with the critique of the scientific basis of brain claims, move onto attempts to understand the political significance of the early years policy focus, and finally we discuss the work of scholars researching the impact of these ideas on the norms of child-rearing and the practices of parents.

The critique of the scientific validity of brain claims

The 'First Three Years': Review of critiques

Back in 1999, John Bruer identified and evaluated the three most-repeated claims relating to the brain and the early years. While these evidence claims have their origins in the scientific study of brains, these have seldom been human brains, as it has been considered ethically problematic to conduct experiments on infants (Bruer 1999a; Castaneda 2002). Results have therefore, often been derived from animal experimentation, in particular with rats, kittens or monkeys [1]. As Bruer's analysis has been returned to by many scholars since, we will outline it here:

1. The infant brain can be characterised as undergoing a period of 'explosive synaptic connectivity', that is, brain growth is most dynamic during gestation and during the early years of life. This is interpreted by the first three years movement to mean that the early years represent a 'use it or lose it' opportunity to shape infant brains. Many have disputed these claims to truth: arguing that more synapses do not mean more brain power; increased dendritic density occurs at any age, and that only certain areas of the brain showed increased density during the early years.

2. This period of intensive synaptic growth constitutes a 'critical' or 'sensitive' period during which particular aspects of development must be nurtured lest permanent damage to the child's cognitive and emotional potential occurs. Bruer contends that critical periods are the exception, not the norm in human development, that although there seems to be evidence that language acquisition and visual development are particularly rooted in the early years, this is atypical of the development of other human faculties.

3. 'Enriched' or 'stimulating' environments produce better infant brains which will, in turn, create cleverer, more emotionally attuned infants children and adults. Bruer argues that human brains develop in

The 'First Three Years': Review of critiques

massively varying but essentially 'ordinary' environments, which are sufficient to stimulate brain development.

Others, like Bruer, working within the field of neuroscience have identified and challenged some of the key 'neuromyths' (Blakemore and Frith 2000; Thompson and Nelson 2001; Tallis 2011). There has also been what one neuroscientist calls 'rumblings in the jungle of neuroscience', with a 'spate of high-profile papers particularly critical of the methodological shortcomings in neuroimaging studies' (Bishop 2012).

There is now a large literature critiquing the way in which neuroscience enters the public domain (Jones and Zigler 2002; Bangerter and Heath 2004; Poldrack 2006 and 2008; O'Connor, Rees and Joffe 2012; Racine et al. 2010). The disjuncture between the scientific evidence available from neuroscience and the claims made in its name has been analysed by scholars concerned with the apparent impact of images of fMRI (brain) scans on media reporting and, it is presumed, a wider public. Weisberg et al. (2008) and McCabe and Castel (2008) are the most widely cited authors on the subject. Their experiments with presenting scientific evidence to a lay public, with and without neuroscience images and vocabulary, seem to show that neuroscience enjoys a high level of legitimacy, which adds to the authority of claims made, regardless of its scientific relevance to them (Weisberg et al. 2008, 470). Legrenzi and Umiltà suggest that,

When a part of the body acquires particular relevance and comes into the foreground, all the rest fades in to the background...In other words, the activity detected by the scanner shows (or, more precisely, convinces us that we have seen) something of which we were not aware, that is outside the boundaries of our knowledge...(Legrenzi and Umiltà 2011, 69)

The 'First Three Years': Review of critiques

This, they argue produces a 'wonder effect' in new knowledge claims based in brain science. (Diane M. Beck (2010) concludes that the power of brain imaging in the popular press resides in the simplicity of the message it conveys and the belief that images 'prove' behavioural connections that we already think are true (Beck 2010, 763). Connors and Singh (2009) suggest that fMRI images have a 'seeming transparency' and 'lay interpretability', while Meloni (2011) says the turn towards neuroscience and 'the proliferation of references to our neurobiological dimension' reflects a search for moral foundations and 'deeply interacts with our societies' cultural needs and expectations' (Meloni 2011, 310). Fine's critique of the neuro-fixing of gender differences highlights the conservative effects of brain claims:

The answer, 'Oh, it's the *brain*,' offers a tidy justification for accepting the status quo with clear conscience. (Fine 2008, 71)

