ESPORTS

AOASM OMED

2019 Baltimore, MD

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Director, Sports Medicine

Team Physician, Assistant Professor Family Medicine
• Explain the phenomenon of esports.

• Explain the health and injury considerations of the esports player.

• Explain the mental health considerations in the esports player.

• Defend a healthcare model for the management of the esports player.
What do you think when you hear the term "ESPORTS"?
Pro Esports Schedule

Tuesday through Friday are “normal” working days

• **7am** Daily gym sessions
• **9:45am** Catered breakfast—“fruits or a Mediterranean omelet”
  • “no breads or doughnuts or anything like that”
• **10:30 am** Team meeting
• **10:45 am** Break
• **Noon** First block of scrims
• **2pm** Lunch prepared by executive chef
• **3pm** Practice block
• **6pm** Dinner
• **7pm – 10pm** Required solo queue practice hours
  • Stream those practices on Twitch if they wish.

*Some stream until 2 am, either in the facility or back at their bedrooms. Others opt to return to the gym at 10 pm.*
What is esports aka competitive gaming?

- Difficult to define
- Catchall term for games that resemble conventional sports
  - Superstars, playoffs, fans, uniforms, comebacks, and upsets.
- Organized video game competitions
- All action is online
  - Contestants hardly move
- Not sedentary sports video games i.e. MLB 19: The Show, NBA 2K19, Madden NFL 19, and FIFA 19
- Not bound by a specific genre of game
- Competitions centered on fantasy worlds

League of Legends 2018: 100 million
Super Bowl 2018: 103 million
Super Bowl 2019: 100.7 million

Which had more viewers?

June 2014 – Robert Morris University recognized esports as varsity sport

2018- 200 varsity programs
  • $16 million in scholarships

National Association of Collegiate esports (not NCAA) main home for most of those organization
  • >500 college esports clubs

Purported benefits to universities:
  • Revenue generation
  • Participant diversity in athletic departments
    • Increased representation of Korean and Asian Americans
  • Physical activity??

Health and Injury Considerations

- Computer Vision Syndrome
- Circadian Rhythm Disorders
- Metabolic Dysregulation
- Upper Extremity Dysfunction
- Neck and Back Pain
- Mental Health
Computer Vision Syndrome

- >30% report eye fatigue
- Eyes fixed on computer for long periods
  - 2 hours before standing break in >50% of respondents
- Characterized by
  - Blurry vision
  - Low back pain
  - Tension headache
- Found in >90% use computer >3hrs/day
- Lack of definition- pixelated image
  - Increased - Saccades, Accommodation/Convergence
  - Decreased - blink rate

Computer Vision Syndrome

Interventions

• Gaming station organization
  • 20-28” distance
  • 5-6 “ below straight
  • Limit glare

• Correct refractive errors, astigmatism

• 20-20-20 rule

• Near far focusing

• Palming
“Because of pain in my spine, sometimes my arm will go numb. My shoulders feel terrible. Sometimes I can’t even pick up the mouse”

- Jong Hyun “MVP” 2013 (age 24)

“My wrist injury is something I simply cannot ignore, it limits my ability to play and it's not fair to my team”

- Hai Lam 6 years pro

RETIRED 26 years old

“Now, I suppose there could be no correlation between Price’s new injury (carpal tunnel syndrome) and a new video game that is eating up to one-eighth of Price’s daily routine...”

- Michael Silverman
Sports Reporter, Boston Herald

Upper Extremity Dysfunction

- >3hrs. Gaming -> shoulder pain
- >30% report hand/wrist
- Quick repetitive movements
- Flexor tendons – hypertrophy
- Median nerve – increase swelling ratio
  - 30-60 min. keyboard use increased pressure – worse w/ ulnar deviation wrist
- Joystick video games – de Quervain’s tenosynovitis

<table>
<thead>
<tr>
<th>Swelling Ratio</th>
<th>Baseline mean [SD] (range)</th>
<th>30-minute * mean [SD] (range)</th>
<th>60-minute ** mean [SD] (range)</th>
<th>90-minute mean [SD] (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>1.02 [0.14] (0.81–1.39)</td>
<td>1.07 [0.17] (0.79–1.55)</td>
<td>1.08 [0.16] (0.72–1.64)</td>
<td>1.05 [0.16] (0.75–1.52)</td>
</tr>
<tr>
<td>N</td>
<td>1.05 [0.14] (0.86–1.41)</td>
<td>1.12 [0.14] (0.86–1.48)</td>
<td>1.10 [0.13] (0.87–1.47)</td>
<td>1.06 [0.14] (0.85–1.37)</td>
</tr>
</tbody>
</table>

\[ SR (F(3,108) = 7.970, P < 0.001, \eta^2 = .181) \]


