The Four Five Dimensions of Video Game Effects

Research on Both Intended and Unintended Effects
- Educational video game effects (e.g., Murphy, Poush, Means, Candel, & Whitehouse, 1991)
- Health video game effects (e.g., Leshner, 1997)
- Video game effects on
  - Visual attention skills (e.g., Deane & McBurney, 2002)
  - Aggression (e.g., Anderson, Gentile, & Bushman, 2007)
  - Obesity (e.g., Ersing, Adams, & Gatenby, 2009)
  - School performance (e.g., Gentile, Bushman, & Walsh, 2004)
  - Seizures (e.g., Wozniak & Zyganski, 1999)
  - Advanced laparoscopic surgical skills (e.g., Rosen, Levison, Holcomb, Vogt, Gentile, & Sanberg, 2007)
- Video game “addiction” (e.g., Gentile, under review)

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

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

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

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