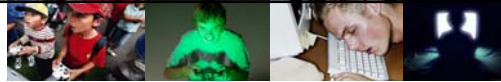


# VIDEO GAME ADDICTION - AN OVERVIEW

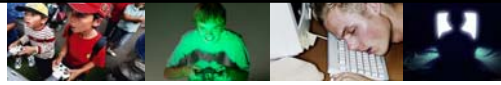
Hamar, May 29, 2013

Ståle Pallesen  
Professor, PhD  
University of Bergen, Norway



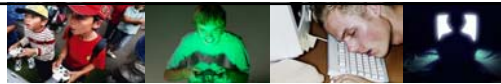
## OUTLINE

- Does video game addiction really exist?
- How is video game addiction assessed?
- What is the prevalence of video game addiction?
- How is video game addiction related to health and other outcomes?
- How can video game addiction be treated?

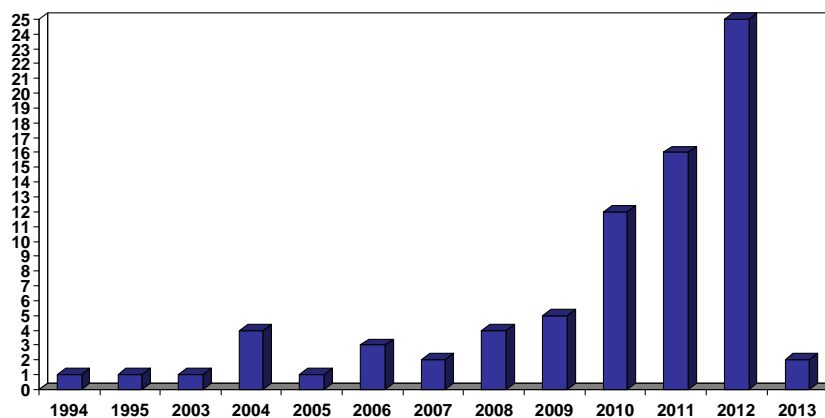


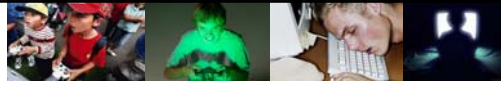
- First scientific paper was published in 1982 (Ross et al).
- Several papers has been published recently
- Search with the term "game addiction" May 24, 2013:
  - 3180 hits on Google Scholar
  - 40 hits on PubMed
  - 81 hits on Web of Knowledge
  - 98 treff on "PsycINFO

Ross et al. JAMA 1982; 248:1117



## WEB OF KNOWLEDGE 81 HITS

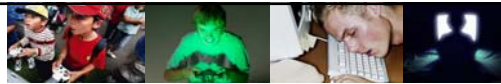




## ARGUMENTS AGAINST THE EXISTENCE OF VIDEO GAME ADDICTON

- No official diagnosis
- Fail to distinguish between addiction/dependency and high engagement/involvement (cognitive salience, tolerance and euphoira).
- Instruments adapted from instruments assessing pathological gambling by exchanging "gambling" with "video games".
  - However, "chasing the losses" does not occur in video game addiction
  - The same kind of tolerance seen in pathological gambling is not seen in video game addiction (play for more and more money in order to obtain the same level of excitement)
  - Video game addicts do not accumulate debts
- Several instruments do not adhere to the basic criteria for addiction (e.g., salience, loss of control, tolerance, withdrawal symptoms, negative consequences)

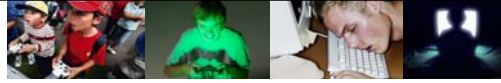
Starcevic. Australian & Zew Zealand Journal of Psychiatry 2012;47:16-19  
Wood. International Journal of Mental Health and Addiction 2008; 6:169-178



## ARGUMENTS AGAINST THE EXISTENCE OF VIDEO GAME ADDICTON 2

- Spending much time on an activity is not a criterion in itself (e.g., some spend a lot of time watching TV)
- Overestimated prevalence figures in many studies
- The part who defines the problem is often not the gamer him/herself and is based on an individual's value judgment and not any objective criteria
- Not being able to control use of something cannot is not equal with an addiction ("many would like to use the car far less than they do).
- Excessive game playing may be just a symptom of a underlying problem (e.g., being bullied at school, boredom, loneliness, escaping problems)
- If video games really had addiction potential far more people should have problems related to the number of people who play games
- No aspects of the games themselves are addictive
- Video game addiction is based on a "media hype"

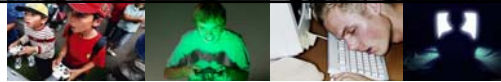
Wood. International Journal of Mental Health and Addiction 2008; 6:169-178  
Błaszczynski. International Journal of Mental Health and Addiction 2008; 6:179-181



## ARGUMENTS FOR THE EXISTENCE OF VIDEO GAME ADDICTION

- For some video games do not reflect "healthy excessive enthusiasm" but an addiction. The former "adds to life" whereas the latter "take away from it".
- Excessive video game playing is associated with poor health (epilepsy, auditory hallucinations, enuresis, encopresis, pain in wrists and neck, headache, overweight, etc.)
- Not all judgments of video game playing are just based on subjective values (e.g., playing instead of job or studying, sleep, family interactions etc.)
- Even if one don't lose money there might be a problem (e.g., some pathological gamblers may actually make money on their activity)
- Even though excessive video game addiction is triggered by underlying factors this does not mean that the phenomenon does not exist (same argument could be used in relation to alcoholism and drug addiction)

