THE 21ST CENTURY BRAIN

THE IMPACT OF TECHNOLOGY
WHAT IS THE BASIS OF HUMAN UNIQUENESS?
(1) DEVELOPING A MIND...

Newborn  3 Months  15 Months  2 Years
EXPERIENCES LEAVE THEIR MARK ON THE BRAIN...
‘THINKING IS... MOVEMENT CONFINED TO THE BRAIN’

Control

Physical Practice

Mental Practice

AN ‘ENRICHED’ ENVIRONMENT...
EFFECTS OF AN ‘ENRICHED’ ENVIRONMENT

Standard

‘Enriched’
CONNECTIONS GIVE EVER DEEPER MEANING OVER TIME...
THE BIOLOGICAL BASIS OF THE MIND IS THE PERSONALISATION OF THE BRAIN THROUGH UNIQUE DYNAMIC CONFIGURATIONS OF NEURONAL CONNECTIONS, DRIVEN BY UNIQUE EXPERIENCES
(2) THE 21ST CENTURY ENVIRONMENT IS UNPRECEDENTED...
Daily Media Usage (standard deviation) for Children, Preteens and Teens Shown in Hours: Minutes

<table>
<thead>
<tr>
<th>Media/technology usage item</th>
<th>4- to 8-year-olds</th>
<th>9- to 12-year-olds</th>
<th>13- to 18-year-olds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online</td>
<td>0:27 (0:44)</td>
<td>1:01 (1:11)</td>
<td>1:24 (1:53)</td>
</tr>
<tr>
<td>Using computer (not online)</td>
<td>0:23 (0:38)</td>
<td>0:53 (1:07)</td>
<td>1:37 (1:49)</td>
</tr>
<tr>
<td>E-Mail</td>
<td>0:06 (0:25)</td>
<td>0:22 (1:02)</td>
<td>0:56 (1:49)</td>
</tr>
<tr>
<td>IM/Chat</td>
<td>0:04 (0:22)</td>
<td>0:24 (1:19)</td>
<td>1:21 (2:35)</td>
</tr>
<tr>
<td>Telephone</td>
<td>0:20 (0:37)</td>
<td>0:41 (0:55)</td>
<td>1:14 (1:47)</td>
</tr>
<tr>
<td>Text messaging</td>
<td>0:07 (0:42)</td>
<td>0:41 (1:37)</td>
<td>2:25 (3:19)</td>
</tr>
<tr>
<td>Video games</td>
<td>0:50 (1:05)</td>
<td>1:12 (1:21)</td>
<td>1:06 (2:01)</td>
</tr>
<tr>
<td>Music</td>
<td>0:42 (0:46)</td>
<td>1:16 (1:44)</td>
<td>2:49 (2:56)</td>
</tr>
<tr>
<td>Television</td>
<td>2:05 (1:28)</td>
<td>1:52 (1:27)</td>
<td>1:55 (1:45)</td>
</tr>
<tr>
<td>Tech toys</td>
<td>0:59 (1:01)</td>
<td>0:41 (0:55)</td>
<td>0:41 (1:09)</td>
</tr>
<tr>
<td>TOTAL TECH</td>
<td>7:11 (4:45)</td>
<td>9:57 (7:34)</td>
<td>18:28 (11:30)</td>
</tr>
</tbody>
</table>

(3) THE BRAIN WILL BE CHANGING CORRESPONDINGLY IN NEW WAYS

THE ENVIRONMENT OF THE SCREEN:

Gaming
AGGRESSION...

Repeated Exposure to Media Violence Is Associated with Diminished Response in an Inhibitory Network.

ATTENTION

Research Article
Television and Video Game Exposure and the Development of Attention Problems
Edward L. Swing, Douglas A. Gentile, Craig A. Anderson, David A. Walsh
Pediatrics Vol. 126 No. 2 pp. 214-221

Research Article
Video game playing, attention problems, and impulsiveness: Evidence of bi-directional causality
Douglas A. Gentile, Edward L. Swing, Choon Guan Lim, and Angeline Khoo
Psychology of Popular Media Culture, 1, 62-70.
ADDICTION?

TOP 10 SIGNS YOU MIGHT BE ADDICTED TO POKEMON!
The average person checks their phone 200 times a day - that's once every six and a half minutes.

73% of Brits say they'd struggle to go a day without checking their phone or computer.

One in four people spend more time online than they do asleep.

