Virtual Addiction: Gaming and Internet Addictions

Dr. David N. Greenfield
Founder, The Center for Internet and Technology Addiction & The Healing Center, LLC.
Assistant Clinical Professor, University of Connecticut, School of Medicine, Department of Psychiatry

www.virtual-addiction.com drdave@virtual-addiction.com
Social Connection vs. Social Isolation

• Are games a form of communication?
• What is being communicated and is it constructive?
• When you play in a virtual game world are you the same person as your are in real-time interaction?
• Inner-tainment pulls us away from real-time social interaction—what is being left in your real-time world.
• Entertaining in small doses, but seems to be psychologically damaging/limiting in larger doses, over longer durations.
• Are electronic/computer games addictive?
Technology is Amoral...

• The U.S. culture celebrates power and accomplishment.
• We have lost the ancient and normal social initiation into manhood. In short our youth have lost directional capacity.
• Gaming provides an analogous ritualized process whereby the player quests and accomplishes a goal while experiencing adversity and challenge. These are archetypical rites of passage into adulthood.
• What we have with gaming is a *Virtual Hero’s Journey* (without real-time physical risk)
• Children, adolescents, and young men find something in gaming they are lacking in their actual lives.
• In the U.S. many things are excused in the name of ENTERTAINMENT.
Dong et al (2012) fMRI used incongruent stroop trials with young men with IAD showed increased BOLD signal in anterior and posterior cingulate cortices compared with healthy peers. This suggests diminished efficiency of response-inhibition processes in IAD.

Dong et al (2012) looked specifically at IGA (Internet Gaming Addiction) and found that diminished white matter integrity demonstrated with a wide range of other addictive disorders is also present in IGA and the lack of integrity is associated with addiction severity, treatment response and cognitive impairments. Using Diffusion Tensor Imaging (DTI) IGA subjects (n=16) showed higher fractional anisotropy (FA) in the thalamus and left posterior cingulate cortex (PCC) as compared to controls. Higher FA in the thalamus was associated with greater severity of Internet Addiction. Increase regional FA in individuals with FA may suggest a pre-existing vulnerability factor for IGA or may arise secondary to neuroplasticity change from IGA/IAD. This is consistent with my clinical findings in the predominance of my patients with IGA/IAD having ADD/ADHD or other soft neurological signs. IAD severity scores were + correlated with white matter integrity in Thalamus only and this suggests greater reward processing and goal directed behavior which is consistent with gaming behavior. Other SA disorders have deceased thalamic white matter integrity UNTIL instances and with motor training, suggesting possible clinical/therapeutic implications.
• Dong et al (2011) called Internet Addiction the “world’s fastest growing addiction” found in an fMRI study that Internet addicts have increased activation in the orbitofrontal cortex in gain trials (money-like rewards in a game) and decreased anterior cingulate activation in loss trials than normal controls. Study suggests that Internet addicts have enhanced reward sensitivity and deceased loss sensitivity (something we see in other process addictions like gambling).

• Ko, et al. (2011) 3-T fMRI subjects viewed images associated with online games, smoking, and neutral scenes. Found that in both cue induced gaming and smoking urges there was an increased anterior cingulate and parahippocampus gyrus activation. Study suggests that IGA and nicotine dependence share similar mechanisms of cue-induced reactivity over the fronto-limbic network, especially the parahippocampus gyrus.
Recent Trends in the Neurobiology and Research on Internet Addiction-3

In subjects with Internet Addicted (IA) adolescents had lower gray matter density (GMD) changes in the left anterior cingulate cortex, left posterior cingulate cortex, left insula, and left lingual gyrus, when compared to controls using high-resolution T1-weighted MRI using voxel-based morphology. Findings suggest that structural brain changes are present in IA adolescents. The group of impacted structures are all implicated in executive cognitive function (ECF) which govern resolution of conflict, including response inhibition, performance monitoring, implementation of control, and error monitoring. Disruption of these structures could impair an individual’s ability to monitor and inhibit appropriate behavior.