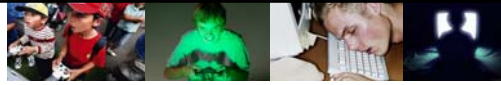
Griffiths. International Journal of Mental Health and Addiction 2008: 6:182-185  
Turner. International Journal of Mental Health and Addiction 2008: 6:186-190



## ARGUMENTS FOR THE EXISTENCE OF VIDEO GAME ADDICTION 2

- Even though few of those who play video games become addicted doesn't mean that video games cannot cause addiction (e.g., only a minority of those participating in gambling or drinking alcohol becomes pathological gamblers or alcoholics).
- Similar to other addictions video game addiction is related to both positive reinforcement (win, beat other players, master challenges) and negative reinforcement (escape unpleasant feelings, situations).
- Even if a behavior (e.g., video game playing) starts as a coping strategy or as a pure entertainment, it can become an addiction if one loses control over the behavior.

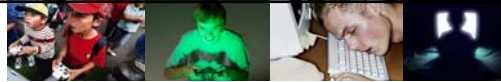
Griffiths. International Journal of Mental Health and Addiction 2008: 6:182-185  
Turner. International Journal of Mental Health and Addiction 2008: 6:186-190



## ARGUMENTS FOR THE EXISTENCE OF VIDEO GAME ADDICTION 3

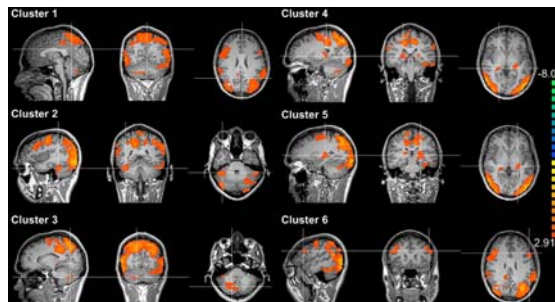
- There are structural aspects inherent in the video games that might contribute to addictive behavior
  - **Social features** (communication, group/team membership, social competition, friendship and support (technical/social))
  - **Manipulation and control features** (interaction with game, save and correct mistakes, manage resources, loading periods, )
  - **Narrative and identity features** (create character, story telling, different genre with appeal to different players).
  - **Reward and punishment**
    - Reward: points, resources, leveling-up, upgrades, finding hidden treasures, unlock bonus games. Meta-reward (overall achievements - also across games). High event frequency. Variable event duration. Immediate reward when winning.
    - Negative reinforcement (increasing health and avoid dying, near miss). Tutorial feedback,
    - Punishment: failure scenarios, restart level, losing resources/points)
  - Presentation features (Graphic/sound, music, inclusion of well-known characters and stimuli, in-game advertising)

King et al. International Journal of Mental Health and Addiction 2010: 8:90-106

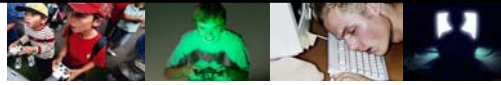


## VIDEO GAMES AND BRAIN REWARD PATHWAYS

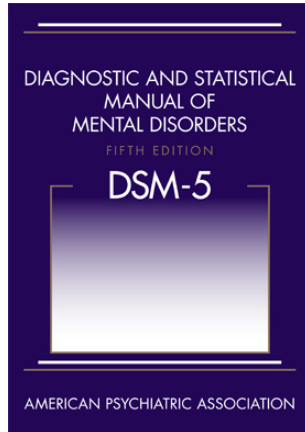
- Increased activity in brain regions such as DLPFC, OFC, thalamus/striatum, amygdala and hippocampus has been observed when presenting cues related to different drugs, food and gambling.
- 21 students participated. The played a new first person shooter game 60 min per day for 10 days.
- During fMRI they were presented to 30 segments of a white cross on black background (B), animated war scenes (N) and a video game cue (C)



Han et al. Comprehensive Psychiatry 2011: 52:88-95

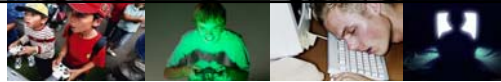


## DSM-5



- Some hoped and some hoped not that "Video Game Addiction" would be a new disorder in DSM-5
- For long it seemed that "**Internet Use Disorder**" would be suggested as a condition recommended for further study.
- In the final version "**Internet Gaming Disorder**" suggested as a condition warranting more clinical research and experience

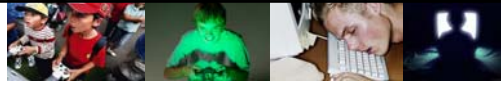
American Psychiatric Association. DSM-5, Washington, DC: American Psychiatric Association, 2013



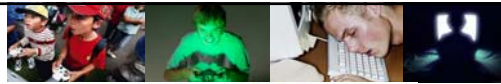
## INTERNET GAMING DISORDER

- Patients must meet at least **5** of the **9** following criteria within the past year:
  - 1) Preoccupation with games
  - 2) Psychological withdrawal symptoms (e.g., anxiety, irritability)
  - 3) Tolerance (need to spend an increasing amount of time playing)
  - 4) Unsuccessful attempts to control or limit game participation
  - 5) Loss of interest in previous hobbies
  - 6) Continued use despite knowledge of problems
  - 7) Deceiving family members and/or therapists
  - 8) Use of Internet games to escape negative mood
  - 9) Has jeopardized or lost a relationship, job, or educational opportunity

