

An analysis of the evidence for adverse consequences of the internet cited on Susan Greenfield's website

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BRIEF BACKGROUND

Three years ago I wrote an [open letter to Susan Greenfield](#) asking her to please stop claiming there is a link between autism and use of digital media. It's never pleasant criticizing a colleague, and since my earlier blogpost I've held back from further comment, hoping that she might refrain from making claims about autism, and/or that interest in her views would just die down. But now she's back, reiterating the claims in a new book and TV interview, and I can remain silent no longer.

Greenfield featured last week as the subject of a [BBC interview](#) in the series Hard Talk. The interviewer, Stephen Sackur, asked her specifically if she really believed her claims that exposure to modern digital media – the internet, video games, social media – were damaging to children's development. Greenfield stressed that she did: although she herself had not done direct research on the internet/brain impact link, there was ample research to persuade her it was real. Specifically, she stated: “.. in terms of the evidence, anyone is welcome to look at my website, and it's been up there for the last year. There's 500 peer-reviewed papers in support of the possible problematic effects.”

A FACT-CHECK ON THE “500 PEER-REVIEWED PAPERS”

The list can be downloaded from [here](#): it's not exactly a systematic review. I counted 395 distinct items, but only a small proportion are peer-reviewed papers that find evidence of adverse effects from digital technology. There are articles from the Daily Mail and reports by pressure groups. There are some weird things that seem to have found their way onto the list by accident, such as a report on the global tobacco epidemic, and another from Department of Work and Pensions on differences in life expectancy for 20-, 50- and 80-year-olds. I must confess I did not read these cover to cover, but a link with 'mind change' was hard to see. Of the 234 peer-reviewed papers, some are reports on internet trends that contain nothing about adverse consequences, some are straightforward studies of neuroplasticity that don't feature the internet, and others are of uncertain relevance. Overall, there were 168 papers that were concerned with effects of digital technology on behaviour and 15 concerned with effects on the brain. Furthermore, a wide range of topics was included: internet addiction, Facebook and social relations, violent games and aggression, reading on screens vs books, cyberbullying, 'brain training' and benefits for visuospatial skills, effects of multitasking on attention. I could only skim titles and a few abstracts, but I did not come away feeling there was overwhelming evidence of adverse consequences of these new technologies. Rather, papers covered a mix of risks and benefits with varying quality of evidence. There is, for instance, a massive literature on Facebook

influences on self-esteem and social networks, but much of it talks of benefits. The better studies also noted the difficulties of inferring causation from correlational data: for instance, it's possible that an addictive attitude to a computer game is as much a consequence as a cause of problems with everyday life.

Greenfield's specific contribution to this topic is to link it up with what we know about neuroplasticity, and she has speculated that attentional mechanisms may be disrupted by effects that games have on neurotransmitter levels, that empathy and social relationships can be damaged when computers/games take us away from interacting with people, and that too much focus on a two-dimensional screen may affect perceptual and cognitive development in children. This is all potentially important and a worthy topic for research, but is it reasonable, as she has done, to liken the threat to that posed by climate change? As Stephen Sackur pointed out, the evidence from neuroplasticity would indicate that if the brain changes in response to its environment, then we should be able to reverse an effect by a change in environment. I cannot resist also pointing out that if it is detrimental to perform socially-isolated activities with a two-dimensional surface rather than interacting with real people in a 3D world, then we should be discouraging children from reading books.

DIGITAL MEDIA USE AS A RISK FACTOR FOR AUTISM

My main concern is the topic that motivated me to write to Greenfield in the first place: autism. The arguments I put forward in 2011 still stand: it is simply irresponsible to indulge in scaremongering on the basis of scanty evidence, particularly when the case lacks logical consistency.

In the [Hard Talk interview](#), Greenfield attempted to clarify her position: "You have to be careful, because what I say is autistic spectrum disorder. That's not the same as autism." Yet this is no clarification at all, given that the latest edition of DSM5 states: "Individuals with a well-established DSM-IV diagnosis of autistic disorder, Asperger's disorder, or pervasive developmental disorder not otherwise specified should be given the diagnosis of autism spectrum disorder (ASD)." Greenfield has had a few years to check her facts, yet seems to be under the impression that ASD is some kind of mild impairment like social gaucheness, quite distinct from a clinically significant condition.

In an [interview in the Observer](#), Greenfield was challenged by the interviewer, Andrew Anthony, who mentioned my earlier plea to her to stop talking about autism. She replied to say that she was not alone in making the link and that there were published papers making the same case. She recommended that if I wanted to dissent, I should "slug it out" with the authors of those papers. That's an invitation too good to resist, so I searched the list from her website to find any that mentioned autism. There were four (see reference list below):

We need not linger on the Hertz-Picciotto & Delwiche paper, because it focuses on changes in rates of autism diagnosis and does not mention internet use or screen time. The rise is a topic of considerable interest about which a great deal has been written, and numerous hypotheses have been put forward to explain it. Computer use is not generally seen as a plausible hypothesis because symptoms of ASD are typically evident by 2 years of age, long before children are introduced to computers. (Use of tablets with very young children is increasing, but would not have been a factor for the time period studied, 1990-2006).

The Finkenauer et al paper is a study of internet use, and compulsive internet use by married couples, who were assessed using self-report questionnaires. Frequency of internet use was not related to autistic traits, but compulsive internet use was. The authors did not conclude that internet use causes autistic traits – that would be a bit weird in a sample of adults who grew up before the internet was widespread. Instead, they note that if you have autistic traits, there is an increased likelihood that internet use could become problematic. The paper is cautious in its conclusions and does not support Greenfield's thesis that the internet is a risk factor for autism. On the contrary, it emphasises the possibility that people who develop an addictive relationship with the internet may differ from others in

pre-existing personality traits.

So on to Waldman et al, who consider whether television causes autism. Yes, that's right, this is not about internet use. It's about the humble TV. Next thing to note is this is an unpublished report, and not a peer-reviewed paper. So I checked out the authors to see if they had published anything on this, and found an earlier paper with the intriguing title: "Autism Prevalence and Precipitation Rates in California, Oregon, and Washington Counties". Precipitation? Like, rainfall? Yup! The authors did a regression analysis and concluded that there was a statistically significant association between the amount of rainfall in a specific county, and the frequency of autism diagnoses. They then went on to consider why this might be, and came up with an ingenious explanation: when it is wet, children can't play outside. So they watch TV. And develop autism.

In the unpublished report, the theme is developed further, by linking rate of precipitation to household subscription to cable TV. The conclusion:

"Our precipitation tests indicate that just under forty percent of autism diagnoses in the three states studied is the result of television watching due to precipitation, while our cable tests indicate that approximately seventeen percent of the growth in autism in California and Pennsylvania during the 1970s and 1980s is due to the growth of cable television."

One can only breathe a sigh of relief that no peer-reviewed journal appears to have been willing to publish this study.

But wait, there is one more study in the list provided by Greenfield. Will this be the clincher? It's by Maxson McDowell a Jungian therapist who uses case descriptions to formulate a hypothesis that relates autism to "failure to acquire, or retain, the image of the mother's eyes". I was initially puzzled at inclusion of this paper, because the published version blames non-maternal childcare rather than computers, but there is an updated version online which does make a kind of link – though again not with the internet: "The image-of-the-eyes hypotheses suggest that this increase [in autism diagnoses] may be due to the increased use, in early infancy, of non-maternal childcare including television and video." So, no data, just anecdote and speculation designed to make working mothers feel it's their fault that their child has autism.

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