Incorporating Video Games into Physical Education

ELISABETH HAYES   LAUREN SILBERMAN

Between their popularity and their efficient delivery of information, video games may help to enhance students' motivation, understanding, and performance in sports.

The growing prevalence of video gaming among young people, particularly males, is often considered to be a contributing factor in the rise of obesity and the shrinking levels of physical activity among youths. This popular belief has been contradicted by studies that have found no relationship between video game play and obesity or physical inactivity (Lager & Bremberg, 2005; Marshall, Biddle, Gorely, Cameron, & Murdey, 2004), or between physical fitness and Internet-use time (Kerner, 2005). However, the unproven association between video gaming and limited physical activity, as well as the persistent stereotyping of video games as predominantly mindless, violent forms of entertainment, has prevented most physical education teachers (as well as the general public) from seeing the potential of video gaming technologies as instructional tools. Notably, the most popular video games are *not* war games or fighting games, but sports games. Of the 20 top-selling video games in 2006, nine were sports-related games, including *Madden NFL 2006, NBA Live 2006,* and *MVP Baseball 2006* (Entertainment Software Association [ESA], 2006). Such sports games are typically so realistic and complex that college-level and professional athletes use them as part of their ongoing off-the-field training (Machosky, 2005; Rosewater, 2004). Furthermore, playing sports video games seems to be associated with participation in real-life athletic activities (Silberman, 2005a).

This article will show how video gaming is an untapped resource for enhancing young people's motivation and ability to participate in a wide range of sports and other movement-based activities. Many educators have already recognized that technology can be an important means of supporting general learning in schools and particularly in physical education (Fiorentino & Castelli, 2005; President's Panel on Educational Technology, 1997). Various forms of technology have been advocated as tools for physical education, such as digital video clips for the creation of game-like practice situations (Fiorentino & Castelli, 2005) and for mental-skills training (Voight, 2005), or the Internet for activities like webquests to gather information about fitness concepts or other relevant material (Woods, Shimon, Karp, & Jensen, 2004). Commercial video games involving actual physical activity have been adopted with great success in some settings (e.g., Bosman, 2005).

This article focuses on the use of commercial video games that offer sophisticated and engaging simulations of popular team sports, such as basketball and soccer, and paired or individual activities, such as tennis and skateboarding (see table 1 for a list of representative games). The article will describe how such games offer simulated experiences that may enhance students' motivation, confidence, understanding, and performance in athletic activities.

Video Games and Learning

The use of video games for serious educational purposes is drawing attention from a growing number of educators and educational theorists (Aldrich, 2005; Klopfer & Yoon, 2005; Squire & Jenkins, 2003). While games are already being developed specifically for education and training, educators have also been adopting commercial off-the-shelf (COTS) games to teach subjects ranging from history to languages (Purushotma, 2005; Squire, 2005). Well-designed COTS games offer a number of advantages for learning, as described in detail by authors such as Aldrich (2005), Gee (2003), and Prensky (2000).

Empirical support for the effectiveness of video games as instructional tools is still rather sparse. The lack of extensive research support is due in part to the relative novelty of the technology, as well as the rapid evolution of this technology over the last decade. Still, there is a small but growing number of empirical studies that provide evidence of various learning outcomes. Research indicates that video games can be used to enhance spatial abilities (de Lisi & Wolford, 2002), motor skills (Fery & Ponserre, 2001), knowledge structures and transfer (Day, Winfred, & Gettman, 2001; Gopher, Weil, & Bareket, 1994), visual selective attention (Green & Bavelier, 2003), and problem-solving skills (Ko, 2002). Skilled video gamers show many attributes of "expert" behaviors, such as self-monitoring and problem recognition (Van Deventer & White, 2002).

Another source of support for the educational value of video gaming is the military, which has been using computer-based training simulations with success for decades. As one example, the Navy has conducted extensive research on the training value of *Flight Simulator*, a commercial game. They found that 54 percent more of the trainees who used the simulation achieved above average flight scores, compared to trainees who did not use it (Macedonia, 2002).

There have not been empirical studies on the outcomes of video gaming in physical education specifically. This article describes the most pertinent potential benefits of video gaming for supporting physical education by making analogies to the use of other media in physical education and results from other settings, as well as by drawing on the more theoretical claims made by other scholars and educators.