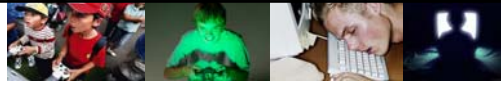
American Psychiatric Association. DSM-5, Washington, DC: American Psychiatric Association, 2013



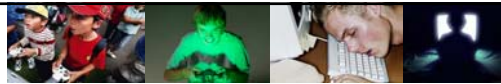
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Author	Name of scale	Basis	N of items	Response format	Diagnosis
Brown & Robertson, 1993	–	AA and GA Twenty Questions		Yes/No	–
Griffiths, 1991	DSM-III-Checklist for Amusement Machine Play	DSM-III-R	9	Yes/No	Yes to 4 or more questions
Fisher, 1994	DSM-IV-Juvenile-Arcade Video Game Scale	DSM-IV criteria for gambling	9	Yes/No	Yes to 4 or more questions
Salguero et al. 2002	Problem Video Game Playing	DSM-IV criteria for substance abuse and gambling	9	Yes/No	No cut-off
Rau et al. 2006	Online Game Addiction Test	Young's Diagnostic Questionnaire for Internet Addiction	8	Yes/No	No cut-off
Charlton & Danforth, 2007	Addiction-Engagement Questionnaire	Charlton (2002) General Computing Questionnaire	29	1-7	No cut-off
Lemmens et al. 2009	Game Addiction Scale for Adolescents	Griffiths (2005) criteria for addiction	21 and 7	1-5	Monothetic 3 or more on all 7 items Polythetic – 3 or more on at least 4 items
Wenzel et al. 2009	Time spent gaming per day		1	Time	≥ 4 h play per day
Porter et al. 2010	Video Game Use Questionnaire	DSM-IV criteria for substance dep and gambling, research, testimonies	10 + 23	Yes/no	Preoccupation (2 of 3) Interference (3 of 7)
Van Rooij et al. 2010	Video Game Addiction Test	Compulsive Internet Use Scale (Meerkerk et al. 2009)	14	0-4	No cut-off
King et al., 2011	Problem Video Game Playing Test	Internet Addiction Test (Young, 1998)	20	1-5	No cut-off
Topor et al. 2011	Problematic Video Game Use Scale	Fisher (1994) and DSM-IV criteria for gambling	11	1-5	No cut-off



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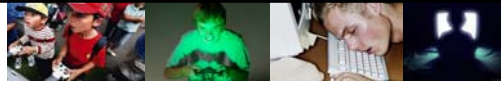


### 3 NORWEGIAN STUDIES

- **Wenzel et al., 2009:**
  - 3405 respondents based on a national representative sample 16-74 years,
  - Excessive players” were defined as playing  $\geq 4$  h per day
- **Mentzoni et al., 2011:**
  - 816 respondents based on a national representative sample, 16-40 years
  - Problem video game use was defined as scoring 3 or more on at least 4 of 7 items on the GASA.
- **Brunborg et al., 2013:**
  - 1320 respondents based on a national representative sample of 8th graders. GASA was administered.
    - Addicted gamers=endorsing all core addiction criteria (relapse, withdrawal, conflict and problems)
    - Problem gamers=endorsing 2 or three of the core addiction criteria
    - Engaged gamers=endorsing all the engagement items (salience tolerance and mood modification) but none of the core addiction criteria

Brunborg et al. Media Psychology 2013; 16:115-128  
Mentzoni et al. Cyberpsychology, Behavior, and Social Networking 2011;14:591-596  
Wenzel et al. Psychological Reports 2009;105:1237-1247





PROPORTION (%) OF EVER-PLAYERS PLAYING COMPUTER GAMES >4 HR. DAILY

	<i>n</i>	Prevalence	95%CI	Unadjusted Odds Ratio	95%CI	Adjusted Odds Ratio	95%CI
All respondents	2,191	2.1	1.6-2.8				
Sex							
Female	1,025	1.0	0.5-1.8	1		1	
Male	1,165	3.2	2.3-4.3	3.3	1.6-6.7	3.1	1.5-6.4
Age (years)							
16-29	741	4.4	3.1-6.1	1			
30-39	567	1.0	0.4-2.1	0.2	0.1-0.5		
40-59	742	0.7	0.3-1.6	0.2	0.1-0.4		
60-74	142	3.0	1.2-7.2	0.7	0.2-1.9		
Gaming preference							
Off-line	1,842	1.1	0.7-1.7	1		1	
Online	349	7.5	5.2-10.7	7.0	3.9-12.6	5.8	3.1-10.6
Domicile							
City	1,158	1.5	0.9-2.4				
Small town	572	2.5	1.5-4.2				
Countryside	427	2.4	1.3-4.4				
Marital status							
Married/cohabitating	1,395	1.0	0.6-1.6	1		1	
Single	791	4.2	3.0-5.9	4.5	2.4-8.6	3.0	1.5-5.9
Education							
Low	291	2.2	1.1-4.6	4.3	1.4-13.8	4.6	1.5-14.6
Medium	895	4.0	2.9-5.5	7.9	3.1-20.0	2.6	1.3-5.1
High	998	0.5	0.2-1.2	1		1	
Subjective financial situation							
Good	1,372	1.5	1.0-2.3	1			
Average	631	2.3	1.4-3.8	1.5	0.8-3.0		
Unsatisfactory	179	6.0	3.3-10.4	4.1	1.9-8.6		
Subjective health							
Good	1,728	1.5	1.1-2.2	1		1	
Average	383	4.3	2.7-6.8	2.9	1.5-5.3	2.4	0.7-8.0
Unsatisfactory	77	5.5	2.2-13.0	3.7	1.3-10.6	4.4	1.7-11.5

