My assumptions and goals for today

- Science helps to separate fact from opinion
- You should leave with information that you can take back to your homes, communities, and the families you serve

What this IS about

- Research findings
- Media are powerful, far more than most people admit
- Media affect everyone

Spheres of Influence

What this IS about

- Research findings
- Media are powerful, far more than most people admit
- Media affect everyone
- The main power may be to change cultural norms
- Media are a risk factor
Three Principles of Neural Network Development

- **Use it or lose it**: Experience plays a major role in which connections get formed and maintained.
- **Sensitive or critical periods**: The window of opportunity is only open so long.
- **Brain plasticity**: Always possible to form new networks.

Neural Network Growth

What is Learning at the Neural Level?

- Learning is the process of making certain pathways work more readily than they did before.
  - Generally by increasing the strength of synaptic communication.

Learning at the Neural Level

- **Long-Term Potentiation**: Increases the likelihood that a single neuron can cause an action potential.

Neural Network Development

- Neural network development is use-dependent.
- Neural network development peaks at age 7 and then begins to decline after age 12.
- Neural network development is not only important in traditional brain functions such as reading, math, and critical thinking, but also for attitudes and values.
Conclusion
• Early experience is a major factor in determining attitudes, values, and patterns of behavior

What Are the Experiences Forming Neural Networks?
• American children spend more time in front of electronic screens than any other activity except sleeping
• Therefore, TV & video games are likely to have an effect on the development of neural networks

Do we really need to be concerned about media violence, and how can we cut through the hype about it?

Defining Aggression
• Aggression is defined as behaviors that are intended to harm another person, and the intended victim would want to avoid the harm

Four Major Effects of Viewing Violence in Mass Media
• Aggressor effect: Increased meanness, aggression, and violence toward others
• Victim effect: Increased fearfulness, mistrust, and self-protective behavior
• Bystander effect: Increased desensitization, callousness, and apathy toward victims
• Appetite effect: Increased self-initiated behavior to see more violent material
Effects of Media Violence on Aggression

Two Major Effects of Viewing Prosocial Behavior in Mass Media

- **Prosocial effect**: Increased helpful behavior toward others
- **Antiviolence effect**: Decreased violence toward others
  - Importantly, these effects are not just short term. Children who watch more prosocial shows at home are more prosocial at school.

What if Violent and Prosocial Messages are Mixed Together?

- For young children (about up to age 8), when shown shows with **only prosocial acts**, they exhibit more helpful behaviors than hurtful ones
- When shown shows with **only aggressive acts**, they exhibit about as many helpful behaviors as hurtful ones
- When shown shows with **both aggressive and prosocial acts**, they exhibit more hurtful behaviors than helpful ones!
- Older children begin to be able to understand these mixed messages

Direction of the Effect

- **Huesmann and his colleagues conducted a classic 22-year longitudinal study**
  - Children first studied at age 8 to determine how much violent TV they watched
  - Amount of violent TV was correlated with peer-perceived aggression

Direction of the Effect

- Boys who watched the most violent TV at age 8 were the most aggressive at age 19
  - Being violent at age 8 did not predict violent TV viewing at age 19

- Boys who watched the most violent TV at age 8 were the most likely to have been convicted of violent crimes at age 30
Catharsis?

- It has been long hypothesized that watching violent media or playing violent video games allows people to “blow off steam” and actually makes them less likely to act aggressively in the real world.
- There are at least 4 problems with this theory.

1. Drive theory model not appropriate
2. Aristotle had very clear ideas about what was necessary for catharsis to happen, most notably that FEAR and PITY had to be felt.
3. Many studies have been performed to show this -- In 40 years of research, there is no substantiation of the catharsis hypothesis.
4. It’s not how the brain works.