Kim, et al. (2012) using fMRI found increased activation in the thalamus, bilateral precentral area, bilateral middle frontal area, and areas around the right temporoparietal junction and that the experience of disembodiment (feeling outside of the physical boundaries of one’s body) is significantly increased in adolescents with IA. Study suggests that IA in adolescents could be unfavorable in their brain development related to identity formation.
Recent Trends in the Neurobiology and Research on Internet Addiction

• Han, et al (2012) compared professional video gamers with patients with on-line game addiction (POGA), and controls using an MRI and voxel-wise comparisons of grey matter. They found the POGA group showed increased impulsiveness and preservative errors, and higher volume in the thalamic grey matter and lower grey matter volume in the inferior temporal gyri, right middle occipital gyrus, and left inferior occipital gyrus. The thalamus is associated with conditioned responses (expectation) and deficits in anterior cingulate function are associated with major depression, ADHD, and impulse control disorders. During on-line game play the higher levels of Dopamine make the thalamus more active which reinforces the behavioral effects of on-line game play and an imbalance of mesolimbic circuits (orbitofrontal gyri, anterior cingulate, ventral striatum, amygdala, and hippocampus) is thought to associated with a distorted reward system.
Kuss and Griffiths (2012) did an exhaustive review of the neurobiological imaging studies on Internet and Gaming addiction. They reviewed 18 studies (some which we have already examined) and found:

1) Compelling evidence for similarities for different types of addiction, notably substance-based and process-based or behavioral addictions such as Internet and Gaming addiction. There were findings of increased glutamatergic and electrical activity on the functional side and evidence of morphometry and water diffusion pointing to changes in brain structure.

2) On a molecular level Internet Addiction is characterized by an overall reward deficiency that involves decreased dopaminergic activity (down regulation).

3) On a neural circuitry (structural level) Internet and Gaming addiction led to neuroadaptation and structural changes that occur as a consequence of prolonger elevated activity in brain areas associated with addiction (mesolimbic system).

4) On a behavioral (clinical) level Internet/Gaming addicts appear constricted in a variety of cognitive domains, including depressive, anxiety, and socially-isolative symptomatology.

5) Understanding the morphology and pathogenesis of Internet/Gaming addiction help further define more specific pharmacologic and psychological treatments.
Evolutionary and Sociobiological Basis of Process Addictions

• There may be an evolutionary/adaptive basis for addictive behavior.
• The 4 F’s of survival: Feeding, Fighting, Fleeing, and Fornicating are all mid-brain, limbic-based behaviors.
• The neurohormonal pathways from midbrain to frontal cortex are bypassed (shut down) during this high arousal of Hypothalamic Adrenal Axis and dopaminergic down-regulation secondary to prolonged dopamine-elevated intense behaviors (e.g. Internet/gaming) or from high cortisol during fight or flight responses.
• There is an adaptive context to this process in that the bypass of slower processing via higher cortical executive functions insures survival via rapid stimulus-response limbic-based actions by shutting down these limbic-frontal cortex connections.
• Addiction also shuts down this same neural circuitry to the frontal cortex as the mesolimbic system is flooded with Dopamine.
• This is ideally modulated via top-down processes in individuals who have developed secure attachment and ability for novel experience
Implications of current clinical and Neurobiological research on the treatment of Internet Addiction Disorder


- Grant et al (2010) look at natural history, phenomenology, tolerance, withdrawal, co-morbidity, overlapping genetic contribution, neurobiological mechanisms and response to treatment strongly suggest that behavioral (process) addiction such as IA resemble substance addictions and that excessive Internet use is indeed an addiction.

- Winkler, et al (2013) found that both pharmacological and psychological treatments were effective in treating IA (time spend online, depression, and anxiety.)
Comparison/Contrast of the Substance based model of addiction to the Process-based Internet Addiction

- Compulsive Use
- Tolerance
- Withdrawal Effects
- Interference with Major Life Spheres
Emerging Trends

• The merging of MP3 players, cell phones and cameras with the Internet = Smartphone (I-phone, Android, blackberry). All digital devices will be Internet connected.
• The continue perfection of smartphones wireless speed capability.
• The further integration of all home entertainment systems into the above devices
• Most importantly everything will be linked and uploaded/stored in the “cloud”.
• Smaller devices, cheaper, more part of clothing & jewelry.
• Everyone on the planet will likely have a Smartphone eventually.
• Smartphone's are the most rapidly adopted technology....ever!
• Flexible and shapeable screens.
We are genetically predisposed to socially connect and communicate