Wenzel et al. Psychological Reports 2009;105:1237-1247

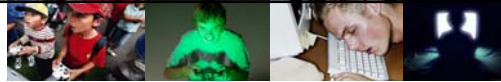
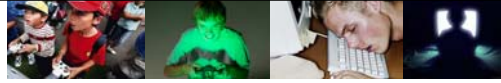


TABLE 4. PREVALENCE OF PROBLEM VIDEO GAME USE BY GENDER AND AGE GROUP

<i>Category</i>	<i>Problem VGU %</i>
Male	
16-21	15.4
22-27	9.7
28-33	1.1
34-40	2.8
Female	
16-21	2.5
22-27	1.1
28-33	0
34-40	1.6

VGU, video game use.

Mentzoni et al. Cyberpsychology, Behavior, and Social Networking 2011;14:591-596



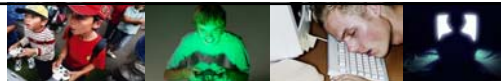
- Results Brunborg et al. (2013):
  - Video game addiction 4.2% (6.5% boys, 2.2% girls)
  - Problem gamers 12.9% (18.0% boys, 8.1% girls)
  - Engaged gamers 4.9% (8.5% boys 1.6% girls)

**TABLE 1** Prevalence (%) of Subjective Psychological Complaints Among Gaming Addicts, Problem Gamers and Highly Engaged Gamers ( $N = 1320$ )

	Addicted ( $n = 56$ )	Problem gamers ( $n = 170$ )	Highly engaged ( $n = 65$ )	Contrast group ( $n = 1029$ )
Dependent variables				
Feeling low	20.0 (9.1–30.9) <sup>af</sup>	18.0 (11.5–24.5) <sup>af</sup>	10.8 (2.9–18.6) <sup>af</sup>	12.5 (10.4–14.6) <sup>af</sup>
Irritability or bad mood	47.3 (31.6–63.0)	26.3 (18.6–34.1) <sup>f</sup>	23.1 (12.2–34.0) <sup>ab</sup>	16.8 (14.6–19.1) <sup>b</sup>
Nervous	38.2 (24.4–50.9)	17.3 (10.5–24.0) <sup>f</sup>	10.8 (3.0–18.5) <sup>ab</sup>	10.8 (9.0–12.7) <sup>b</sup>
Trouble sleeping	29.1 (17.0–41.2) <sup>f</sup>	32.1 (24.9–39.4) <sup>f</sup>	13.8 (5.0–22.7) <sup>b</sup>	17.6 (15.0–20.2) <sup>b</sup>
Tired and exhausted	47.3 (33.7–60.8) <sup>f</sup>	34.3 (25.8–42.9) <sup>ab</sup>	24.6 (13.8–35.4) <sup>bc</sup>	19.9 (16.9–22.8) <sup>f</sup>
Afraid	16.4 (6.8–26.0) <sup>f</sup>	10.1 (5.9–14.4) <sup>ab</sup>	1.5 (–0.2–4.7) <sup>bc</sup>	3.1 (2.0–4.3) <sup>f</sup>
Control variables				
Gender (female)	26.8 (17.1–36.4) <sup>f</sup>	32.9 (25.9–39.9) <sup>f</sup>	16.9 (7.2–26.7) <sup>f</sup>	58.9 (55.9–61.9)
Physical exercise ( $M, SD$ )	2.62 (18.86–3.37) <sup>f</sup>	2.93 (2.62–3.24) <sup>f</sup>	3.30 (2.59–4.00) <sup>ab</sup>	3.61 (3.43–3.78) <sup>b</sup>

Note. The contrast group comprises non-addicted/non-problem/non-highly engaged adolescents. With 95% confidence intervals in parentheses. Groups differ at  $p < .05$  by chi-square (or  $t$  test) if they do not share a letter in their superscripts.

Brunborg et al. Media Psychology 2013; 16:115-128



## META-ANALYSIS PREVALENCE

- Included 30 articles and 3 PhD-theses published in the period 2001-2011
- Investigated prevalence and factors that co-varied with video game addiction
- Investigated psychosocial correlates to video game addiction

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A meta-analysis of pathological gaming prevalence and comorbidity with mental health, academic and social problems

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**ABSTRACT**

Background: Mental health professionals, policy makers and the general public continue to debate the issue of pathological video gaming. In some instances the condition is diagnosed, whereas in other cases it is merely a general term. The current meta-analysis examines existing literature to estimate the global prevalence of pathological gaming, the most common method of diagnosis, and its association with other mental health problems.

**Method:** Thirty three published studies and doctoral dissertations were analyzed in meta-analysis. Prevalence rates and comorbidity with other mental health problems were estimated according to measurement method.

**Results:** Prevalence estimates and comorbidity with other problems varied widely between studies. Measurement which attempted to replicate "pathological gaming" operations produced higher prevalence estimates and lower comorbidity estimates than methods which focused on the underlying habit of pathological gaming. The most precise prevalence estimate is based on prevalence rates of 12.1% (95% CI: 10.5–13.7%).