Construction of Mental Models. Current cognitive theory supports the notion that the mind works by storing records of actual experiences and constructing intricate connections among them (Clark, 1989; Gee, 1992). From this perspective, human understanding consists of how people imagine, or simulate an experience in a way that prepares them for the actions they need and want to take in order to accomplish their goals (Barsalou, 1999; Clark, 1997; Glenberg & Robertson, 1999). This notion of understanding is implicit in the use of mental-skills training in athletics, which engages athletes in creating mental images of successful performance (Voight, 2005). By engaging players in goal-directed actions within compelling virtual environments, video gaming can help players develop these mental models, or simulations of experience, in a more concrete and embodied sense than

Table 1. A Selective List of Sports Video Games

Nearly all of these games release new editions every year. They are usually updated with new players and features. Typically, the newest games will be the best games to use. The games listed here are appropriate for most age levels. They play on consoles—such as PlayStation 2, Xbox, or Game Cube—that link to a television. Many of these games are available for use on PCs. They range in price from $10 to $50, and consoles cost from $90 to $140.

Baseball
MLB Baseball PS2

MVP Baseball GC, PS2, Xbox, PC

Basketball
ESPN NBA 2k5 GC, PS2, Xbox

NBA Live GC, PS2, Xbox, PC

NBA Street GC, PS2, Xbox

Football
Madden NFL GC, PS2, Xbox, PC

NCAA Football GC, PS2, Xbox

Golf
Hot Shots Golf Fore! PS2

Tiger Woods PGA Tour PS2, Xbox, PC

Hockey
Gretzky NHL PS2

NHL Hockey GC, PS2, Xbox, PC

Soccer
FIFA Soccer GC, PS2, Xbox, PC

World Soccer Winning 8 Eleven International PS2, Xbox, PC

World Tour Soccer PS2

Tennis
Mario Power Tennis GC

WTA Tour Tennis GC, PS2

Other
Athens 2004 (Olympic game events) PS2

Dance Dance Revolution (Exergame-player moves on a dance pad to a song and movement sequence on screen) GC, PS2, Xbox

Rapala Pro Fishing PS2, Xbox, PC

Rugby 2005 PS2, Xbox

SSX (snowboarding) GC, PS2, Xbox

Summer Heat Beach Volleyball PS2

Tony Hawk Underground Series (skateboarding) GC, PS2, Xbox, PC

The United States Navy has long used an interactive video "game," *Flight Simulator,* to train its pilots.

through mental imagery alone. Video gaming allows players to experience immediate and often unpredictable consequences from their actions. Since video games can portray a diverse range of potential situations, players can develop a much wider set of mental models of what to do (Magill, 1993), enabling them to make better and faster decisions during actual physical activities (Chamberlin & Coelho, 1993; Starkes & Lindley, 1994). Fery and Ponserre (2001) offer evidence that visual simulation is effective for motor learning when the learner is intentionally using the simulation for learning and attempts to sense the execution of the simulated action by "getting into the body of the virtual player" (p. 1034).

Learning Tactics and Strategies. While the above point refers broadly to how video gaming can develop an embodied understanding of physical performance, video games can also be used to help students acquire more specific declarative knowledge of strategies and tactics in sports and other physical activities. This is perhaps the most common reason that professional athletes use video gaming: to enhance their mastery of new strategies and to become more aware of and responsive to the strategies that might be used by their competitors (Silberman, 2005b). Video clips are already used by coaches and physical education instructors as tools for analyzing athletic performance. Video games offer the advantage of more closely tying observation and analysis to practice; a clip can be observed and then practiced immediately in the game, or a game play can be recorded and then observed and practiced once again. As Fery and Ponserre (2001) point out, sport video games provide very sophisticated virtual sequences in which learners can acquire appropriate knowledge. They offer examples from golf video games, which "provide bird's eye views together with virtual trajectories to explain the best approach to the hole or the most suitable alignment from a range of optional visual alignments between the club, the ball and the hole" (p. 1025).

The realism of certain aspects of particular games can be used to introduce some key movement concepts. For example, in *Mario Power Tennis*, the power of a shot is affected by the (virtual) player's position relative to the ball, the ball's height, and the direction in which the player is headed when he or she strikes the ball. Since the video game user controls the virtual player's movements, the user may obtain feedback on the power required by viewing previously performed shots.

Acquiring the Language of Sports and Other Physical Activities. An important aspect of developing proficiency in a sport or other physical activity is learning its language (i.e., learning key terminology as a means of understanding the activity and communicating that understanding to others). Video games typically provide "situated" language learning, by integrating terminology into game play. For example, the names of particular moves may appear on the screen while they are executed, terminology may be reinforced orally as well as in writing, and in-game tutorials and game manuals often provide definitions and examples of movement language. In addition, games typically immerse players in simulated social worlds associated with sports, and players are often exposed to conversations and comments by virtual players who speak the language of that particular sport culture.