Attention Problems: Longitudinal Findings
1,323 3rd-5th Graders

<table>
<thead>
<tr>
<th>T1 Attention Problems</th>
<th>T4 Attention Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>0.520 ***</td>
<td></td>
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<tr>
<td>0.213 ***</td>
<td></td>
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<tr>
<td>0.192 ***</td>
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<tr>
<td>0.073 **</td>
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<tr>
<td>0.240 ***</td>
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</tbody>
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GAM: Short-Term Processes Overview
(Carnagey & Anderson, 2003)

GAM: Short-Term Decision Process Details
(Carnagey & Anderson, 2003)
GAM: Short-term to Long-Term Change Processes

Violent Game Play Effects on Physiological Arousal and Aggressive Cognition

(N = 136 8- to 12-year-olds)
Barlett, Gentile, & Anderson (under review)

Video Game Meta-analysis: Overall

Correlations with Exposure to Video Game Violence among Adolescents

- Hostile attribution bias \( (r = .11) \)
- Arguments with teachers \( (r = .20) \)
- Physical fights \( (r = .32) \)
- Negatively correlated with grades \( (r = -.23) \)

All correlations \( p < .001 \)
Playing Violent Video Games Makes a Difference

<table>
<thead>
<tr>
<th>Percentage of Students Involved in Physical Fights</th>
<th>Low Violent Game Play</th>
<th>High Violent Game Play</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Hostility</td>
<td>3%</td>
<td>38%</td>
</tr>
<tr>
<td>High Hostility</td>
<td>28%</td>
<td>28%</td>
</tr>
</tbody>
</table>

The Good News

- Kids who report that their parents “always” check the ratings before allowing them to play:
  - get into fewer physical fights
  - have better grades in school
**Three Studies**  
(Anderson, Gentile, & Buckley, 2007)

- **Study 1 - Experimental:** 161 9- to 12-year-olds and 354 college students
  - Played V or NV video game (E or T rated)
  - Given opportunity to punish an “opponent”
  - Gave over 40% more high intensity blasts if they played a V game

**Children 9-12**

8.88
4.88
4.26
7.18
6.10
5.43

**Youth 17+**

**E Nonviolent Game**

4.88
4.26
7.18
6.10
5.43

**E-Violent Game**

**T-Violent Game**

- **Study 2**
  - Correlational: 189 high school students
  - Playing violent games linked to:
    - More pro-violence attitudes
    - More hostile personalities
    - Less forgiving
    - Believe violence to be normal
    - Use more physical aggression in their every day lives (even controlling for sex, total screen time, aggressive beliefs and attitudes)

- **Study 3 - Longitudinal**  
  (Anderson, Gentile, & Buckley, 2007)

  **Participants**
  - 430 3rd (N = 119), 4th (N = 119), & 5th (N = 192) graders
  - Five MN schools:
    - 1 Private, 4 Public
    - 4 Suburban, 1 Rural
  - 51% Male, 49% Female
  - 7-11 (M = 9.7; SD = 1.0)
  - 86% Caucasian

**Longitudinal Study of 3rd-5th Graders**  
(Gentile et al., 2004; Anderson, Gentile, & Buckley, 2007)

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<tbody>
<tr>
<td>Time 1</td>
<td>Time 1/TIME 2</td>
<td>Time 2</td>
<td>Time 2</td>
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**3 Longitudinal Samples from the US and Japan**  

- **Habitual Video Game Violence**
- **Sex** (female = 0, male = 1)
- **Physical Aggression**

**Allowing Younger/Older Children Paths to Differ**  

**Habitual Video Game Violence**

Sex (female = 0, male = 1)

Physical Aggression

**Physical Aggression**

All paths are significant at p < .001. All values are standardized path coefficients. Maximum likelihood results for the overall model: NFI = .982, PNFI = .982, CFI = .997, Chi-squared(18) = 21.68, p > .2, RMSEA = .02.

Based on 2 studies from Japan (N = 1050, 181) and 1 study from the U.S. (N = 564).
fMRI Study

- 13 late adolescent males (18-20 years)
- Video game play at least 10 hrs/wk
- No current or past diagnosis or treatment for behavioral or psychiatric disorder, including depression, anxiety, learning disability, or attention deficit
- No psychoactive medications
- Classified as having high (n=7) or low (n=6) violence experience based on most frequently played video games

Activity during Violent vs. Non-Violent Game

- Activity in the dorsal anterior cingulate cortex (dACC) and left insula was greater during violent game play.
- Additional regions showing this effect included: bilateral motor cortex, bilateral fusiform gyrus, posterior cingulate, thalamus/pulvinar, and cerebellum.
- No brain regions showed greater activity for the non-violent game.