**Conclusions:** Diagnostic analyses with pathological gaming may produce notably high prevalence estimates, especially when diagnostic criteria are not clearly defined. The current meta-analysis suggests that the underlying habit of pathological gaming is associated with other mental health and organizational problems, but that the prevalence of pathological gaming is not necessarily as high as some studies suggest.

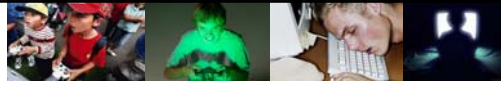
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**1. Introduction**

Given the increasing sales of video games and the popularity of this new medium particularly among youth and young adults, public interest, scholars and the general public have expressed concern that some players may progress into pathological gaming. The term "pathological gaming" has been used to describe a condition of excessive and compulsive gaming that interferes with other aspects of life (Griffiths, 2005; Griffiths, 2006; Wood, 2008). Although most scholars acknowledge the potential for some video game players to engage in pathological use (Shan, 2008; Deaux et al., 2010; Griffiths, 2008; Van Boven et al., 2010), some have expressed concern that video games are currently on a path of "total game" conquest to all new media, and the potential for reorganization of a real life environment problem should be carefully guarded against (Kerwin and Coulton, 2010; Ferguson, 2010; Green, 2010). Perhaps with these concerns in mind, the American Psychiatric Association has filed the issue to consider the addition of pathological gaming to its list of diagnostic manuals in the forthcoming DSM-5 (American Psychiatric Association, 2010). Such discussions have focused on current definitions, although some argue for a percentage of gaming activity on the screen, the adoption of an internet addiction diagnostic criteria eventually and a procedure for video game category. Given the increasing prevalence of video gaming, particularly among young generations, the potential relevance of a "video game addiction" category, particularly among older professionals, who may be addicted to video gaming, warrants this caution. The current meta-analysis examines the prevalence of pathological gaming in the general population, and the prevalence of pathological gaming in video game players.

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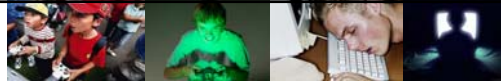
Ferguson et al. Journal of Psychiatric Research 2011;45:1573-1578



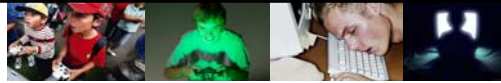
**Table 2**  
Meta-analytic results for prevalence of problematic gaming behavior.

Effect sizes	k	Prev <sub>+</sub>	95% C.I.
All observations	17	.060	(.041, .089)
Measurement Approach <sup>a</sup>			
P. Gambling	9	.089	(.062, .127)
Interference	7	.031	(.017, .057)
Sampling Approach			
On-Line	7	.096	(.072, .126)
Off-Line	10	.044	(.026, .074)
Age			
Adult	8	.089	(.064, .121)
Child	9	.042	(.024, .072)

Ferguson et al. Journal of Psychiatric Research 2011;45:1573-1578

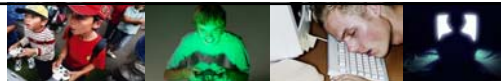


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- How can video game addiction be treated?



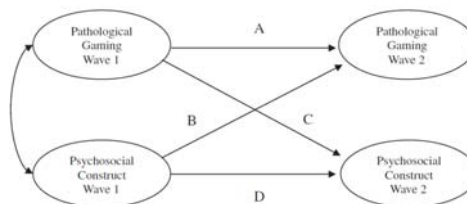
Effect sizes	k	r <sub>+</sub>	r <sub>u</sub>	95% C.I.
<b>Overall by Outcome Type</b>				
Mental Health	18	.19	.19	(.13, .24)
Social	8	.25	.32	(.04, .44)
Academic	10	.12	.15	(.02, .21)
<b>Problematic Gambling Approach by Outcome Type</b>				
Mental Health	5	.17	.17	(.11, .24)
Social <sup>a</sup>	N/A	N/A	N/A	N/A
Academic	4	.08	.17	(-.13, .30)
<b>Interference Approach by Outcome Type</b>				
Mental Health	7	.26	.26	(.16, .36)
Social	5	.31	.31	(.00, .56)
Academic	3	.02	.17	(-.13, .17)
<b>Exposure Amount Only Approach by Outcome Type</b>				
Mental Health	6	.09	.09	(.00, .17)
Social <sup>a</sup>	N/A	N/A	N/A	N/A
Academic	2	.08	.08	(-.02, .17)
<b>Child Only by Outcome Type</b>				
Mental Health	14	.18	.18	(.11, .25)
Social	4	.26	.26	(-.10, .55)
Academic	9	.12	.12	(.03, .21)
<b>Adult Only by Outcome Type</b>				
Mental Health	4	.15	.19	(.08, .22)
Social	4	.15	.40	(-.14, .41)
Academic	N/A	N/A	N/A	N/A
<b>Asia Only by Outcome Type</b>				
Mental Health	7	.21	.21	(.11, .31)
Social	4	.23	.23	(.06, .29)
Academic	4	.09	.09	(.02, .17)
<b>West Only by Outcome Type</b>				
Mental Health	10	.18	.18	(.09, .26)
Social	N/A	N/A	N/A	N/A
Academic	5	.03	.14	(-.17, .23)

Ferguson et al. Journal of Psychiatric Research 2011;45:1573-1578



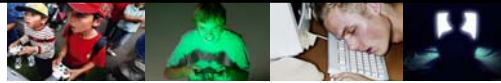
## LONGITUDINAL STUDY 1

- Study from the Netherlands with 2 time points spaced with 6 months.
- Sample of 543 respondents 11-17 years, playing games at both time points
- At both times video game addiction, life satisfaction, loneliness, social competence and self-esteem were assessed.