70% of 16-24-year-olds say they prefer texting to talking.

The average teenager sends 3,400 electronic messages a month from their bed.
Children who love video games have brains like gamblers

Certain children's brains could be hard-wired to spend hours playing video games, according to a study which reignites the debate over whether the habit should be considered an addiction.

Researchers studied 154 healthy 14-year-olds, who played video games for an average of 12 hours a week, and scanned their brains while they played two games. Photo: ALAMY

By Nick Collins, Science Correspondent
6:38AM GMT 16 Nov 2011
Arousal  Addiction  Reward
RISK-TAKING
THE CASE OF PHINEAS GAGE
Damage to Prefrontal Cortex
Led to Excessive Recklessness
Research Article
Inverse Association Between BMI and Prefrontal Metabolic Activity In Healthy Adults
Thanos PK, Ma Y, Pradhan K.


Research Article
Decision-Making in Obesity: A Study using the Gambling
Pignatti R, Bertella L, Albani G, Mauro A, Molinari E, Semenza C.

WITHOUT SCHIZOPHRENIA

WITH SCHIZOPHRENIA
A COMMON FACTOR:
The Press of the Senses?
Having a sensational time

Letting yourself go...
TWO BASIC MODES FOR THE HUMAN BRAIN

‘MEANINGLESS’
Prefrontal Under-function?

- Strong feelings
- Sensory
- Here-and-now
- External stimuli dominant
- Little ‘meaning’
- Reduced sense of self
- No time-space
- Infants and children
- More DOPAMINE

YOU
ONLY
LIVE
ONCE
(1) Intense stimulation of screen: fast response

(2) High arousal, high levels of dopamine release

(3) Reward seeking addictive behaviour

(4) Dopamine released

(5) Dopamine causes PFC hypo-function

(6) Conditions of childhood, schizophrenia, obesity

(7) Drive: sensation over cognition

(8) Greater appeal of a screen environment?
In 11 studies, we found that participants typically did not enjoy spending 6 to 15 minutes in a room by themselves with nothing to do but think, that they enjoyed doing mundane external activities much more, and that many preferred to administer electric shocks to themselves instead of being left alone with their thoughts. Most people seem to prefer to be doing something rather than nothing, even if that something is negative.
THE ENVIRONMENT OF THE SCREEN:
Social Networking Sites

- Words: 10% of total impact
- Eye contact
- Body language
- Voice (tone/rate/volume)
- Pheromones?
- Physical contact?
A LINK BETWEEN AUTISTIC TYPE BEHAVIOUR AND THE SCREEN?

- A link between atypical brain wave responses in problematic face recognition, characteristic of autism, and also of heavy internet users (He et al., 2011)

- A link between autistic spectrum disorders and an under-functioning prefrontal cortex, indicative of a more literal take on the world (Amodio & Frith 2006)

- A link between early screen experiences and later development of autism (Waldman et al., 2006)

- A link between autistic conditions and an appeal of screen technologies (Finkenauer et al., 2012).

- A link between autistic spectrum disorder and compulsive video game use (Mazurek & Engelhardt 2013)
FIVE DAYS AT OUTDOOR EDUCATION CAMP WITHOUT SCREENS IMPROVES PRETEEN SKILLS WITH NONVERBAL EMOTION CUES.
HISTORY OF BLOGGING…

1999:
I just have to tell someone about this thing my cat did today…

2004:
OMG! Cat pictures!

2005:
Moving cat pictures!

2007:
1:00pm. My cat just sneezed!
1:02pm. Cat sneezed again!
1:04pm. Cat hasn’t sneezed recently. Getting worried.
THE ‘SOMETHING’ ABOUT SOCIAL NETWORKING

Loneliness bad for health

Sharing personal info: feel good

SNS: release of dopamine

No normal restraints of negative body language

Privacy trade-off

Real you concealed in favour of ideal you

‘Real’ you more vulnerable
MORE THAN THIRD OF TEENAGE GIRLS IN ENGLAND SUFFER DEPRESSION AND ANXIETY

A major survey of 14 year-olds carried out for the Department for Education:

37% reported feeling unhappy, worthless or unable to concentrate a rise since a study in 2005 “We have seen a very disturbing change in admissions to hospital for self-harm in under-16s that have gone up by 52%” - Marjorie Wallace, CEO of Sane

The Guardian, 22nd August 2016
AS INDIVIDUAL AS YOU ARE...
It's Not Just A Tattoo. It's A Story, It's Self Expression, It's A Lifestyle.

