I want to remind you:

- The media are powerful
- Sometimes the power is used intentionally

A True Example

- You’re an advertiser who has been asked to come up with a campaign for cigarettes
- 5 problems to overcome

Focus for Today

- Briefly describe 11 largely disparate studies on video game effects
- Put them all together
What Makes a Great Teacher?

1. Have clear objectives, often set at multiple difficulty levels to adapt to the prior knowledge and skills of each learner
2. The pace of the activities can be adjusted for faster or slower learners, novices or experts, to deliver differentiated instruction.
3. Well-sequenced in levels of increasing difficulty, pace, or complexity, with success at later levels contingent on competencies at prior levels

What Makes a Great Teacher?

4. Learning is active with practice, feedback, and more practice to the point of mastery
5. Once mastered, the knowledge and skills are practiced further to the point of automaticity
6. Mastery of an objective is reinforced both extrinsically (e.g., with points, weapons, levels, etc.) and intrinsically (higher levels of competence and resulting self-esteem)

What Makes a Great Teacher?

7. Encourage a close-to-optimal combination of massed and distributed practice
8. Knowledge/skills learned and practiced in multiple ways in a variety of contexts
   - Important if transfer is desired
9. Great teachers get students excited and “hooked” on topics

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

- Video game effects on
  - Visual attention skills (e.g., Green & Bavelier, 2003)
  - Aggression (e.g., Gentile, Lynch, Linder, & Walsh, 2004)

Violent Video Games, Emotions, and Physiology

- Study partially supported by ISS
- N = 234 college students
- Randomly assigned to play one of 4 matched video games (2 violent, 2 non-violent)
- Measured emotional state before/after play
- Measured blood pressure before/during play
- Measured salivary cortisol baseline/during play

Presence of Positive Emotions Before and After Game Play

- Positive emotions by Game: (F(1,234) = 18.4, p < .001, controlling for sex and trait hostility)
Negative emotions by Game ($F(1, 224) = 24.4, p < .001$), controlling for sex and trait hostility.

Blood Pressure (MAP) before and during game play ($F(1, 224) = 7.4, p < .01$), controlling for sex and trait hostility.

Cortisol by Game ($F(1, 224) = 1.6, p = ns$), controlling for sex and trait hostility.

Correlations with exposure to video game violence among adolescents (Gentile, Lynch, Linder, & Walsh, 2004, Jnl of Adolescence):

- 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.
### Percentage of Students Involved in Physical Fights

<table>
<thead>
<tr>
<th>Hostility</th>
<th>Low Violent Game Play</th>
<th>High Violent Game Play</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>28%</td>
<td>38%</td>
</tr>
<tr>
<td>High</td>
<td>28%</td>
<td>38%</td>
</tr>
</tbody>
</table>

### Amount of play

- Playing V 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)

### Path Analyses

- **R² = .09***
  - Grades
    - .12
    - .54***
    - .14*
    - 0.7***
    - .31***
  - Arguments with teachers
    - .17**
  - Violent video game exposure
    - Physical fights
- **R² = .13***
  - Peer rejection
  - Hostility
  - Physical fights
- **R² = .19***

### 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

### Longitudinal Study of 3rd-5th Graders

(Gentile et al., 2004; Anderson, Gentile, & Buckley, 2007)

- Time 1
  - Time 1/Time 2
  - Time 2
  - Time 2

### Three New Studies

(Anderson, Gentile, & Buckley, 2007)

- **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
- **Correlational:** 189 high school students
  - Playing V 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)
The Industry’s Response

"Computer games don’t affect kids; I mean if Pac-Man affected us as kids, we’d all be running around in darkened rooms, munching magic pills and listening to repetitive electronic music.” Kristian Wilson, CEO, Nintendo Gaming Corporation, Inc, 1989

- Doug Lowenstein, President of the Entertainment Software Association

Children’s Access to Violent Games: A Public Policy Issue

- Games are rated
- \( N = 665 \) 8- to 16-year-olds in 5 states
- 70% say they play M-rated (“Mature”) games
- 61% own their own
- When asked to name 3 favorite games, 50% list an M-rated game as a favorite
- Only 27% say parent has ever stopped them from getting a game because of its rating

Switch Community Intervention Program

- Anti-obesity intervention aimed at multiple ecological levels
- Two participating school districts in MN and IA
- 10 schools matched and randomized into experimental and control schools
- 1,374 3rd – 5th grade students at Wave 1

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

M-rated Purchasing

- 44% say they have bought M-rated games themselves (12% say “don’t know”)
  - When asked about the last time they bought an M-rated game, a parent was with them only 56% of the time
  - Last time, 75% of parents knew what game the child bought
  - 30% admit that they have bought M-rated games without their parent knowing what game they bought (15% say “don’t know”)

Video Games and Obesity?