Practice in a Psychologically and Physically Safe Environment. Video gaming, when done independently, offers a "sandbox" (Gee, 2003), or psychological moratorium, where students can experiment with fewer risks to their self-esteem and physical safety. Mimicking a better player is a key to learning new athletic skills, and games offer ample opportunities for students to observe virtual players successfully execute skills that may be new to them. Students who are less adept than their peers can become familiar with various moves before engaging in the actual activity. Even more-experienced players may benefit from opportunities to observe and rehearse new skills in a low-threat environment. Students can also learn about team roles on their own before practicing these roles with their peers. By reducing the negative consequences of failure, video games can enhance students' self-image as athletes and increase the likelihood that they will experiment with new movements on the real athletic field.

Differentiated Instruction. Shelley Paul Smith (2005) persuasively argues for a broad view of differentiated instruction in physical education, across motor, cognitive, social, and affective domains of skill and knowledge. Video games offer considerable potential for tailoring the level of instruction to individual or group levels of proficiency in these domains. Many games can be played at various difficulty levels, and students can practice repeatedly until they achieve mastery. Even team sports can be practiced by individuals at their own level of performance. Video games might be effectively used for one or more learning stations, which allow students to practice different sets of skills in small groups.

Enhanced Motivation. The potential of video games to motivate engagement in prolonged and difficult learning is widely touted (Dickey, 2005). This enhanced motivation is due, at least in part, to the opportunities that games afford players to take on and play with new and compelling

identities. Players can imagine themselves as a favorite sports icon, a significant motivator given that, according to one study, 63 percent of 11- to 12-year-olds dream about being a sports star (Global Kids Study, 1999, cited in Youth Media Campaign, n.d.). Players can also create their own identity as an athlete. For example, *Madden* and *NCAA Football* allow gamers to create their own virtual players by designing body shape and skills, and to write their own name on the player's jersey. Games such as *Tony Hawk ProSkater* and Play2's *Home Run* give gamers the option of inserting their own photo as the face of their virtual player. In addition, students may be motivated by having a (virtual) professional athlete as an instructor, such as in the *Tiger Woods Golf* tutorial, where Tiger teaches players special shots. Success in a virtual sport can motivate students who otherwise would be reluctant to try out a new physical activity on their own. Anecdotal evidence suggests that some children who play sports games, such as basketball or tennis, become more motivated to participate in such sports. Furthermore, many young people who already have positive associations with video gaming may be motivated simply by the opportunity to "play" rather than "learn."

Collaboration and Teamwork. Various types of social interaction are obviously crucial in physical education, not only for the development of teamwork skills, but also for the creation of shared understandings of good practice. While many adults still hold an image of video gaming as a solitary pursuit, for young people such gaming is more often a communal activity (Pew Internet and American Life Project, 2003). Games typically are designed to encourage competitive play, either face-to-face or online. Young people often watch each other play, alternate watching and playing, and engage in continuous conversation about game play. Online affinity groups associated with various games share information and strategies, and serve as a nexus for joint game play. These groups, which typically interact through fan sites on the Internet, can be tapped into as additional resources for learning and collaboration.

Technological Proficiency. Video gaming can be used to enhance students' proficiency in using technology to support physical activity. This would help students meet two of the standards set by the International Society for Technology in Education (2000): standard three (ability to use technology productivity tools) and standard six (ability to use technology problem-solving and decision-making tools). In addition, video gaming can be used as a starting point for students' use of the web to locate information from fan sites, post advice and strategies, and discuss issues with a wide network of other players (International Society for Technology in Education, 2000). Students can even learn about the use of design tools in games that offer user-creation options, such as *Tony Hawk Underground's* design-a-skate-park or design-a-trick modes.

Game Features as Opportunities to Learn

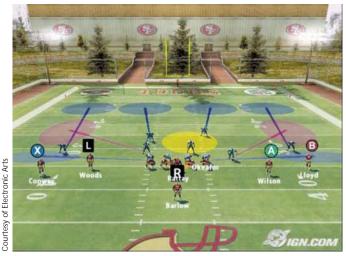This section will discuss a few common features of COTS video games that can be useful for physical education.

The video game, *Athens 2004,* allows players to experience Olympic events such as the high jump.