Group Differences by Game

- Despite many regions of similarity, a number of brain areas showed differential activation by game type for the two groups of participants.
- Rostral anterior cingulate gyrus (rACC) was greater during violent game play for players with low violence experience.
- The same regions showed reduced activity during the violent game for players with high violence experience.
- This pattern was particularly true in the subgenual ACC, although the signal change in this region was more variable across individuals.

Connecting the Dots: Neural Network Development

- Remember the “Use It or Lose It” principle
- Example: Violence
  - If television portrays violence as the preferred method of conflict resolution, and kids see this message 200,000 times by the end of high school, the brain pathways supporting these values have been well “used”
  - Every shot fired in a violent video game is one more practice opportunity

“Abeunt studia in mores.”  
(Pursuits become habits.)  
Ovid

“We are what we repeatedly do. Excellence, then, is not an act, but a habit.”  
Aristotle

“The chains of habit are generally too small to be felt until they are too strong to be broken.”  
Samuel Johnson

“When an act, and you reap a habit. Sow a habit, and you reap a character. Sow a character, and you reap a destiny.”  
Charles Reade

“Habit is second nature, or rather, ten times nature.”  
William James

Size of the Effect

Reframing the Issue

- Media violence is typically discussed by the media and public policy types as being a *values* issue
- Too often it is discussed in reaction to extreme tragedies, like Columbine or Erfurt
- These events foster a *culprit mentality*
- It is time we retake control of the issue, and reframe it as the *public health* issue that it truly is
Problems in Addressing Risk Factors Predicting Aggression

• “Risk factors are personal characteristics or environmental conditions that predict the onset, continuity, or escalation of violence.” (Surgeon General, 2001, p. 58)
  • A problem with this definition is that it only examines the extreme, rather than examining aggression more broadly.
  - This allows critics to say correctly that there are almost no studies demonstrating that media violence predicts violent crime.
  • This is like saying that we don’t need to be worried about trans fats because there are no studies showing that eating hydrogenated oils kills you.

Known Risk Factors for Aggressive Behavior

- Antisocial Behavior
  - Physical violence
  - Aggression
  - Higher attributed blame
  - Vandalism
  - Proactive delinquency
  - Status offenses

- Personal Characteristics
  - Gender
  - IQ
  - Low IQ
  - Low language abilities
  - Medical/Physical
  - Developmental history
  - Medical conditions
  - Physical development
  - School attitude/performance
  - Dropped out from school

- Family Characteristics
  - Antisocial parents
  - Abusive parents
  - Broken home
  - Presence of antisocial peers

- Social Characteristics
  - Few social activities
  - Low popularity

Risk/Resilience Approach

- May help to explain individual differences - why we might see greater effects of media violence on some children than others
- Strength: Acknowledges that a true challenge to developmental outcomes comes from the interaction of multiple risk factors, and that this cumulative risk is greater than any single risk factor

Media Violence as a Risk Factor

- Shooting or stabbing someone
- Hitting with intent to injure
- Occasional threats of violence
- Pushing and shoving
- Occasional violent thoughts/fantasies
- Verbally aggressive behavior
- Occasional aggressive thoughts/fantasies
- Occasional rude behavior
- Routinely respectful and polite behavior

Theoretical Predictions

- Testable predictions:
  - The presence of an individual risk factor for aggression should increase the likelihood of aggressive behavior
  - The presence of protective factors should lower the likelihood of aggressive behavior, even in the presence of other risk factors
  - The presence of multiple risk factors should increase the likelihood to a greater extent

Hyp 2: Protective Factor Effect

- Low Risk on 3 Factors
- Median Risk on 3 Factors
- High Risk on 3 Factors
- Sex, Physical Victimization, Prior Fights
- Hostile Attribution Bias, Parental Involvement, Preference for violence in VGs, Physical Victimization, Sex, Media Violence Exposure, Physical Fights Time 1

Effect of Each Risk Factor Holding Others Constant (Controlling for T1 Total Screen Time)

- Low Risk
- High Risk

- 35% 35% 36%
- 38%
- 32% 32%
- 40%
- 42%
- 45%
- 48%
- 44%
- 57%
- 51%
- 40%
- 50%
- 60%

- Hostile Attribution Bias
- Parental Involvement
- Preference for violence in VGs
- Physical Victimization
- Sex
- Media Violence Exposure
- Physical Fights Time 1
Percentages of Participants Engaged in Physical Fights at Time 2 by Number of Risk Factors Present (Empirically derived)

Risk Factors include: Sex, high Prior Physical Aggression, low Parent Involvement, high Hostile Attribution Bias, high Physical Victimization, high Preference for Violent Video Games, and high Media Violence Exposure.