#InkDaWorld #InkLife
DEVELOPING AN INNER NARRATIVE...
AND IDENTITY
THE ‘REAL’ YOU?
THE ENVIRONMENT OF THE SCREEN:
Search Engines
Research Article

Higher Media Multi-Tasking Activity Is Associated with Smaller Gray-Matter Density in the Anterior Cingulate Cortex

Kep Kee Loh, Ryota Kanai

WHAT IS HONOUR?
PRINCESS MARYA...
‘I worry that the sort of overwhelming rapidity of information...is in fact affecting cognition. It is affecting deeper thinking. I still believe that sitting down and reading a book is the best way to really learn something. And I worry that we’re losing that...’
MIND CHANGE
How digital technologies are leaving their mark on our brains
SUSAN GREENFIELD
THE MIND OF THE FUTURE?

- Short attention span
- Sensation at premium
- Addictive
- Reckless
- Low empathy
- Poor interpersonal skills
- Weak sense identity
- Efficient information processing
- Icons not ideas
- Poor critical thought
“We are all in the gutter, but some of us are looking at the stars...” *Oscar Wilde*
RISK MANAGEMENT:
Generating an Individual Life Story...
‘From the moment we become aware of others, we demand to be told stories that allow us to make sense of the world, to inhabit the mind of someone else. In old age we tell stories to make small museums of memory. It matters not whether the stories are true or imaginary. The narrative, whether oral or written, is a staple of every culture the world over. But stories demand time and concentration; the narrative does not simply transmit information, but invites the reader or listener to witness the unfolding of events’.

BEN MACINTYRE
Provide a conceptual framework: ‘meaning’

Enhances attention span and imagination

‘Imagination should be used not to escape reality, but create it.’

C O L I N  W I L S O N

Provide a temporal sequence: ‘thinking’
RISK MANAGEMENT: Slowing Down
RISK MANAGEMENT:
Cognitive Enhancement Through Exercise
Past
happened in the past
"ed"

Present
happening right now
"ing"

Future
will happen later
"will"
COGNITIVE RESERVE AND LIFESTYLE

Scarmeas and Stern, J
THE COGNITIVE BENEFITS OF INTERACTING WITH NATURE

Marc G. Berman, John Jonides, and Stephen Kaplan
RUNNING ENHANCES ‘NEUROGENESIS’: PRODUCTION OF NEW NEURONS

EXERCISE-TRAINING EFFECTS ON COGNITION IN OLDER ADULTS

Charles H. Hillman, Kirk I. Erickson and Arthur F. Kramer
THE SCOURGE OF DEMENTIA
INFOGRAPHIC

The global impact of dementia

Around the world, there will be 9.9 million new cases of dementia in 2015, one every 3 seconds.

46.8 million people worldwide are living with dementia in 2015. This number will almost double every 20 years.

68% 2050

Much of the increase will take place in low and middle income countries (LMICs): in 2015, 58% of all people with dementia live in LMICs, rising to 63% in 2030.

The total estimated worldwide cost of dementia in 2015 is US$ 818 billion. By 2018, dementia will become a trillion dollar disease, rising to US$ 2 trillion by 2030.

If global dementia care were a country, it would be the 18th largest economy in the world exceeding the market values of companies such as Apple and Google.

This map shows the estimated number of people living with dementia in each world region in 2015.

68% 2050

ALZHEIMER’S:

THE CURRENT POSITION

DIAGNOSTIC:
A blood marker detecting increased probability of eventual onset

THERAPEUTIC:
A medication that only slows down early stage progression

THIS IS NOT GOOD ENOUGH!
NEURODEGENERATION IS AN INAPPROPRIATE REACTIVATION OF DEVELOPMENT THAT BECOMES TOXIC IN THE CONTEXT OF THE MATURE BRAIN
THE LONG-TERM GOAL

BIOMARKER in blood detects degeneration before symptoms appear + MEDICATION for stopping any further neuronal death = PERMANENT PREVENTION OF SYMPTOM ONSET!
CELEBRATING THE AGEING MIND

HM b1926

Haitink b 1929

Reg Greenfield b 1915

Buffet b1930

Tutu b1931
“Above all, don’t fear difficult moments. The best comes from them”

Rita Levi-Montalcine (1909-2012)
MORE INFORMATION CAN BE FOUND:

www.susangreenfield.com

www.neuro-bio.com