There is a consensus amongst those psychologists and neuroscientists who have criticised the interpretation given to neuroscientific findings to justify an early years policy focus, that too much deterministic power is attributed to the early years. They argue, that in fact, longer childhood experiences are just as, if not more, significant than those of infancy, and neurological development continues into, and throughout, adulthood. Brain development is therefore better described as plastic and resilient rather than determined or fixed. In his Presidential Address to the Society for Research on Child Development, Michael Rutter, while acknowledging the real advances in scientific understanding of the brain emerging from neuroscience, criticised the 'misleading scientific evangelism' which was giving rise to 'polarising battles and absurd claims' about the role of the early years in determining brain development (Rutter 2002, 1). Rutter's own research with children raised in the extreme deprivation of Romanian orphanages, has often been misused by brain policy advocates to support the idea of critical periods of development

The 'First Three Years': Review of critiques

and to argue for the need for enriched environments for children, despite Rutter's much more open interpretation of the influence of the early years. Jerome Kagan concurs with Rutter's conclusion that:

The ill effects of early traumata are by no means inevitable or irrevocable...the evidence runs strongly counter to views that early experiences irrevocably change personal development.
(Rutter, 1987 cited in Kagan 1998, 112)

These criticisms from within science suggest that brain-policy advocates have a tendency to depict a false consensus amongst scientists, to misrepresent or misinterpret the findings of scientific research and are unfamiliar with the caution and questioning characteristic of the scientific method. Raymond Tallis (2011) draws a useful distinction between science as a discipline and 'scientism' as an ideological phenomenon in which the authority of science is drawn upon by those outside the field. John Bruer (1999a) and the historian Ann Hulbert (2004) point out that even at President Clinton's 1997 White House 'Conference on the Brain', a pivotal moment in the development of the first three years movement, just two brain scientists were present, and both of these made far more modest claims than the campaigners and brain intervention advocates.

Within the critical analysis of the cultural significance of neuroscientific claims-making, there is a focus on the particular strength of the 'babies' brains' trope. A review by psychologists Thompson and Nelson (2001) of media coverage of early brain development concludes 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 overemphasize the developmental significance of parental care relative to other influences. Social psychologists O'Connor and Joffe suggest that brain research has become an 'important reference point in child-rearing decisions' used to 'indicate the "correctness" of parenting practices' (O'Connor and Joffe 2012, 221). We will return to this in the third

theme, but first we turn to the critique of the political significance of the focus on babies' brain development.

Babies' brains and the politicisation of parenting

Despite the attempt by neuroscientists and psychologists to challenge the certainty of brain claims, they have continued to be disseminated, relatively unchanged, by energetic advocates of brain-based parenting education interventions. The 'I am your child' campaign, launched at the 1997 White House Conference by the film director Rob Reiner, achieved international reach with its celebrity-endorsed and corporate-funded, brain-advocacy campaign and, according to Thompson and Nelson, 'crystallized the central messages of early brain development for the public' (2001, 7). Canadian sociologist Glenda Wall describes how 'I am your child' was heavily promoted by the Canadian Institute of Child Health (Wall 2004, 42) while Wilson reported successful lobbying for the campaign in New Zealand (Wilson 2002). More recently, academics have noticed the incorporation of the same brain-based policy ideas into UK family policy, most explicitly since the election of the Conservative/Liberal Democrat Coalition government in 2010 (Wastell and White 2012; Edwards, Gillies and Horsley 2013), but actually from the early 2000s, when New Labour was in government (Macvarish 2014). Below we can see the front covers of two reports produced for the UK government, making the case for early intervention on brain-based grounds.

The 'First Three Years': Review of critiques



[<http://media.education.gov.uk/assets/files/pdf/g/graham%20allens%20review%20of%20early%20inter%20vention.pdf> and <https://www.gov.uk/government/publications/early-intervention-smart-investment-massive-savings>]

In 'The Allure of Infant Determinism', Kagan argues that the appeal of brain claims to contemporary politicians lies in the fact that they serve to avoid moralising parental behaviour and therefore divert attention from the reality of an absence of consensus about what is right and wrong in family life, or about the legitimate role of the state in raising children. 'Good parenting' becomes that which demonstrates a commitment to the improvement of knowledge and skills by engaging with expert knowledge (see also Smeyers 2008 and 2010). Kagan characterises this construct thus; '...poor mothers love their children, but do not know the basic facts of human development' (Kagan 1998, 90).