Profiling: Predicting the Likelihood of T2 Fights from Four T1 Risk Factors

What Culture Have We Wrought?

• Jack Paar once said:
  There’s a lot of humor on television these days…I wonder if that causes comedy in the streets

Do not let these studies distract from the fact that there are also many potential benefits from games.
An overlooked positive effect of violent games?

Video Games are Natural Teachers

- They do what excellent teachers do
  - Give immediate feedback, rewards, multiple contexts, etc.
  - Students self-motivate and distribute practice over time
  - Adapt to the level of the learner

How about Prosocial Games?

- In three new studies, we tested prosocial game effects
- Study 1: 727 Singaporean 7th-8th graders
  - Correlational: Playing prosocial games predicted helping behavior, empathy, cooperation, and lower hostile attribution bias and attitudes
- Study 2: 1,830 Japanese 3rd-5th graders
  - Longitudinal: Playing prosocial games predicted later prosocial behavior
- Study 3: 161 US college students
  - Experimental: Played game, then had the opportunity to help or hurt another student

Laparoscopic Surgeons Study 1

- \( N = 33 \) Laparoscopic Surgeons
- Played 3 video games, requiring
  - Fine motor skills/reaction time
  - Non-dominant hand dexterity
  - Two-handed choreography
  - Targeting
  - 3D depth perception from 2D information
- Participated in Top Gun laparoscopic training and standardized scored drills

The surprise

- Demonstrated VG skill and past amount of VG play are significant predictors of advanced laparoscopic skills and suturing capability after controlling for sex, years of medical training, and number of laparoscopic surgeries performed
Laparoscopic Surgeons
Study 2 – Preliminary Results

- 303 Surgeons (82% M, 18% F)
  - M = 13 years experience (SD = 9.6)
  - M = 328 laparoscopies performed (SD = 491, median = 112)
- 180 completed Top Gun in standard form, and 123 completed it with embedded VG play
- Not randomly assigned, but received same training, not different in number of surgeries performed or pretest measure of suturing skill

Preliminary Results

- Replicated previous surprising finding – game best predictor of skill
- All surgeons performed Cobra Rope drill
- Surgeons playing VGs prior to the drill were significantly faster at first attempt ($t = 2.17, df = 301, p < .05$) and overall across 10 trials ($t = 2.28, df = 301, p < .05$)

What happens when it’s time to stop playing for some children?

Video Game “Addiction”

Is it real?

Peter, 21 year-old, self-identified Video Game Addict

Criteria of Pathological Game Use

- During the past year, have you become more preoccupied with playing video games, studying video game playing, or planning the next opportunity to play? (Y/N/S)
- In the past year, do you need to spend more and more time and/or money on video games in order to achieve the desired excitement? (Y/N/S)
- In the past year, have you sometimes tried to limit your own playing? (Y/N) If yes, are you successful in limiting yourself? (Y/N/S)
- In the past year, have you become restless or irritable when attempting to cut down or stop playing video games? (Y/N/S)
Items 2

- In the past year, have you played video games as a way of escaping from problems or bad feelings? (Y/N/S)
- In the past year, have you ever lied to family or friends about how much you play video games? (Y/N/S)
- In the past year, have you ever committed illegal/unsocial acts such as theft from family, friends, or elsewhere in order to get video games? (Y/N/S)
- In the past year, have you ever neglected household chores to spend more time playing video games?