	Path A	Path B	Path C	Path D
Loneliness	.66 <sup>c</sup>	.12 <sup>b</sup>	.12 <sup>b</sup>	.50 <sup>c</sup>
Life satisfaction	.68 <sup>c</sup>	-.07	-.03	.53 <sup>c</sup>
Social competence	.72 <sup>c</sup>	-.15 <sup>c</sup>	.04	.91 <sup>c</sup>
Self-esteem	.67 <sup>c</sup>	-.09 <sup>a</sup>	.05	.71 <sup>c</sup>

Lemmens et al. Computers in Human Behavior 2011; 27:144-152



## LONGITUDINAL STUDY 2

- Study from Singapore with 3 waves, each separated by 1 year.
- Sample comprised 3034 youths who played video games at all waves. They were recruited from primary and comprehensive school.
- Time spent playing, impulsivity, social competence, depression, social phobia, anxiety, school performance and video game addiction were assessed.

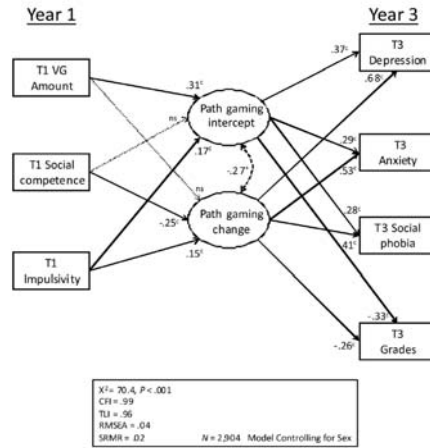
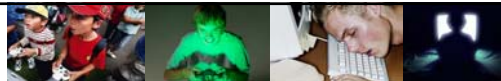


FIGURE 2 Longitudinal growth curve model, testing risk factors and outcomes of pathological gaming. VG indicates video gaming; T1, time 1; T3, time 3; ns, not significant; CFI, comparative fit index; TLI, Tucker-Lewis index; RMSEA, root mean square error of approximation; SRMR, standardized root mean square residual. + indicates  $P < .10$ ; a,  $P < .05$ ; b,  $P < .01$ ; c,  $P < .001$ .

Gentile et al. Pediatrics 2011; 127:e319-ee329



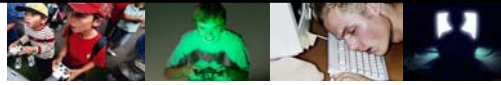
## LONGITUDINAL STUDY 3

- Study from UK with 2 waves, 2 years apart.
- Sample comprised 11014 children 5 years old at wave 1.
- Mothers completed questionnaire about time spent gaming as well as the Strength and Difficulties Questionnaire

Table 5 Associations between typical daily screen exposure time at 5 years and change in psychosocial adjustment from 5 years to 7 years, with further adjustments for maternal and family characteristics, child characteristics and family functioning

	Conduct problems		Hyperactivity/inattention		Emotional symptoms		Peer relationship problems		Prosocial behaviour	
	Coeff. (95% CI)	p	Coeff. (95% CI)	p	Coeff. (95% CI)	p	Coeff. (95% CI)	p	Coeff. (95% CI)	p
<b>Model A) TV/Video/DVDs only</b>										
TV/Video/DVDs										
None	0.10 (-0.09 to 0.28)	0.303	-0.21 (-0.59 to 0.17)	0.274	-0.04 (-0.28 to 0.20)	0.751	-0.07 (-0.26 to 0.11)	0.430	0.05 (-0.18 to 0.28)	0.671
<1 h	Reference group		Reference group		Reference group		Reference group		Reference group	
1 to <3 h	0.07 (0.00 to 0.14)	0.051	0.00 (-0.11 to 0.11)	0.979	0.02 (-0.07 to 0.10)	0.690	0.01 (-0.06 to 0.07)	0.869	0.06 (-0.02 to 0.14)	0.118
3+ h	<b>0.15 (0.05 to 0.25)</b>	<b>0.003</b>	0.05 (-0.09 to 0.19)	0.465	0.03 (-0.10 to 0.15)	0.683	0.09 (-0.01 to 0.18)	0.086	-0.04 (-0.14 to 0.06)	0.442
<b>Model B) Electronic games only</b>										
Electronic games										
None	0.06 (-0.01 to 0.13)	0.070	0.04 (-0.06 to 0.14)	0.475	0.07 (-0.01 to 0.15)	0.094	-0.04 (-0.11 to 0.02)	0.193	-0.05 (-0.12 to 0.03)	0.206
<1 h	Reference group		Reference group		Reference group		Reference group		Reference group	
1 to <3 h	0.07 (-0.02 to 0.17)	0.130	-0.05 (-0.16 to 0.06)	0.396	0.03 (-0.06 to 0.12)	0.467	-0.06 (-0.13 to 0.02)	0.133	0.00 (-0.08 to 0.08)	0.989
3+ h	0.19 (-0.02 to 0.40)	0.075	0.16 (-0.14 to 0.46)	0.300	0.26 (-0.05 to 0.57)	0.106	0.15 (-0.07 to 0.37)	0.194	-0.12 (-0.36 to 0.12)	0.338

Parkes et al. Archives of Disease in Childhood 2013; 98:341-348.