The 'First Three Years': Review of critiques

Despite their apparently morally neutral appearance, Gillies (2013) argues that brain interventions are in fact, deeply moralising and establish new norms and standards, in particular, with their demands for intensive maternal interaction with the baby and even the fetus. They construct as biologically necessary, a lifestyle which is, in reality, only realistic for a small number of better-off mothers with the inclination to devote all their time to baby-care. It is reported that brain-based training programmes for professionals are now being rolled out nationally in health, social care and education services (Gillies 2013; Edwards, Gillies and Horsley 2013). Brain-based predictions of long-term harm to babies from negative early experiences are also informing decision-making by child protection services, with the result that more babies are being removed from their parents on pre-emptive, harm prevention grounds (Wastell and White 2012; Featherstone, Morris and White 2013). Here we can see the harsh consequences of brain-based determinism when it informs the judgements of those with the power to judge parents and remove children from their care.

Writing from the American experience, Hulbert also highlights the negative implications of brain-based early intervention: in spite of brain advocates' liberal social agenda for greater social interventions, the flipside, she argues, has been a profound fatalism and pessimism.

If young brains subjected to deprived conditions, and to the inadequate parenting that often goes along with them, are irrevocably damaged – pickled in stress hormones, stripped of synapses – there is no time to waste, that is true. Yet such alarm, though it conveys urgency, can all too easily fuel defeatism. If children become neurologically unresilient at an early age, then only intrusive and intensive remedial efforts seem equal to the job. And if – or, let's face it, when – such intervention fails to materialize, the case for subsequent help is bound to seem weaker.' (Hulbert 2004, 316)

The 'First Three Years': Review of critiques

The brain claims, she argues,

...consigned the child, as much as genetic determinism ever had, to a fate shaped decisively by her parentage, thus depriving her of more than baby talk. She was denied a resourceful role in helping to shape a future that was still unfolding long past the age of three, influenced by forces well beyond simply her parents' ministrations (Hulbert 2004, 316)

Although brain claims have been most consistently criticised for their determinism, a more recent aspect of the literature attempts to critique brain-based thinking more theoretically, as a reflection of 'neoliberalism'. Wall describes neoliberalism as placing greater emphasis on 'the ability of individuals to adapt to change, to engage in self-enhancing behaviour, and to manage the risk they pose to themselves and thus reduce their potential burden on society' (Wall 2004, 46). Others have associated the arguments for brain-based early intervention with a desire to cut welfare spending and to 'responsibilize' the raising of children solely to parents, in particular, mothers (Gillies 2013). This view concurs with Wall's assessment that:

The focus on educating parents fits well with a model of individual responsibility and privatized parenting. It does not require governments to re-invest in the welfare state and design policy to alleviate poverty, provide affordable housing and child care services, and improve employment practices. (Wall 2004, 47)

Thornton understands brain-based parenting culture as driven by a 'neoliberal' imperative to 'reproduce entrepreneurial forms of self-governance by producing babies emotionally primed to navigate an economic system that prioritizes flexible, mobile, and adaptable workers' (Thornton 2011, 400).

The 'First Three Years': Review of critiques

Nadesan takes a similar view but raises questions about the wider and deeper significance of the appeal of neuroscientific explanations. She explores in greater depth than most others, the political significance of neuroscience to the contemporary period, and in particular, to new constructions of personhood. She points to the authoritarian aspects of brain-based policy when applied to those at the bottom of society:

...brain science legitimizes more formal surveillance of, and intervention in, infant development, particularly the development of economically disadvantaged children. (Nadesan 2002, 424)

But also describes brain culture's wider impact across wider society:

In addition to functioning as a tool of social engineering for the poor, brain science, as popularized by the US media, also functions as a form of corporate colonization among the middle classes through its implicit promises to engineer middle-class parents' anxiety by holding them accountable for each and every stage of their infant's 'development' and for every future success and failure. (Nadesan 2002, 424)

Contextualising brain claims within contemporary parenting culture

Social scientists have begun to analyse the way in which brain-focused conceptualisations of the child interact with the broader culture of contemporary parenting norms (Hays 1996; Furedi 2001; Nadesan 2002; Wall 2004 and Wall 2010; Romagnoli and Wall 2012; Lupton 2011). The construction of babies' brains as extremely susceptible to benign and malign influences can be seen as a biologised concentration of pre-existing idea of infant vulnerability, discussed at length by British sociologist Frank Furedi in his book *Paranoid Parenting* (2001). Furedi and the American sociologist Sharon Hays (1998) identify the idea of infant vulnerability as underpinning the 'intensification of parenting': if the infant body and brain is conceived of as continually 'at-risk', then the task of parenting becomes one fraught with anxiety and problems. From Australia, Deborah Lupton has also written extensively about the idea that 'childhood

The 'First Three Years': Review of critiques

should be a protected world and that children can only survive and develop successfully if intensely nurtured and protected by adults' (Lupton 2011, 638).