Items 3

- (For students) In the past year, have you ever done poorly on a school assignment or test because you spent too much time playing video games?
  (For non-students) In the past year, has your work ever suffered (e.g., postponing things, not meeting deadlines, being too tired to function well, etc.) because you spent too much time playing video games? (Y/N/S)
- In the past year, have you ever needed friends or family to help you financially because you spent too much money on video game equipment, software, or game/Internet fees? (Y/N/S)
  “Yes” to 5 or more = addicted

Scoring Issues

- Categorical or Continuous?
  - I take a categorical approach because it is the cleanest clinical line, and is most similar to other DSM criteria
- How to score Yes, No, and Sometimes?
  - I have tried several methods, but the one that seems to work best so far is
    • No = 0
    • Sometimes = .5
    • Yes = 1

Theoretical Approach

- If pathological gaming exists, it should show
  - Construct validity
    • Convergent validity – Pathological students should play more, buy more games, feel addicted, etc.
    • Comorbidity – Pathological students should be more hostile, show more antisocial and aggressive behaviors, get worse grades, etc.
  - Predictive validity
    • Cue Reactivity – Pathological students should have stronger reactions to playing games

Summary of Studies 1, 2, 4 & 5

- Pathological gamers showed patterns expected:
  - Poorer grades, spend more time playing, prefer more violence in games now compared to past, more hostile personalities, more aggressive behaviors, more diagnosed ADD/ADHD, say they feel “addicted,” etc...
Convergent Validity:  
Amount of Play - Young Adolescents  
Pathological Gamers (compared to other gamers)  
- Have been playing for more years ($M\approx 8$ & 6 yrs)  
- Play longer ($M \approx 20.9$ & 7.9 hrs/wk)  
- Play longer at one sitting ($M \approx 77$ & 45 minutes)  
- More familiar with games  
- More likely to own their own games (98% & 87%)  
- Buy games more frequently ($M \approx$ “about every 2 weeks” & “every couple of months”)  

Convergent Validity:  
Knowledge/Engagement - Young Adolescents  
Pathological Gamers (compared to other gamers)  
- More likely to  
  - Know the VG rating symbols (62% & 41%)  
  - Download VGs from Internet (52% & 34%)  
  - Visit game sites on the Internet  
  - Customize video games  
  - Use “cheat codes” in VGs  
- Name more violent VGs as their 3 favorite games  
- Expose themselves to more VG violence  
- More likely to report that they usually feel “excited,” “energized,” and “negative” after playing VGs

Convergent Validity:  
Other Problem Markers - Young Adolescents  
Pathological Gamers (compared to other gamers)  
- Parents more likely to say they play VGs too much (60% & 25%)  
- More likely to play VGs to release their anger (68% & 34%)  
- Prefer more violence in VGs ($M \approx 7.2$ & 5.1)  
- Prefer more violence now compared to 2-3 years ago  
- More likely to say they have felt like they were addicted to VGs (54% & 15%)  

Convergent Validity:  
Comorbidity - Young Adolescents  
Pathological Gamers (compared to other gamers)  
- Higher hostile attribution bias  
- Higher trait hostility (Cook & Medley)  
- Higher antisocial behaviors (e.g., arguments with friends)  
- Higher aggressive behaviors (i.e., physical fights)  
- More likely to have “addicted” friends (59% & 35%)  
- Poorer school performance ($M \approx$ B- & B+)  
- Watch more TV ($M \approx 35.7$ & 24.5 hours/week)  
- More likely to be male

Study 2 with  
Older Adolescents  
- Modified addiction items to be more similar to DSM-IV  
- Used other measures of hostility, antisocial behavior, aggressive behavior, etc.  
- Found the same results (although lower prevalence of pathological gaming)

Study 3: Predictive Validity  
Older Adolescents  
We had undergraduate volunteers play 3 randomly selected video games (out of 19)  
- Before and after each game, they completed a state emotion checklist  
- After each game, they evaluated each game on 14 dimensions  
  - Assumption: If pathological gaming is real, “addicts” should show cue reactivity similar to other addictions  
  - Hypothesis 1: Pathological gamers will be more emotionally reactive to playing games than other gamers  
  - Hypothesis 2: Pathological gamers will rate games more positively than non-addicts on subjective dimensions (e.g., how fun, absorbing, etc.), but will not differ on objective dimensions (e.g., how action-packed, how violent, etc.)
Study 3: Predictive Validity

Emotional Reactivity - Older Adolescents

Pathological Gamers more likely (than nonpathological gamers and non-gamers) to
• Feel less calm, peaceful, and pleasant after playing
• Feel less agitated and irritated after playing
• Feel more angry, and both more and less mad
• Feel both more and less happy
• Feel more energetic
• Feel less lonely, sad, and unhappy