## LONGITUDINAL STUDY 4

- Study from the Netherlands with 2 waves, separated by 6 months.
- Sample comprised 288 subjects, age 12-22 years.
- Model testing the Theory of Planned Behavior – relevant questions were administered.

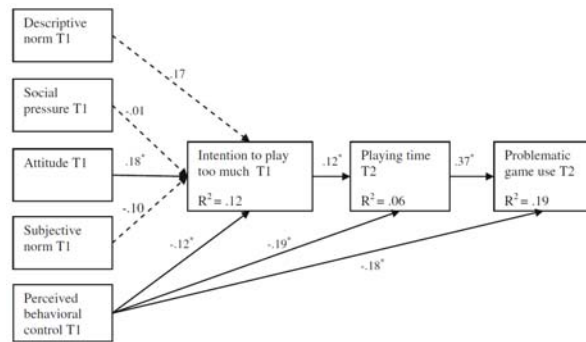
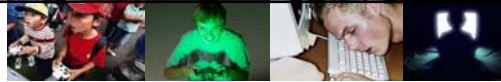
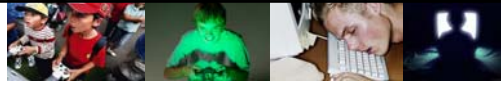


Fig. 3 Results of the structural equation modeling including psychosocial variables at Time 1, and playing time and PGU at Time 2. Note. \*  $p < .05$

Haagsma et al. International Journal of Mental Health and Addiction 2013; 11:172-185



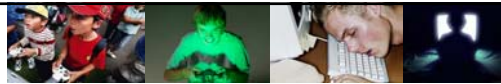
- Does video game addiction really exist?
- How is video game addiction assessed?
- What is the prevalence of video game addiction?
- How is video game addiction related to health and other outcomes?
- How can video game addiction be treated?



## RECOMMENDATIONS

- Learn problem solving skills
- Parents need to cooperate in terms of limit setting
- Family therapy (emphasize therapeutic alliance, patterns of family interactions maintain the problem, restructuring)
- Motivational interviewing
- Cognitive-behavioral therapy (monitoring use, goal setting, dealing with problem cognitions)
- Parents should be involved in game playing (but not play violent games together with the child)

Young. The American Journal of Family Therapy 2009;37:355-372  
 Griffiths & Meredith. Journal of Contemporary Psychotherapy 2009;39:247-253  
 Gentile. Psychological Science 2009;20:594-602  
 King et al. Journal of CyberTherapy & Rehabilitation 2010; 3: 261-273.



## UNCONTROLLED TREATMENT STUDY WITH METHYLPHENIDATE

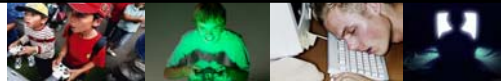
- 62 children (8-12 years) with ADHD, and extensive video game playing received 18-54 mg Methylphenidate for 8 weeks.
- Outcome measures were among others Young's Internet Addiction Scale and time on internet.

Table 1  
 Internet video game use and ADHD symptoms at baseline and 8 weeks later

	Baseline	8 wk later	Paired <i>t</i> test ( <i>t/P</i> )
Age		9.3 ± 2.2	
Sex (man/woman)		52/10	
Dose (mg/d)		30.5 ± 13.3	
K-WAIS		103.4 ± 16.1	
YIAS-K	54.0 ± 23.2	41.2 ± 14.8	3.67, <.01
Internet use (h/d)	2.2 ± 1.2	1.5 ± 0.8	3.9, <.01
K-ARS-PT			
Inattention	21.5 ± 6.4	16.5 ± 7.1	4.12, <.01
Hyperactive	21.5 ± 6.8	16.2 ± 8.4	3.90, <.01
Total	43.0 ± 13.0	32.6 ± 14.5	4.20, <.01
VCPT			
Correct response	92.5 ± 22.7	101.8 ± 23.4	-2.24, .03
Omission error	30.3 ± 19.1	19.5 ± 12.2	3.73, <.01
Commission error	35.9 ± 13.3	27.1 ± 12.6	3.80, <.01

Han et al. Comprehensive Psychiatry 2009; 50:251-256





## UNCONTROLLED TREATMENT STUDY

- 11 subjects suffering from internet video game addiction received Bupropion for 6 weeks.
- Outcome measures were fMRI responses to game cues, Beck Depression Inventory, self-report of craving and Young's Internet Addiction Scale
- Treatment effects: Decrease of 23% in craving ( $p=.04$ ), 15% reduction of YIAS ( $p=.01$ ) and 35% reduction in playing time. No change on BDI ( $p=.50$ )

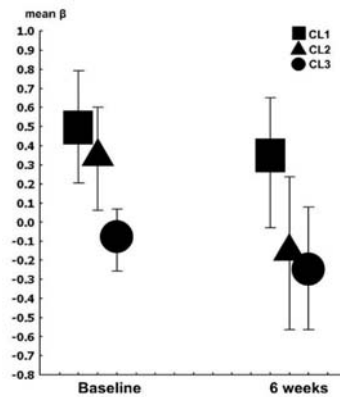
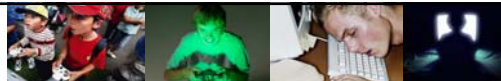