Neck and Back Treatments

**OMM**
- Postural manipulation
  - Increase cervical extension ROM
  - Decrease forward head posture
- HVLA, muscle energy
  - Decreased neck pain
- Soft-tissue mobilization, muscle energy techniques, and mobilization for lumbar segment
  - reduced pain intensity and improved physical function and mental health in LBP

**Stretching**
- anterior/medial/posterior scalenes, upper trapezius, levator scapulae, pectoralis minor, and pectoralis major

**Traction**

**Exercise therapy**
- Exercise type not determinate

**Electrotherapy**
- Low quality evidence


Upper Extremity

Shoulder
• Fascial distortion model -> increase shoulder ROM
• HVLA, LVHA -> improve shoulder recovery

Wrist/Hand
• Rest, NSAIDs, immobilization
• BLT interosseous membrane
• HVLA carpal bones
• Extension and release of the transverse carpal ligament w/ opponens pollicis roll maneuver
• Myofascial increase carpal tunnel dimensions

Back Dysfunction

- Slumping posture
  - Increases force on intervertebral discs
- Back rests
  - Common in gaming chairs
  - Flattened lordosis
  - Posterior pelvic tilt
  - Increase tension
    - Paraspinals
  - Weakness
    - Transversus abdominus


• 40% no regular physical activity

• 15% reported 3 hours or more without a standing break

• Exercise deficit disorder
  • < 60 min./day physical activity children

• Reverse - negative spiral of inactivity

## Metabolic Dysregulation

<table>
<thead>
<tr>
<th>Variables</th>
<th>ESport (n=11)</th>
<th>Controls (n=10)</th>
<th>Difference</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI (lb)</td>
<td>23.7 (3.3)</td>
<td>24.9 (2.1)</td>
<td>-1.21</td>
<td>0.35</td>
</tr>
<tr>
<td>Body fat (%)</td>
<td>24.0 (6.7)</td>
<td>19.1 (6.0)</td>
<td>-4.9</td>
<td>0.05*</td>
</tr>
<tr>
<td>Total fat mass (lb)</td>
<td>38.1 (14.1)</td>
<td>31.8 (12.3)</td>
<td>6.3</td>
<td>0.31</td>
</tr>
<tr>
<td>Arm fat mass (lb)</td>
<td>4.4 (1.5)</td>
<td>4.0 (1.6)</td>
<td>0.43</td>
<td>0.55</td>
</tr>
<tr>
<td>Leg fat mass (lb)</td>
<td>12.6 (4.3)</td>
<td>11.3 (4.1)</td>
<td>1.24</td>
<td>0.52</td>
</tr>
<tr>
<td>Trunk fat mass (lb)</td>
<td>19.1 (8.5)</td>
<td>14.4 (6.7)</td>
<td>4.66</td>
<td>0.20</td>
</tr>
<tr>
<td>Visceral fat (lb)</td>
<td>0.74 (0.5)</td>
<td>0.44 (0.3)</td>
<td>0.3</td>
<td>0.07</td>
</tr>
<tr>
<td>Total lean mass (lb)</td>
<td>111.8 (8.8)</td>
<td>131.5 (18.7)</td>
<td>-8.95</td>
<td>0.003*</td>
</tr>
<tr>
<td>Arm lean mass (lb)</td>
<td>14.4 (1.7)</td>
<td>17.1 (3.0)</td>
<td>-2.77</td>
<td>0.02*</td>
</tr>
<tr>
<td>Leg lean mass (lb)</td>
<td>37.8 (3.9)</td>
<td>47.7 (9.0)</td>
<td>-9.90</td>
<td>0.004*</td>
</tr>
<tr>
<td>Trunk lean mass (lb)</td>
<td>51.2 (4.2)</td>
<td>58.9 (6.9)</td>
<td>-6.92</td>
<td>0.01*</td>
</tr>
<tr>
<td>ALM/Height(m²)</td>
<td>13.7 (1.4)</td>
<td>16.8 (2.5)</td>
<td>-3.11</td>
<td>0.002*</td>
</tr>
<tr>
<td>ALM/Wt (%)</td>
<td>30 (0.0)</td>
<td>38 (0.03)</td>
<td>-8</td>
<td>0.002*</td>
</tr>
<tr>
<td>BMC (lb)</td>
<td>6.4 (0.7)</td>
<td>7.1 (0.9)</td>
<td>.7</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Data are means with standard deviation of means in parenthesis. Asterisk (*) represents significance (P< 0.05)