In-Game Tutorials and Instruction. Many games offer tutorials or embedded instruction to introduce new skills and scaffold the experience of new players. These tutorials are often quite sophisticated. For example, *World Soccer Winning Eleven 8 International* has four training options: beginner, free, situation, and challenge training. Beginner training teaches new players how to perform all the basic moves and explains the sport itself, the roles of the different players on the pitch, and even the offside rule (via a series of texts, diagrams, and demonstrations). Free training lets players take control of a team on a field where the only opponent is a goalkeeper. Situation training teaches players how to use some of the more advanced controls to make them more effective at dribbling, passing, shooting, attacking, and defending. Challenge training is a series of increasingly difficult trials that test players' skills in eight different disciplines: attacking, defending, dribbling, short passing, manual passing, free-kick long passing, free-kick shooting, and ball possession.

As another example, the street basketball game, *NBA Street Volume 2* has a game mode called "Street School." In Street School, a coach, Stretch, guides players through 36 practice lessons divided into three categories: offense, defense, and advanced.

In many games, instruction is embedded in actual game play. For example, *Tony Hawk Underground's* story mode introduces players to basic skateboarding moves through a series of challenges that advance the storyline, such as beating your best friend's score in a series of tricks.

Manuals and Guides. Most COTS games come with brief written guides that include basic information such as how to use the game controller. Much more extensive information is usually available online, in formats ranging from player-created guides, FAQs, discussion boards, and walk-throughs, to more official manuals. These sites often sponsor online competitions and contests for related activities (e.g., best screen shot, best player-constructed skatepark). Players can also post "cheats" that can be useful in modifying the game parameters (and not necessarily to make the game easier).

Video games such as *Madden NFL 2005* can be used to chart complex plays.

These sites can also be used to help students gain information about the history of a sport and its prominent players and events. *NBA Street Volume 2's* official web site (http://www.easportsbig.com/games/nbastreet2/home.jsp#) has extensive information on the legendary players who appear in the game. Many games have such information embedded in the game. For example, a series of COTS games based on the Olympics (*Salt Lake City, Athens 2004*, and *Visa Championships Torino 2006 Online Video Game*) allow players to experience Olympic events such as archery, weightlifting, equestrian, track and field, swimming, and shooting. They can help students become familiar with various events, including real world records and times in real Olympic scenarios.

Player-Role Configurations. Commercial off-the-shelf games generally offer one or more of the following options for game play: (1) a single gamer controls a single virtual athlete, (2) multiple gamers each control a single virtual athlete, (3) a single gamer controls a virtual team, and (4) multiple gamers each control a virtual team. Each option offers somewhat different opportunities for learning. For example, the first mode allows students to become familiar with one sport or position on a team without the participation of other students or even a teacher. The second mode can be used to help students learn to collaborate with each other or even with a virtual partner. For example, in *Mario Power Tennis* a student can play doubles with three other classmates. The game can also provide a virtual athlete to fill in if one of the foursome is unavailable for practice.

In the third mode, a student can take on the role of coach, choosing the overall team strategy and monitoring the actions of all team members. Games such as *FIFA Soccer 2006* and *NHL Hockey* allow gamers to choose their team based on information such as player statistics. Most team-based options allow gamers to control a select number of team members. In *NBA Street,* players not only have to see the whole court and make play decisions, they must control all five team members on offense and defense simultaneously. By playing in these modes, students can begin to get a wider perspective on how a team functions, various player roles, and the importance of a unified team strategy. Team modes allow students to play different positions and experience a sport from various perspectives, leading to a better understanding of team sports as interconnected systems.

Customizable Game-Play Parameters. In addition to player-configuration options, most COTS games are designed to accommodate different gamer ability levels and goals and to change the constraints of a particular setting. Many games can be played at different levels of difficulty, increasing the likelihood that all students can find a level that is challenging, yet not excessively frustrating. A number of games offer format options from mini-games to more extended "seasons," which can be selected according to the gaming time available in class or after school, or according to the goals of a particular unit or lesson. In some cases, games offer optional settings to increase the realism of game play. For example, *NHL Hockey* has an "action view" option that simulates the feeling of actually being on the ice, as opposed to a more aerial view. Many games offer location options, allowing the students or teacher to make choices about the particular stadium, golf course, skatepark, or other game conditions. These options can enhance student motivation by offering variety and by encouraging them to vary strategies to meet the demands of different contexts. As noted above, many games allow user creation of virtual athletes with different sets of strengths and limitations. This feature can be used to help students learn about the importance of acquiring various skills for success in different moves and strategies.