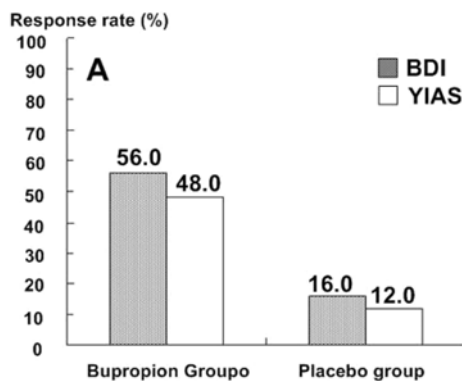
Figure 2. The changes of mean  $\beta$  values during 6 weeks of Wellbutrin SR treatment period. Mean  $\pm$  95% CI. CL1: Talairach  $x, y, z$ : -1, -79, 38, left occipital lobe cuneus, Brodmann area 19,  $z = 0.98, p = .33$ ; CL2: -22, 41, 24, left superior frontal gyrus, Brodmann area 10,  $z = 2.1, p = .04$ ; CL3: -44, -29, -9, left parahippocampal gyrus, Brodmann area 36,  $z = 0.98, p = .33$ .

Han et al. Experimental and Clinical Psychopharmacology 2010;18:297-304



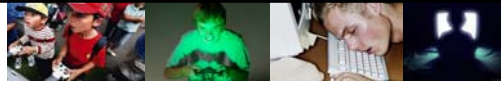
## RCT BUPROPION (ZYBAN)

- 57 men suffering from depression and excessive online video game playing randomized either to:
  - Bupropion and education about internet use ( $n=29$ , age= 21.2)
  - Placebo and education about internet use ( $n=28$ ; age=19.1)
- Outcome measures (8 weeks)
  - Beck Depression Inventory (BDI)
  - Young Internet Addiction Scale (YIAS)



Han et al. Journal of Psychopharmacology 2012;26:689-696



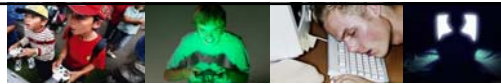


## CBT/MEDICATION RCT

- 65 teenagers suffering from depression and excessive online video game playing randomized to either:
  - CBT (8t) and Bupropion (n=32, age: 16.2)
  - Bupropion (n=33; age 15.9)
- Outcome measures (8 + 12 weeks)
  - Online game-Time /week
  - Beck Depression Inventory (BDI)
  - Young Internet Addiction Scale (YIAS)

	CBT-Med (n = 32)	Med (n = 33)	Statistics
<i>On-line game-T</i>			
Baseline	59.9 ± 14.8	60.0 ± 11.2	<i>t</i> = 0.01, <i>p</i> = 0.99
8 weeks	17.7 ± 10.9	28.3 ± 13.7	<i>t</i> = 3.53, <i>p</i> < 0.01
12 weeks	17.8 ± 10.6	26.9 ± 12.5	<i>t</i> = 3.20, <i>p</i> < 0.01
<i>YIAS</i>			
Baseline	69.1 ± 9.3	65.5 ± 11.3	<i>t</i> = 1.44, <i>p</i> = 0.16
8 weeks	33.6 ± 11.1	43.5 ± 16.2	<i>t</i> = 2.91, <i>p</i> < 0.01
12 weeks	35.2 ± 12.2	43.7 ± 17.2	<i>t</i> = 2.42, <i>p</i> = 0.02
<i>BDI</i>			
Baseline	32.7 ± 8.8	33.3 ± 8.7	<i>t</i> = 0.76, <i>p</i> = 0.44
8 weeks	15.5 ± 8.4	20.7 ± 8.5	<i>t</i> = 2.54, <i>p</i> = 0.01
12 weeks	15.6 ± 7.5	20.4 ± 1.2	<i>t</i> = 2.69, <i>p</i> < 0.01

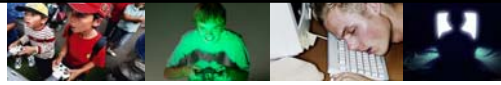
Kim et al. Computers in Human Behavior 2012;28:1954-1959



## FAMILY THERAPY

- 15 families with moderate to severe family dysfunction and with a teenager (15.2 years ± 1.5) suffering from video game addiction were recruited to a family therapy treatment study for 3 weeks.
- Treatment comprised 7 sessions, focus on reduction of problems and enhancing cohesion. Home work 1h per day/4 days per week.
- Outcome measures: Young Internet Addiction Scale (YIAS) and online playing time – fMRI scans related to affection stimuli and game stimuli
- Results
  - Reduction on YIAS (from 75.1 to 54.2), and hours playing (from 34.5 to 12.4) Improvement of FAPGAR score (from 2.5 to 5.8).
  - Increased activation of caudate body to affection stimuli and reduced activation of left middle frontal gyrus activation.

Han et al. Psychiatry Research: Neuroimaging 2012; 202:126-131



## CONCLUSIONS AND SUGGESTIONS

- There should be more **consensus** about how to assess video game addiction
- More **longitudinal studies** investigating both predictor and consequences of excessive video game playing should be conducted.
- More **biological measures** should be used (physiological measures, genes, brain scans, biochemical data etc.) in game addiction research
- More **experiments** in order to investigate mechanism that may lead to video game addiction should be conducted
- More **treatment studies** (preferably based on treatment manuals) should be conducted
- More **health registry studies** (NB! Nordic countries) concerning video game behavior should be conducted.