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The ~~Four~~ Five Dimensions of Video Game Effects

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William Stone
Douglas A. Gentile

Media Research Lab, Iowa State University

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Research on Both Intended and Unintended Effects

- Educational video game effects (e.g., Murphy, Penuel, Means, Korbak, & Whaley, 2001)
- Health video game effects (e.g., Lieberman, 1997)
- Video game effects on
  - Visual attention skills (e.g., Green & Bavelier, 2003)
  - Aggression (e.g., Anderson, Gentile, & Buckley, 2007)
  - Obesity (e.g., Vandewater, Shim, & Caplovitz, 2004)
  - School performance (e.g., Gentile, Lynch, Linder, & Walsh, 2004)
  - Seizures (e.g., Ricci & Vigevano, 1999)
  - Advanced laparoscopic surgical skills (e.g., Rosser, Lynch, Haskamp, Yalif, Gentile, & Giammaria, 2004)
- 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

WORLD OF VIDEO GAMES

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 r̶... ̶ of the
    screen ... n skills
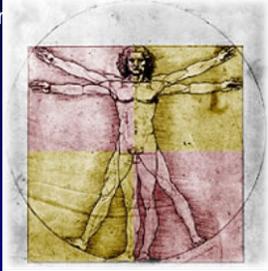
Halo: Constant scanning

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

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

Try to remember where the yellow-outlined ship is

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  - To the extent the representation is more **realistic**, learning and transfer should be faster

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

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

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