Evaluative Reactivity - Older Adolescents

Pathological Gamers more likely (than nonpathological gamers and non-gamers) to rate the games as
• Entertaining, exciting, fun, absorbing, arousing, enjoyable, involving, stimulating, and addicting

Pathological Gamers less likely to rate the games as
• Boring

Pathological Gamers equally likely to rate the games as
• Action-packed, violent, frustrating, difficult to play

Study 4: Nationally Representative Sample

(Gentile, 2009, Psychological Science)

• Collected by Harris Polls
• N = 1,178 8- to 18-year-olds across America

• 88% of youth play
• Average time is 13.2 hours/week (SD = 13.1)
  – Boys 16.4, Girls 9.2
• Only about half of children say there are rules in their houses for VG use
• 22% of children 8-11, 41% of 12-14, and 56% 15-18 own “Mature”-rated games

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Yes</th>
<th>Sometimes</th>
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<tbody>
<tr>
<td>Over time, have you been spending much more time thinking about playing VGs, planning about VG playing, or planning the next opportunity to play?</td>
<td>21%</td>
<td>19%</td>
</tr>
<tr>
<td>Do you need to spend more and more time and/or money on VGs in order to feel the same amount of excitement?</td>
<td>6%</td>
<td>9%</td>
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<tr>
<td>Have you tried to play VGs less often or for shorter periods of time, but are unsuccessful?</td>
<td>2%</td>
<td>22%</td>
</tr>
<tr>
<td>Do you become restless or irritable when attempting to cut down or stop playing VGs?</td>
<td>2%</td>
<td>6%</td>
</tr>
<tr>
<td>Have you played VGs as a way of escaping from problems or bad feelings?</td>
<td>23%</td>
<td>20%</td>
</tr>
<tr>
<td>Have you ever lied to family or friends about how much you play VGs?</td>
<td>14%</td>
<td>10%</td>
</tr>
<tr>
<td>Have you ever stolen a VG from a store or a friend, or have you ever stolen money in order to buy a VG?</td>
<td>2%</td>
<td>2%</td>
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<tr>
<td>Do you sometimes skip household chores in order to spend more time playing VGs?</td>
<td>33%</td>
<td>25%</td>
</tr>
<tr>
<td>Do you sometimes skip doing homework in order to spend more time playing VGs?</td>
<td>23%</td>
<td>19%</td>
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<tr>
<td>Have you ever done poorly on a school assignment or test because you spent too much time playing VGs?</td>
<td>20%</td>
<td>12%</td>
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<tr>
<td>Have you ever needed friends or family to give you extra money because you spent too much time playing VGs?</td>
<td>9%</td>
<td>6%</td>
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Symptoms Yes Sometimes

Prevalence and Validity

• 8.5% of American gamers aged 8 to 18 would classify as pathological
• Demonstrates construct validity in several ways (both convergent and divergent):
  – Play more frequently, spend more time playing (average of 24.6 hours/week), get poorer grades, have ADD/ADHD, have a video game system in their bedrooms, feel more “addicted,” etc.
What about Time Spent Playing?

• Amount of time is not a criterion for diagnosis
• Amount of time, however, does predict poorer school performance
• Pathological gaming should be a distinct construct, over and above amount of play
  – ANCOVA controlling for sex, age, and weekly amount of play
    Pathological status still a significant predictor of school performance ($F = 27.7$, $df = 1$, $1003$, $p < .001, \eta^2 = .027$)

Conclusions

• The results of these five studies converge to demonstrate that Pathological Use of Video Games shows high construct validity and predictive validity
• In addition, it shows reasonable test-retest reliability

My Questions

• Is Pathological Gaming part of a broader spectrum of technology addictions?
• How strict should addiction criteria be?
• Should Pathological Gaming be defined in a categorical or continuous manner?
• What is the developmental course of Pathological Gaming? Who is at risk?
• What are the outcomes of Pathological Gaming?
• What is required to treat Pathological Gaming?