- Preliminary data analyses document a correlation between weekly amount of video game time and

<table>
<thead>
<tr>
<th></th>
<th>Self-report</th>
<th>Parent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Mass Index (BMI)</td>
<td>.15***</td>
<td>.25***</td>
</tr>
<tr>
<td>Waist Circumference</td>
<td>.13***</td>
<td>.27***</td>
</tr>
<tr>
<td>Mean Pedometer</td>
<td>.02</td>
<td>-.08*</td>
</tr>
</tbody>
</table>

(Controlling for age and physical maturity)
Laparoscopic Surgeons Study 1

- Surgeons who played video games in the past for at least 3 hours/week were:
  - 77% Faster at advanced surgical procedures, and made
  - 37% fewer errors
  Compared to surgeons who did not play video games

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)

Proposed Diagnostic Items for Children/Adolescents

1. In the past year, has your schoolwork suffered because you spent too much time playing computer/video games (CVG)?
2. ...have you become restless or irritable when trying to cut down or stop playing CVGs?
3. ...have you ever skipped your homework to play more CVGs?
4. ...have you ever lied to family or friends about how much you play CVGs?
5. ...do you need to spend more and more time or money on CVGs to feel the same amount of excitement?
6. ...have you played CVGs to escape from problems, bad feelings, or stress?
7. ...are you thinking about CVGs more and more?
8. ...do you sometimes skip household chores to play more CVGs?
9. ...have you ever stolen a CVG from a store or a friend, or stolen money so you could buy or play a VG?
10. ...have you tried to play CVGs less often or for shorter periods of time?
11. ...have you ever needed friends or family to give you extra money because you spent too much money on VG equipment, software, or game/Internet fees?

Criteria of Pathological Computer/VG use

- Need to spend more time/$ to achieve the desired excitement
- Over time, more preoccupied with games
- Play to escape from problems or bad feelings
- Play interferes with homework
- Lower grades on tests/assignments due to play
- Lie about how much
- Illegal/antisocial acts (e.g., theft/piracy) to get games
- Try to limit own playing, with limited success
- Restless or irritable when trying to cut down
- “Yes” to 5 or more = addicted
Concerns about Compulsive Computer/Video Game Use: Theoretical Approach

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

Three Studies of Compulsive Video Game Play

- Study 1: 607 8th/9th Grade children (Mean age = 14)
  - Correlational – testing construct validity
  - Prevalence – 12.5% addicted
- Study 2: 613 undergraduates
  - Correlational – testing construct validity
  - Prevalence – 5.8% addicted
- Study 3: 254 undergraduates
  - Experimental – testing predictive validity
  - Prevalence – 5.2% addicted

Convergent Validity: Amount of Play - Young Adolescents

Addicted Gamers (compared to non-addicted gamers)
- Have been playing for more years ($M = 8 \& 6$ yrs)
- Play longer ($M = 20.9 \& 7.9$ hrs/wk)
- Play longer at one sitting ($M = 77 \& 45$ minutes)
- More familiar with games
- More likely to own their own games (98% & 87%)
- Buy games more frequently ($M = "\text{about every 2 weeks}" \& "\text{every couple of months}"")

Convergent Validity: Knowledge/Engagement - Young Adolescents

Addicted Gamers (compared to non-addicted 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

Addicted Gamers (compared to non-addicted 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 ($M = 7.2 \& 5.1$)
- 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%)

Construct Validity: Comorbidity - Young Adolescents

Addicted Gamers (compared to non-addicted 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 ($M = B- \& B+$)
- Watch more TV ($M = 35.7 \& 24.5$ hours/week)
- More likely to be male
- More likely to be minority (marginally significant)
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 VG addiction)

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 VG addiction is real, "addicts" should show cue reactivity similar to other addictions
  - Hypothesis 1: Addicts will be more emotionally reactive to playing games than non-addicts
  - Hypothesis 2: Addicts 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

Addicted Gamers more likely (than non-addicted 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

Study 3: Predictive Validity

Evaluative Reactivity - Older Adolescents

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

Addicted Gamers less likely to rate the games as
- Boring

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

Male, 22, VG Addict

Physiological Cue Reactivity to Play

Salivary Cortisol Levels from Baseline to During Game Play, controlling for Sex, Trait Hostility, and Compulsive Gaming

Correlate by Game (F(1,205) = 5.9, p = .05), controlling for sex, trait hostility, and compulsive gaming
3-Way Interaction: Cortisol x Game x Compulsive Play

Research on Both Intended and Unintended Effects

- Educational video game effects (e.g., Murphy, Paucek, Means, Gallo, & Whitty, 2004)
- Health video game effects (e.g., Lichtenstein, 1977)
- Video game effects on
  - Visual attention skills (e.g., Green & Berenson, 2002)
  - Aggression (e.g., Anderson, Gentile, & Buckley, 2007)
  - Obesity (e.g., Physical Activity, Bres & Capodilupo, 2003)
  - School performance (e.g., Gentile, Castano, Li, & Marsh, 2004)
- Seizures (e.g., Kato & Ohashi, 1999)
- Advanced laparoscopic surgical skills (e.g., Rosen, Lencioni, Molteno, Yeo, Jamieson, & Min, 2001)
- Video game “addiction” (e.g., Gallo, under review)

And these are just some of the empirically identified effects!

How can we make sense of it all?

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
- Game requires use of 2-D representations to provide 3-D information and navigation -> Improved ability to use 2D for 3D

Halo: Constant scanning

Halo: 2D info -> 3D navigation

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

Try to remember where the yellow-outlined ship is
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
- Game requires constant scanning and maintaining orientation in spherical 3D space with only 2D information
- To the extent the representation is more realistic, learning and transfer should be faster

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

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

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

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

Two Benefits to This Approach
- Gets beyond dichotomous thinking
- Allows for greater impact when attempting to have intended effects