Tools for Feedback and Analysis of Game Play. Commercial off-the-shelf games often include features intended to support post-game or even during-game analysis of moves and strategies. These features are valuable educational tools because they get students in the habit of thinking critically about game play. For example, *Tiger Woods PGA Tour 2004* offers a "mouse-motion swing," in which the tempo and pace of the player's entire backward and forward movement affect the final result. The point at which the player stops the mouse, the length of the movement, and the amount of side-to-side deviation affect the result as well. After the shot, the game delivers a painstaking analysis of each factor of the swing, thus allowing the player to work on perfecting the speed of his or her backswing, general tempo, and/or side-to-side variances. As another example, *Tony Hawk Underground 2* has "focus/slow-motion" control options, which allow players to see their moves displayed in slow motion while they are executing them. Many games allow the replay of game segments for post-game analysis.

Implementation Issues

The cost of video game consoles and software is obviously an issue affecting their incorporation in physical education. Fortunately, as newer systems and games are released, older versions can be purchased for considerably reduced prices. A new PlayStation 2 can be purchased for about $150, and a used PlayStation 2 or Xbox can be bought for slightly more

than $100. While new game software can cost $50 or more, used or older games can be had for half that price or less. A basic television and one game station can be set up for less than $400.

Video gaming can be successfully incorporated even with just a few game stations. One approach is to use a learning-station arrangement, such as that described by Smith (2005). In this model, students rotate among different stations, individually or in small groups. Video games can be used for one or more stations, interspersed with stations that require actual physical performance. A number of sport games have multiplayer options that allow up to four students to play on the same system, with the addition of a few game controllers. Many games, as noted above, have tutorials or practice options that can be completed in the short periods of time that are typical of learning-station rotations.

Some physical educators may feel that using video gaming will take away from the time that students are engaged in actual physical activity. However, the use of such games may actually enable class time to be used more efficiently, as well as support the broader goal of encouraging youths to become more knowledgeable about physical activities such as sports, and more confident and enthusiastic about engaging in such activities on their own. Seifried (2005) makes a similar argument for the use of video-taped athletic contests, pointing out how educators can use such tools to help students analyze varied situations and anticipate the outcomes of various strategies. Video games can be used to reduce the time that students spend waiting to participate or are otherwise unengaged (Siedentop & Tannehill, 2000), by providing them with a motivating activity that does not require continuous teacher direction. For example, teachers can work with part of the class on physical skills while the others are grouped around game stations with specific assignments, such as to practice or observe particular strategies.

Video gaming can be used in similar ways during after-school programs, for team-sport practice, and for supplemental instruction during lunch hours or study breaks, by giving students relevant goals to master on their own time. Students can also research various game strategies or tools on the Internet during after-school hours.

The implementation approaches we have described are most appropriate for middle and high school students, who are more capable of working independently or in small groups. However, there are age-appropriate sport games for almost every grade level. Many students will have prior experience with gaming; those without such experience will need an introduction to the control system. Good games for beginners and younger players (5-11 years) are the *Mario Series,* such as *Mario Tennis and Soccer* and *Hot Shots Golf* (table 1 provides a list of games appropriate for somewhat older players). These games are animated and exaggerate fundamental moves. At lower grades, games can be used to enhance basic spatial reasoning, reaction time, and selective visual attention skills as well as introduce basic concepts associated with various sports. For younger students, teachers

Courtesy of Nintendo Corp

The *Mario Series* games target younger students with the use of animation and exaggerated fundamental movements.

might introduce gaming by demonstrating short segments of game play to the entire class, engaging them with questions about what they are observing, and suggesting moves. At any level, gaming should be combined with teacher questioning, discussion, and other reflective activities to promote student learning.

Conclusion

If educators accept the argument that COTS games have the potential to enhance physical play, then they should be willing to tap into this potential and experiment with new strategies for incorporating them into their gyms and classrooms. Children are more likely to be inactive and overweight now then ever before. So if they are not motivated by traditional methods of teaching sports and physical education, then conceivably it is time to find ways to employ a medium that many young people are familiar with and already enjoy.

Video games, when introduced into traditional classrooms, have been received with enthusiasm by students who are otherwise unexcited by the standard curricula. Likewise, video games may attract youths who are not typically interested in gym class and offer an alternative transition into sports and physical activity. All students can benefit from the unique qualities that these games embody: adaptability, individualization, collaboration, experimentation, and role-playing as professionals. Educators may find that video games are a stimulating and valuable addition to their instructional endeavors.

