GAMING

Mon., 10 April 2006

APPLIED RESEARCH IN VIDEO GAMES

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Abstract
Three uses of video games are described: 1. Video games as assessment and as measures of performance. 2. Video games as training and practice in cognitive and perceptual skills, biological and physiological functioning, and cooperation and teamwork. 3. Video games as entertainment. Selected studies are described for each domain. The purpose is to suggest the many possible roles for video games in the context of the space program.

APPLIED VIDEO GAME RESEARCH

Introduction

Three uses of video games are described: 1) Video games as assessment and as measures of performance. 2) Video games as training and practice in cognitive and perceptual skills, biological and physiological functioning, and cooperation and teamwork. 3) Video games as entertainment. Selected studies are described. The purpose is to suggest the many possible roles for video games in the context of the space program.

3 uses of games

1. **VGs as performance measure, assessment (*VGs as DV*)**
2. **Training, practice (*VGs as IV*)**
   - **a) cognitive & perceptual skills**
   - **b) biological & physiological functioning**
   - **c) social cohesion**
3. **Entertainment (*VGs as play)***

Even controversial violent video games require and nurture complex cognitive & perceptual skills (Green & Bavelier 2003; Jansz 2005). In an analysis of the cognitive complexity involved in a fighting game, **Squire** (2005) describes how the game ***Viewtiful Joe*** is structured to balance flow and novelty, & to encourage players both to develop new skills and to master those they have.

We should be mindful of how we talk about games. Is someone 'addicted' or are they 'passionately involved' in their play? Do gamers have the attention span of a fruit fly or are they good at 'multitasking'? Are (MMOGs) computer games socially isolating or are they another form of sociability, satisfying similar affiliation, status and dominance needs?

3 uses of games: Selected studies

1. VGs as performance measure, assessment

VGs can easily be used as **dependent variables**. Reaction time, problem solving ability and speed, perceptual responses all can be measured and stored in VGs, enabling comparisons over time.

In small-scale studies we used video games as an **independent variable**, considering their possible effects on cognition and behavior.

a) Insurance Company experiment

US Senator wanted ban on Microsoft games...

Job performance factors associated with play

- perceived control
- positive emotions
- reduced stress
- incubation ('down time')

Computer games at work
Job satisfaction

	Computer game	*Control group*
pretest	2.10	2.33
posttest	2.47	2.41
change	+ 0.37	+ 0.08

t = 2.10, df 21, p<.05

Source: Bogers, et al. (2003). Computer games at work. http://www.gamesconference.org

Games were used in the same way as coffee breaks – as a reward for a job completed, or as a break from a long complex task (Bogers, et al., 2003).

b) The elderly

Video games and the elderly

	Experimental		**Control**	
	Before	After	Before	After
Reaction time* (msec)	**1287**	**940**	**1269**	**1158**
Stroop test (interference,secs.)	**52**	**38**	**48**	**42**
Well-being*	**2.1**	**1.9**	**2.2**	**0.6**

(-5 to +5. Higher scores = more positive well-being)
*statistically significant difference between groups in change scores.

Source: J. Goldstein, et al. (1997). *Social Behavior & Personality, 25*, 345-352.

2. Training, practice

Among the benefits of VGs are the maintenance or improvement of problem solving, enhanced perceptual skills, and a distraction from everyday reality.

a) Cognitive & perceptual skills

Elementary curriculum (Rosas 2003); el-hi (Gee 2003); Prensky (2005).

Types of learning from games

Content	Examples	Games
facts	*laws, formulae, specs.*	memory
skills	*interviewing,teaching, project leader*	RPGs, adventure, detective
judgment	*management, ethics*	RPGs,multiplayer, strategy
reasoning	*tactical thinking*	puzzles
systems	*health care, complex systems*	simulation games

from Prensky 2005

Playing action video games can alter a range of visual skills. **Green & Bavelier** (2003) established changes in different aspects of visual attention in habitual videogame players as compared to non-players. Nonplayers trained on an action video game show marked improvement from their pretraining abilities.

b) Biological and physiological functioning

Motor behavior including muscle training and fine motor skills can be promoted through active and interactive games. Beginning with Sony's Eye-Toy and activities like *Dance Dance Revolution*, VGs can stimulate movement. Today's top athletes use computer imagery to 'digitilize' and 'informationalize' their performance (Miah & Hemphill, in press).

Gaming tasks have to be sensitive to physiological conditions such as stress and fatigue. Even the timing of games is important as sleep may be influenced (e.g, Higuchi et al. 2005).

Technology leads game development

Mind-operated devices

A person can learn to control a video game, the lighting in a room, or move a cursor on a computer monitor by controlling his or her physiology:

- brain wave patterns
- GSR
- HR
- body temperature

Among the most exciting developments in games is the brain-game interface. Developed first by NASA, video games use bio-feedback to train pilots to stay alert during long flights and calm during emergencies (Pope & Bogart 1996; Mason et al. 2004). The technology is now commercially available (CyberLearning's SMART BrainGames) for Sony PlayStation and Microsoft X-box to target symptoms arising from brain injuries, attention-deficit hyperactivity disorder (ADHD) and learning disabilities. The system allows off-the-shelf video games (racing games are best) to be controlled through brain wave activity. The more focused and faster your brain is working, the faster your car accelerates, and the easier it is to play the game. When brain waves aren't in "the zone" the controller makes it harder to accelerate and steer.

Parente & Parente (2006) consider whether a video game can be controlled using biofeedback for **galvanic skin response (GSR), heart rate, and temperature**. 20 students played a computer game using the biofeedback device, both individually and in pairs. [The game involved controlling moving horizontal and vertical lines (like *Tetris?)*.]
Results indicated that most people learned to control the game after a single training session. The GSR measure was the most sensitive

means of control. Pairs of participants controlled the device more effectively than did single individuals, which suggests its potential for increasing cooperation and teamwork. "Mind-operated devices" can be complex. For example, a person could learn to control the lighting in a room, compose music, or move a cursor on a computer monitor by controlling his or her physiology.

3. Entertainment

Entertainment
When freely chosen, entertainment can produce desired states such as relaxation or arousal, and can induce the range of human emotions that enrich daily life.

It is possible to use entertainment to achieve almost any desired state of arousal, emotion, involvement or distraction. Games serve the range of "uses and gratifications" familiar to media students (cognitive, social, emotional/physiological). Games and other forms of entertainment can be used to promote as well as to monitor cognitive and physiological performance. They can enrich daily experience through emotional reactions and contribute to stress reduction, and ultimately to daily functioning.

Emotional and **physiological states** are influenced by both the **form and content** of entertainment. When freely chosen, entertainment can produce desired states such as relaxation, but also is capable of producing increases in arousal states. Entertainment - such as music, film, video games - can induce the range of human emotions and enrich daily life.

Multiplayer games can satisfy **socio-emotional needs** (affiliation, self presentation).

Multiplayer games satisfy **socio-emotional needs** (e.g., affiliation, self-presentation). Even competitive games foster cooperation among participants, who play as equals and cooperate in sticking to the rules.

Virtual pets and robots require caretaking on a regular schedule, helping to maintain a daily routine and providing some of the comforts of social interaction.

Even a competitive game fosters cooperation among participants, who participate as equals and cooperate in taking turns and sticking to the rules, a "status equalizer." **Virtual pets and robots** require caretaking on a regular schedule, helping to maintain a daily routine and providing some of the comforts of social interaction.

Conclusion

The purpose of this selective review is to suggest the range of possible applications of video games to the successful completion of complex tasks.

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