Metabolic Dysregulation

Esports

- Obese: 30%
- Overweight: 40%
- Ideal: 30%

Controls

- Obese: 0%
- Overweight: 33%
- Ideal: 67%

# Metabolic Dysregulation

<table>
<thead>
<tr>
<th>Variable</th>
<th>ESport (n=11)</th>
<th>Control (n=10)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>20.2 (1.7)</td>
<td>19.2 (1.3)</td>
<td>0.09</td>
</tr>
<tr>
<td><strong>Step Count (2 weeks)</strong></td>
<td>6040.2 (3028.6)</td>
<td>12843.8 (5661.1)</td>
<td><strong>0.004</strong> *</td>
</tr>
<tr>
<td><strong>Sleep (min)</strong></td>
<td>388 (98)</td>
<td>441 (1.03)</td>
<td>0.07</td>
</tr>
<tr>
<td><strong>Hours played daily</strong></td>
<td>4.6 (2.6)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Hours played without break daily</strong></td>
<td>4.0 (3.2)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Hours on computer recreational/school use daily</strong></td>
<td>4.3 (1.9)</td>
<td>1.7 (1)</td>
<td><strong>0.001</strong> *</td>
</tr>
<tr>
<td><strong>Days per week they exercise</strong></td>
<td>1.7 (1.9)</td>
<td>4.8 (1.2)</td>
<td><strong>0.001</strong> *</td>
</tr>
<tr>
<td><strong>Minutes of exercise</strong></td>
<td>39.5 (40.4)</td>
<td>56.7 (26.8)</td>
<td>0.29</td>
</tr>
</tbody>
</table>

Video Games & Violence
History
Video Game Violence History

Justice Reject Ban on Violent Video Games for Children

By ADAM LIPTAK  JUNE 27, 2011

- Lamar Alexander - 2013 - Video Games Are ‘A Bigger Problem Than Guns’
- Barak Obama - 2013 encourages scientists to research the effects of violent video games

What does the research show?
Video Game Violence

# Video Game Violence

## Table 1. Longitudinal studies on VGV and aggression

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Nationality</th>
<th>Principal ethnicity</th>
<th>Physical aggression measure</th>
<th>n</th>
<th>Average age T1*</th>
<th>Lag (years)</th>
<th>Covariates other than Initial Aggression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adachi and</td>
<td>2016</td>
<td>Canadian</td>
<td>White</td>
<td>Direct aggression (physical and verbal)</td>
<td>1,132</td>
<td>19.1</td>
<td>1.0</td>
<td>0.136, 0.077, 0.076</td>
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<tr>
<td>Willoughby</td>
<td>(23)</td>
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<tr>
<td>Anderson et al.</td>
<td>2008</td>
<td>Japanese</td>
<td>Asian</td>
<td>Trait physical aggression scale</td>
<td>181</td>
<td>~13.5</td>
<td>0.3</td>
<td>0.144, 0.139</td>
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<tr>
<td>(24)*</td>
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<tr>
<td>Anderson et al.</td>
<td>2008</td>
<td>Japanese</td>
<td>Asian</td>
<td>Physical aggression in past month</td>
<td>1,050</td>
<td>~15.5</td>
<td>0.3-0.5</td>
<td>0.115, 0.075</td>
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<td>(24)*</td>
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<tr>
<td>Anderson et al.</td>
<td>2008</td>
<td>American</td>
<td>White</td>
<td>Index of teacher, peer, and self-reports, current school year</td>
<td>364</td>
<td>~10.5</td>
<td>0.5</td>
<td>0.167, 0.158</td>
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<tr>
<td>(24)*</td>
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<tr>
<td>Breuer et al.</td>
<td>2015</td>
<td>German</td>
<td>White</td>
<td>Buss &amp; Perry Aggression Questionnaire (physical, two items)</td>
<td>140</td>
<td>16</td>
<td>1.0</td>
<td>-0.151, -0.159</td>
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<td>(25)</td>
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<td>Breuer et al.</td>
<td>2015</td>
<td>German</td>
<td>White</td>
<td>Buss &amp; Perry Aggression Questionnaire (physical, two items)</td>
<td>136</td>
<td>19.3</td>
<td>1.0</td>
<td>0.078, 0.070</td>
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<td>(25)</td>
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<td>Bucolo</td>
<td>2010</td>
<td>American</td>
<td>White</td>
<td>Buss &amp; Perry Aggression Questionnaire (physical, five items)</td>
<td>648</td>
<td>13.4</td>
<td>1.5</td>
<td>0.17, 0.15</td>
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<td>(26)</td>
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<tr>
<td>Ferguson (19)*</td>
<td>2011</td>
<td>American</td>
<td>Hispanic</td>
<td>Child Behavior Checklist Youth Self-Report, aggression, child (YSRac)</td>
<td>302</td>
<td>12.3</td>
<td>1.0</td>
<td>0.035, 0.011</td>
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<td>Ferguson et al.</td>
<td>2012</td>
<td>American</td>
<td>Hispanic</td>
<td>Child Behavior Checklist Youth Self-Report, aggression, child (YSRac)</td>
<td>165</td>
<td>12.3</td>
<td>3.0</td>
<td>-0.068, -0.016</td>
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<td>(21)*</td>
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<tr>
<td>Ferguson et al.</td>
<td>2013</td>
<td>American</td>
<td>Hispanic</td>
<td>Child Behavior Checklist Youth Self-Report, aggression, child (YSRac)</td>
<td>143</td>
<td>12.8</td>
<td>1.0</td>
<td>0.069, 0.044</td>
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<td>(20)*</td>
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<tr>
<td>Fikkers et al.</td>
<td>2016</td>
<td>Dutch</td>
<td>White</td>
<td>Physical aggression</td>
<td>943</td>
<td>11.8</td>
<td>1.0</td>
<td>0.180, 0.126</td>
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<tr>
<td>(27)</td>
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<tr>
<td>Gentile et al.</td>
<td>2009</td>
<td>American</td>
<td>White</td>
<td>Self-reported fights, teacher rating of physical aggression</td>
<td>865</td>
<td>9.6</td>
<td>1.1</td>
<td>0.112, 0.089</td>
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<td>(28)</td>
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<tr>
<td>Gentile et al.</td>
<td>2014</td>
<td>Singapore</td>
<td>Asian</td>
<td>Six items assessing physical aggression</td>
<td>2,029</td>
<td>12.2</td>
<td>1.0</td>
<td>0.065, 0.043</td>
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<tr>
<td>(29)</td>
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</tbody>
</table>