- The question is whether virtual communications are as healthy as real-time relationships.
- I believe all communication technologies are attempts to connect to others more efficiently, but perhaps with a cost of less depth and quality.
- Does the Internet affect our ability to judge and obtain social cues?
- There is growing evidence that excessive or repetitive use of the Internet can alter brain structure and function.
Here are the estimates of what gets crowded out. Each additional minute of time spent online is correlated with 0.27 fewer minutes working; 0.28 fewer minutes spent on other leisure activities, mostly watching television; 0.12 fewer minutes sleeping; and 0.05 fewer minutes socializing offline.
Modern Technology Adds to Worldwide Obesity Woes: Report
As countries gain information and communication advances, populations pack on pounds, research shows
August 23, 2012
Spending on Tech = More Obesity

Lots of things are making people fat — what we eat, how we eat and a lack of exercise. Now a report tries to tease out the precise effect of technology such as the TVs and computer screens that keep us sitting still instead of moving around.

It comes up with a surprisingly consistent statistic: For every 10 percent rise in what a country spends on information and communications technology, there’s a 1 percent increase in obesity rates.

Technology doesn’t just keep people in their chairs and on sofas, according to the report from the nonprofit Milken Institute. It changes the way people eat, also – adding even more pounds than the lack of exercise alone would.
Kids and Adolescents see the world from a perspective of instant access and availability.

Little ability to see the need for process and delay of gratification.

Generation-D sees the connection between work/effort and outcome differently.
Myths of Multitasking-1

1. Multitasking can reduce productivity by approximately 40-percent according to some researchers.

2. Switching from one task to another makes it difficult to tune out distractions and can cause mental blocks that can slow down your progress.

3. It multiplies amount of time that it takes to accomplish any one task.

4. Gen-D kids have false perception of being able to do multiple things at once, but studies have shown that actual comprehension of tasks is reduced by the number of open processing tasks engaged in.
The Perils of Multitasking

Even When People are Relaxing, the Urge to Multitask Takes Over

While the average American watches TV

42% Browse the Internet

29% Talk on their phones

26% Text or IM

People who multitask feel like they’re accomplishing more, but they’re actually cutting down their own productivity.

You May Feel Like You Are Accomplishing More, But Really... try to focus on more than one thing causes 40% drop in productivity

Even though 45% of US workers already believe they have to work on too many things at once.

89% of people with smartphones use them at work.

98% of people can multitask effectively, show studies.

Technology is Encouraging More and More Fruitless Multitasking

Even though 45% of US workers already believe they have to work on too many things at once.

67% will do work at the movies.

45% will do work while eating.

33% will do work while driving.

Students Multitask While They Learn

62% of web pages student open on their laptop during class are unrelated to the subject.

65 new screen windows per lecture.

On an average, they generate 10.5 minutes.

On an average, employees who use a computer for work are distracted once every 10.5 minutes.

2 hours a day is what an average office worker spends on interruptions or distractions.

546 hrs is the annual loss in productivity.

Lower IQ

Studies show that while working, using cell phones, texting, sending emails, or talking on cell phones lowers a person’s IQ by 20 points.

The equivalent of missing a night of sleep.

And have the effect of smoking marijuana.

If You Are Trying to Study

Students who do homework while listening to music or talking are more likely to report academic impairment.

If You Are Trying to Multitask in the Car

Using cell phone, hand-held or hands-free, delays a driver’s reaction.

As much as having a blood alcohol content of 0.08%
Social websites harm children's brains: Chilling warning to parents from top neuroscientist

- Social websites harm children's brains: Chilling warning to parents from top neuroscientist
- Social networking websites are causing alarming changes in the brains of young users, an eminent scientist has warned.
- Sites such as Facebook, Twitter and Bebo are said to shorten attention spans, encourage instant gratification and make young people more self-centered.
Three reasons why kids and teens love the Net...