Lupton's research with Australian mothers finds that ideas about stimulating the infant brain have become incorporated into contemporary norms of maternal responsibility:

As well as discussing strategies for promoting good health in their infants, the mothers talked about the importance of helping their children develop normally. They mentioned such strategies as exposing their babies to educational resources and the importance of 'stimulation' to encourage optimal intellectual and physical development. (Lupton 2011, 646)

Canadian sociologist Glenda Wall has also found evidence that mothers in particular are receptive to the message that part of their role is to stimulate their children's brains from a young age. According to Wall, this is not surprising, given that:

Throughout the 1990s, claims about the potential of early education and appropriate stimulation to enhance brain capacity in children have gained a new and prominent place in child rearing advice literature and discourse. These changes in the social understandings of infant and child development have significant implications for mothers, with whom the majority of responsibility for child outcomes is placed. (Wall 2004, 41)

Not only is the born infant an object of concern, but it has been observed that the requirements of intensive parenthood are frequently 'extended backwards' into pregnancy and even pre-conception (Lee et al. 2014). Wolf also locates a concern for the neurobiological within a broader context of intensive parenting, including prenatal parenting and 'fetal programming' (Wolf 2011, 29). A significant feature of the brain claims found in British media representations of 'early human development' analysed by O'Connor and Joffe's was how:

The 'First Three Years': Review of critiques

...diverse phenomena, ranging from psychiatric disorders and obesity to alcoholism, romantic success and sexual orientation, were presented as direct consequences of prenatal events impacting on the fetal brain. (O'Connor and Joffe 2012, 5).

Lachlan Story, a sociologist of reproductive science and medicine, argues that in the 'discourse of fetal stimulation' found in pregnancy and early childhood advice books, and marketing material for products designed to stimulate the fetus, we can see that the 'fetus is infantilized' in its capacity to learn and interact with its 'environment' and 'the infant is fetalised' in its intense vulnerability (Story 2003, 47). US sociologist Victoria Pitts-Taylor explains how the fetal brain has even been targeted in order to 'stave off' dementia at the end of life, with mothers recommended to eat diets rich in folates, expose the fetus to classical music, and to devote maternal attention to the 'bump' to ensure optimal brain capacity throughout life (2010, 645).

We can see from the descriptions above, that the norms of parenting which emerge from a culture attuned to 'scientific evidence' have expanded and intensified the obligations of parents to new levels. The disconcerting effects of the relentless reporting of new risks to the body and brain of the child have been discussed by academics such as Furedi (2001), Lee et al. (2014) and Lupton (2011). It has also been observed that claims to new brain knowledge do not simply make novel demands for parents to 'skill up', but they may also redefine previously held, 'commonsense', understandings of parenting (Thompson and Nelson 2001; Wilson 2002; Yaqub 2002). The UK campaign Five to Thrive, (see website below), urges parents to attune their parenting to the development of their baby's brains by 'talking, playing, relaxing, cuddling and responding'. The campaign's literature and training programmes, currently being purchased by various local councils, illustrates the reconceptualization of everyday parent-child interactions as

The 'First Three Years': Review of critiques

having special brain significance. According to Five to Thrive, the most important of these is 'relaxing' because that is when 'attunement' occurs.

five to thrive

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While Wall and Lupton emphasise the imperative for mothers to maximize the intellectual capacities of their children through specific styles and techniques of care, Thornton identifies a shift within the 'first three years' discourse from the late 1990s, away from claims that the child's cognitive capacities can be enhanced by brain-stimulating parenting techniques and towards the argument that a brain-sensitive way of parenting is vital for ordinary emotional development. Thornton labels new phenomenon, the 'back to basics discourse', because it criticises as anxiety-inducing and consumerist, the earlier emphasis of the

The 'First Three Years': Review of critiques

first three years movement on intelligence, and calls for a more 'basic', emotional focus for everyday practices of brain-informed care (Thornton 2011, 401). The same author makes the important point that this shift towards the emotions places even greater pressure on intense maternal involvement: mothers cannot simply buy DVDs or play classical music to their children, they must commit themselves to true emotional attunement with the infant. This cannot be bought or pretended – it must be authentically felt.