Source: Prescott AT, Sargent JD, Hull JG. Metaanalysis of the relationship between violent video game play and physical aggression over time. Proc Natl Acad Sci USA. 2018;115(40):9882-9888. DOI: 10.1073/pnas.1611617114
Physical Aggression

• Violent video game play with subsequent physical aggression ($\beta = 0.113, P < 0.001$)

• Violent video game play associated with increases in physical aggression controlling for prior aggression and all other covariates. ($\beta = 0.080, P < 0.001$)

• Ethnicity as moderator - White > Asian > Hispanic ($P = 0.001$)

• Effect largest in the studies w/ lag > 1 yr. ($P < 0.001$), and smaller in studies with a lag < 1 yr. ($P < 0.001$).

• “...these findings will assist the field in moving past the question of whether violent video games increase aggressive behavior, and toward questions regarding why, when, and for whom they have such effects.”

Source: Prescott AT, Sargent JD, Hull JG. Metaanalysis of the relationship between violent video game play and physical aggression over time. Proc Natl Acad Sci USA. 2018;115(40):9882-9888. DOI: 10.1073/pnas.1611617114
Majority of research studies in this area assess minor forms of aggression (e.g.,
- Giving an unpleasant noise or,
- Too much hot sauce to another person,
- Self reports of aggressive feelings or behaviors.

Laboratory studies are limited

Aggressive behavior measured in lab ≠ severe forms of aggression in the “real world” i.e. (assaults and homicides)

Population data
Video Game Violence

Video Game Violence

Video Game Violence

Internet gaming disorder (IGD) is defined as:

- prolonged, uncontrollable game playing via the Internet that results in significant psychosocial problems, such as depression and social isolation.