• Its fun
• Its cheap
• Its sort-of social
Today's’ digital technology

• From malt shops to malls---hanging out in cyberspace.
• Texting = a new language of a generation-(gen-D first generation on earth raised form birth with the Internet)
• A way to individuate and separate from previous generations.
• What do the Internet, facebook, texting, and email, all have in common with gambling???
• Virtual slot machines and variable ratio reinforcement .

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Kids and Digital Tech

- 58% of children aged 2-5 know how to play a 'basic' computer game.
- More small children can open a web browser (25%) than swim unaided (20%).
- Twice as many kids aged 2-5 can play with a smartphone application as tie their shoelaces.
- Two thirds of young children can operate a computer mouse.
- More two to three-year-olds can play a computer game than ride a bike.

For more information go to: http://bit.ly/AVDigitalSkills

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Why is the Internet addictive and easily over-used / abused?

• Any behavior that is pleasurable can be abused or used compulsively.

• All pleasurable behaviors change our mood and brain chemistry. The Internet probably does this as well.

• All forms of communication and digital technology speak to our desire to be connected to our world. The Internet *appears* to do this quite efficiently.

• The Internet (www) affords easy access to stimulating and previously unavailable content, and lowers use/abuse thresholds for stimulating content.
The Web is the World’s Hard Drive

• Everything we send via the Internet is traceable and reproducible....
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Digital Media Attractiveness = Internet/Technology Addiction potential

1. Content Factors (Stimulation potential of Available content)

2. Process—Access/Availability Factors (ease of access/instant gratification, anonymity, disinhibition, dissociation, affordability, lack of boundaries found on-line)

3. Reinforcement/Reward Factors (VRSS)

4. Social Factors (Socio-Technical accessories)

5. Gen-D Factors (first generation raised on digital media technology)
Warning signs of Child/Adolescent Digital Technology Use/Abuse

• (−) change in school/work behavior
• (−) change in social/familial involvement (e.g., Isolation and withdrawal—remember all digital/gaming technologies have the potential to isolate users.
• (+) change in time spent online, phone, computer, game device or console game.

Note: There are socially-adaptive, and normative aspects to gaming, texting, tweeting, messaging and social networking sites.
The Internet=World Biggest Slot Machine

- Operant Conditioning and Dopamine-reward system
- Variable Ratio Reinforcement Schedule
- Texting
- Email
- Face book
- General Surfing (intolerance of boredom and real-time social interaction, or doing “nothing”
- Instant Broadcast capacity
Cycles of Addiction

Negative stimuli (pain)

Self-medication of Pain—adaptive use of addictive behavior. (elevation of Dopamine)

Shame and Guilt

Around and around we go....

More pain from negative consequences
Lost in Cyberspace...

The media’s Idea of an Internet Addict!

Surf’s Up

Dr. David Greenfield says millions of Americans are hooked on the Internet, and for some of them, it’s an addiction.
Many factors contribute to the power of the Net.

- **Accessibility:** The Internet never closes and is always available.
- **Intensity:** The power of connecting to the world is intoxicating
- **Stimulation:** There is endless availability of stimulating and potent content.
- **Time Distortion:** (Dissociation) Most of us lose track of time and space when we are online and cannot judge our own use.
- **Means of Connection:** We all want to connect to ourselves, the world, other people, and spiritually.
Anonymity/Fantasy Play: people believe they can be anyone they want online and that no one knows who they really are!

Disinhibition: We say and do things less cautiously online and we do things we might not ordinarily do.

Accelerated Intimacy: We tend to express ourselves more openly and rapidly when we are online.

Ease of Access: When things are easy we tend to use them more freely.

Cost: The Internet provides cheap and powerful entertainment.

Socially acceptable: The Internet in all its forms is part of popular culture.
The Story without an End: Information is available with no boundaries there is always another link, email, or website so we keep looking until we find something more or better?

Instant Gratification: The quicker we get reinforced or rewarded the more addictive it becomes...shorter latency=more addictive

Sex: Human sexuality is forever changed. We are able to access sexual content never before available with relative ease and convenience.

Interactivity: We control the whole process which is very compelling

The Hypnotic Trance: the images, sound, colors and movement all create a dissociated state.

Variable Ratio Reinforcement Schedule