Most of the Research on Video Games has Been on Unintended Effects

• Video game effects
  – Visual attention skills (e.g., Green & Bavelier, 2010)
  – Aggression (e.g., Gentile, Lynch, Linder, & Walsh, 2004)
  – Obesity (e.g., Fuchs, Sturman, & Calvillo, 2004)
  – School performance (e.g., Gentile, Lynch, Linder, & Walsh, 2004)
  – Seizures (e.g., Rossi & Fregni, 2009)
  – “Addiction” (e.g., Gentile, 2009)
  – Advanced laparoscopic surgical skills (e.g., Rosser, Lynch, Haskamp, Veith, Linder, & Gentile, 2004)
• Educational video game effects (e.g., Murphy, P 나면, Means, Reiser, & Widiy, 2003)
• Health video game effects (e.g., Lieberman, 1997)

And these are just some of the empirically identified effects!
How can we make sense of it all?

There are *Multiple Dimensions* on Which Video Games can have an Effect
- Amount
- Content
- Structure
- Context
- Mechanics

Effects of Amount
- Overall amount seems to be most related to school performance
  - Greater amount of entertainment games -> Poorer performance
- Overall amount may be related to health outcomes
  - e.g., Obesity, repetitive-stress disorders
- Overall amount isn’t the whole story, however
  - Distributed vs. Massed practice

Effects of Content
- Specific to the content of the game
  - Reading games -> Increased reading skills
  - Math games -> Increased math skills
  - Health games -> Increased health knowledge and health compliance behaviors
  - Violent games -> Increased aggressive thoughts, feelings, and behaviors

Effects of Structure
- Specific to the *formal features* of the game
  - Game requires constant scanning of the screen -> Improved visual attention skills

Halo: Constant scanning
Effects of Structure

- Specific to the **formal features** of the game
  - Game requires constant scanning of the screen -> Improved visual attention skills
  - Game requires use of 2-D representations to provide 3-D information and navigation -> Improved ability to use 2D for 3D

Halo: 2D info -> 3D navigation

Effects of Structure

- Specific to the **formal features** of the game
  - Game requires constant scanning of the screen
  - Game requires use of 2-D representations to provide 3-D information and navigation
  - Game requires constant scanning and maintaining orientation in spherical 3D space with only 2D information

Star Wars Rogue Leader: 2D info to maintain Spherical 3D orientation

Effects of Structure

- Specific to the **formal features** of the game
  - Game requires constant scanning of the screen
  - Game requires use of 2-D representations to provide 3-D information and navigation
  - Game requires constant scanning and maintaining orientation in spherical 3D space with only 2D information

Effects of Context

- If the game is structured to require cooperation and teamwork, that could moderate the effects
  - Violent MMOs – team aspect moderates violent effect?
  - Halo – slayer vs. capture the flag
- Problem-based (situated) learning
**Effects of Mechanics**

- Related to the mechanical devices used – the closer the similarity to “reality,” the greater the transfer should be
  - e.g., Playing driving game with a wheel and pedals rather than with mouse and keyboard
  - Create medical simulators with input devices similar to laparoscopic tools
- Mechanics are not entirely separate from Structure
  - Movements are guided by visual information gathered from the screen

**Two Benefits to This Approach**

- Gets beyond dichotomous thinking
- Allows for greater impact when attempting to have intended effects

**To have the greatest impact, video game designers should consider all five dimensions of effect**

- Example: Laparoscopic surgical simulators
  - Amount: Require certain amount, distributed practice
  - Content: Variations, complications, errors, etc.
  - Structure: As realistic as possible, as many variations as possible, 3D-2D
  - Context: Sense of urgency similar to surgical context
  - Mechanics: Input devices similar to surgical tools, formal reactivity as similar as possible
- Goal: Under pressure, you see something wrong and instinctively react quickly, proportionally, and correctly

**What can we do?**

- Personal choices
- Amount
- Content
- Share the information
- Media literacy
- Following cartoon

Halo: Scope changes the use of input devices – small moves cause bigger changes
The Power of Parents

- Limiting the amount and content of media appears to act as a protective factor.
- Parents who encourage watching educational and prosocial media, help rehearse and label educational messages, and help explain content can increase the benefits from these types of media.

- Parents who watch together with children and talk about what they see and hear can mitigate many of the negative effects of entertainment media.

How we can help

- [www.DrDouglas.org](http://www.DrDouglas.org)
- [www.psychology.iastate.edu/faculty/dgentile](http://www.psychology.iastate.edu/faculty/dgentile)

The Institute has many resources for parents, educators, health care providers, community leaders:

- Fact sheets
- Parent education curricula
- [www.mediawise.org](http://www.mediawise.org)