---


Gaming Addiction

• Different theories about IGD
  • Comorbidity hypothesis
  • Interpersonal impairment hypothesis
  • Dilution effect hypothesis

• Comorbidity hypothesis
  • IGD cause by psychological problems and poor psychological well being
  • Evidence:
    • Shares psychological symptoms and neurobiological mechanisms with substance abuse and behavioral addictions
    • I.e. – Kept from playing develop withdrawal symptoms and irritability
    • Co-occurs with major depressive disorder and ADHD
    • Inverse relationship between IGD and psychological well being

Gaming Addiction

• Interpersonal impairment hypothesis
  • Derived from CBT
  • Interaction between stress from life experiences and predisposition
  • Range of interpersonal problems
  • Maladaptive interpersonal response rather than pathology
  • Coping life stress primary motive
  • Susceptibility to stress in interpersonal conflicts and social isolation
    • Neglect of significant other
    • Lie about excessive gaming
    • Causing arguments and deteriorations in interpersonal relations
  • Lack social skills to handle interpersonal conflicts exacerbating situation
    • Fail to recognize facial expressions of disgust displayed by others, and continue their annoying behavior despite others’ non-verbal communication of disapproval
  • Inversely related to interpersonal well-being

• Dilution effect hypothesis
  • originates from both the social-cognitive theory
    • frequent engagement in online gaming as an attempt to gratify fundamental psychological needs
  • and escape from self theory
    • a desire to escape into the cyber world to avoid tackling distressing real-life problems
  • However, players are no longer able to regulate their gaming behavior when their ongoing behavioral engagement turns into profound cognitive immersion, which hinders or interferes with executive function
  • IGD as a deficiency in self-regulation with the underlying motive to restore well-being.

• Evidence
  • IGD people – low self-esteem, lack of external support
  • motive to escape from the real world found to be the strongest predictor of IGD symptoms
  • attempts to compensate for their scant social resources by garnering the respect and support of other gamers.
  • appears plausible to users because many online games, MMORPGs in particular, are extremely social in nature
### Gaming Addiction

Table 2. Summary of meta-analysis testing of theory-driven predictions.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Psychological Problems</th>
<th>Interpersonal Problems</th>
<th>Psychological Well-being</th>
<th>Social Well-being</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comorbidity</td>
<td>++ (r = .29)</td>
<td></td>
<td>- (r = -.15)</td>
<td></td>
</tr>
<tr>
<td>Interpersonal impairment</td>
<td>++ (r = .29)</td>
<td>++ (r = .25)</td>
<td></td>
<td>ns (r = -.07)</td>
</tr>
<tr>
<td>Dilution effect</td>
<td>++ (r = .29)</td>
<td>++ (r = .25)</td>
<td>- (r = -.15)</td>
<td>ns (r = -.07)</td>
</tr>
<tr>
<td>Higher power distance</td>
<td></td>
<td>+ (r = .13)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower power distance</td>
<td>+++ (r = .40)</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Note. †This moderation effect is marginally significant. ns = non-statistically significant. A larger number of + symbols indicates a stronger positive association with symptoms of Internet gaming disorder, and a larger number of - symbols indicates a stronger inverse association with symptoms of Internet gaming disorder. Italics indicate findings inconsistent with predictions.
Gaming Addiction

Regions that showed reduced gray matter volume in IGD participants

Gaming Addiction

Regions that showed activation in response to internet and videogame cues in IGD participants –

Gaming Addiction

- Neural mechanisms underlying Internet Gaming Disorder (IGD) resemble those of drug addiction.
- fMRI shows gray matter volume associated with changes to brain regions responsible for attention and control, impulse control, motor function, emotional regulation, sensory-motor coordination.
- Lower white matter density in brain regions that are involved in decision-making, behavioral inhibition, and emotional regulation.
- Changes in reward inhibitory mechanisms and loss of control. Structural brain imaging studies showed alterations in the volume of the ventral striatum that is an important part of the brain’s reward mechanisms. Finally,
- Videogame playing was associated with dopamine release similar in magnitude to those of drugs of abuse and
- Lower dopamine transporter and dopamine receptor D2 occupancy indicating sub-sensitivity of dopamine reward mechanisms.

Gaming Addiction

Gaming Addiction

- Amygdala (A), insula (I) and striatum (S)- encoding of threat and negative affect
  - non-addicted individuals – negative stimuli = increased amygdalar, insula, striatum activity
  - Controls - increased A/I/S activity to negative vs neutral images.
  - IGD – no difference A/I/S activity across conditions
  - consistent with reports of blunted amygdala engagement to stress and negative affect among individuals with drug and alcohol use

- Lateral pre-frontal cortex - ‘top-down’ inhibitory control and modulation of emotion
  - Control - increased to negative images
  - IGD -blunted prefrontal activity across all task conditions

Gaming Addiction

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Chicken or the egg

- Loneliness and physical aggression = risks for addicted gaming

- Self-enhancing vicious cycle

- Most addicted gamers (53%) transit to “problem gamers,” or remain addicted (35%)

- Virtually no transitions between “engaged gamers” and “addicted gamers.”
  - Probability becoming addicted due to engaged gaming is small