As discussed at the beginning, the similarities between the contemporary biologisation of maternal love as a 'tangible resource that has a demonstrable effect on a child's neurobiology' (O'Connor and Joffe 2012, 6) and attachment theory, were recognised early on by Jerome Kagan (for an earlier critique of attachment theory, see Eyer 1992). Reflecting the diverse academic concern with brain-based parenting culture, and echoing Kagan's analysis of the continuity between attachment theory and neuroparenting, philosophers of education, Ramaekers and Suissa propose that 'neuropsychological language' convinces us that new 'real knowledge' now confirms and strengthens pre-existing psychological theories about the parent child relationship (Ramaekers and Suissa 2012, 20).

The implications of this 'reinvigoration' of attachment theory have been explored more recently by Thornton (2011) and Faircloth (2013 and 2014). However, Thornton highlights an important difference between the attachment theory of the 1950s and brain based theories of today: whereas Bowlby posited that attachment was a natural instinct in all babies and most mothers, given the right conditions, and later, 1970s biologised theories of attachment claimed that bonding was driven by hormones, today's neuroscientific-based theories see attachment as a much less natural or reliable occurrence. Instead, says Thornton, bonding is 'a technical problem that must be achieved through constant work on the self, primarily through actions directed inward; towards feelings, attitudes, and desires' (Thornton 2011, 409). Faircloth (2014) also identifies a distinction between the medicalization of motherhood and maternal love

The 'First Three Years': Review of critiques

in particular in the early twentieth century (Kanieski 2010; Apple 2006), which produced a concern to identify particularly dysfunctional mothers, and the contemporary concern to ensure attachment as a necessary protective factor for all children.

We can see here that the apparent biologization of the child's needs is not paralleled in a naturalization of a parent's ability to meet them. This lack of faith in parenting (motherhood) as instinctual is also identified by Story (2003). Although ideas about stimulating or communicating with a fetus have a long history, Story argues that there is a new, intensified focus on the psychophysical health of the fetus in which the mother's body is constructed as a barrier to communication (Story 2003). The mother can even be potentially harmful if her emotional state transfers too much stress to the fetus (Story 2003, 42). Nature is therefore not functional, but must be nurtured through the encouragement of particular practices (such as those promoted by Five to Thrive) by the use of particular products or through accepting the guidance of experts.

Conclusion

In this review we have analysed three dimensions of the critique of the first three years movement: the scientific challenge to the evidence-base of brain claims; the appropriation of neuroscience by politicians, child welfare advocates and policy-makers, and the attempt to theorise brain-centred thinking about children and parents within a broader context of parenting culture and twentieth-century capitalism. More research needs to be done to find out how these new ways of conceptualising parenthood interact, at the individual level in particular, with older ideas about family and child-rearing.

A new area of scholarly interest is an attempt to understand exactly how much reach brain claims have into individuals' conceptualisations of themselves (Dumit 2004; O'Connor and Joffe 2013; Singh 2013).

The 'First Three Years': Review of critiques

Pickersgill et al. (2011) suggest that people still think there is more to subjectivity than just the brain and are resistant to the idea of biological determinism rooted in the 'meat' of grey matter (Pickersgill et al. 2011, 353). They suggest that:

...ideas about neuroscience will continue to be translated into, and intermingle and evolve with, longstanding ideas about self and society, and thus develop further societal meaning and personal salience. (Pickersgill et al. 2011, 362)

The studies discussed above point towards the possibility that brain claims have a greater capacity to convince when it comes to children, perhaps because, as Kagan says, they interact with pre-existing ideas of infant determinism. Kagan argued that in times of rapid social change, infant determinism provides a reassuring reinforcement of the belief in a connectedness between past and present (Kagan 1998). Historians have also pointed to continuities between the current appeal of neuroscience and the late nineteenth century concern for child-rearing, in particular, anxieties about motherly instincts, (Hulbert, 2004; Hays 1996; Apple 2006; Stearns 2003) and a focus on cultivating the child as the pathway to a better future (Lee 2014; Hardyment 2007; Ehrenreich and English 1979; Kessen 1979; Hendrick 1997). As the 'first three years movement' shows no sign of slowing down, the need to understand this phenomenon is a pressing one. This review has aimed to introduce interested scholars to a dynamic field of inquiry which is bringing together insights from an impressive range of disciplines.

ENDNOTES

[1] Although, more recently there seems to be an increasing number of studies reporting on research conducted on babies, children and teenagers using fMRI and other technology. It would be interesting to know whether thinking around ethical constraints has changed.

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