References

Aldrich, C. (2005). *Learning by doing: A comprehensive guide to simulations, computer games, and pedagogy in e-learning and other educational experiences.* San Francisco: Wiley.

Barsalou, L. W. (1999). Perceptual symbol systems. *Behavioral and Brain Sciences, 22*, 577-660.

Bosman, J. (2005, October 13). Putting the gym back in gym class. *New York Times*, p. E10.

Chamberlin, C. J., & Coelho, A. J. (1993). The perceptual side of action:

Decision in sport. In J. L. Starkes & F. Allard (Eds.), *Cognitive issues in motor expertise* (pp. 135-158). Amsterdam: Elsevier.

Clark, A. (1989). *Microcognition: Philosophy, cognitive science, and parallel distributed processing*. Cambridge, MA: MIT Press.

Clark, A. (1997). *Being there: Putting brain, body, and world together again*. Cambridge, MA: MIT Press.

Day, E. A., Winfred, A. Jr., Gettman, D. (2001). Knowledge structures and the acquisition of a complex skill. *Journal of Applied Psychology*, *86*(5), 1022-1033.

de Lisi, R., & Wolford, J. L. (2002). Improving children's mental rotation accuracy with computer game playing. *Journal of Genetic Psychology*, *163*(3), 272-282.

Dickey, M. D. (2005). Engaging by design: How engagement strategies in popular computer and video games can inform instructional design. *Educational Technology, Research and Development*, *53*(2), 67-83.

Entertainment Software Association (2006). *2006 essential facts about the computer and video game industry*. Washington, DC: Author.

Fery, Y. A., & Ponserre, S. (2001). Enhancing the control of force in putting by video game training. *Ergonomics*, *44*(12), 1025-1037.

Fiorentino, L. H, & Castelli, D. (2005). Creating a virtual gymnasium. *Journal of Physical Education, Recreation & Dance, 76*(4), 16-18.

Gee, J. P. (1992). *The social mind: Language, ideology, and social practice*. New York: Bergin & Garvey.

Gee, J. P. (2003). *What video games have to teach us about learning and literacy*. New York: Palgrave/Macmillan.

Glenberg, A. M., & Robertson, D. A. (1999). Indexical understanding of instructions. *Discourse Processes 28*, 1-26.

Gopher, D., Weil, M., & Bareket, T. (1994). Transfer of skill from a computer game trainer to flight. *Human Factors*, *36*, 387-405.

Green, C., & Bavelier, D. (2003). Action video game modifies visual selective attention. *Nature*, *423*, 534–537.

International Society for Technology in Education. (2000). *National educational technology standards for students*. Retrieved October 20, 2005, from http://osx.latech.edu/students/s_book.html.

Kerner, M. S. (2005). Leisure-time physical activity, sedentary behavior, and physical fitness among adolescents. *Journal of Physical Education, Recreation & Dance. 76*(8), 26-30.

Klopfer, E., & Yoon, S. (2005). Developing games and simulations for today and tomorrow's tech savvy youth. *TechTrends, 49*(3), 33-41.

Ko, S. (2002). An empirical analysis of children's thinking and learning using a computer game context. *Educational Psychology*, *22*(2), 219-233.

Lager, A., & Bremberg, S. (2005). *Health effects of video and computer game playing: A systematic review*. Stockholm: Swedish National Institute of Public Health (Translation of Swedish NIPH Report 2005:18, ISSN: 1651-8624).

Macedonia, M. (2002). *Games, simulation, and the military education dilemma*. Retrieved May 1, 2005, from http://www.educause.edu.

Machosky, M. (2005, August 12). Athletes, military find video games educational. *Tribune-Review*. Retrieved November 12, 2005, from http://www.pittsburghlive.com/x/search/s_362803.html.

Magill, R. A. (1993). *Motor learning: Concepts and applications* (4th ed.). San Francisco, CA: Freeman.

Marshall, S. J., Biddle, S. J., Gorely, T., Cameron, N., & Murdey, I. (2004). Relationships between media use, body fatness and physical activity in children and youth: A meta-analysis. *International Journal of Obesity and Related Metabolic Disorders*, *28*(10), 8-46.

Pew Internet and American Life Project. (2003). *Let the games begin: Gaming technology and entertainment among college students*. Washington, DC: Author.

Prensky, M. (2000). *Digital game-based learning*. New York: McGraw-Hill.

President's Panel on Educational Technology. (1997). *Report to the President on the use of educational technology to strengthen K-12 education in the United States*. Washington, DC: Author.

Purushotma, R. (2005). Commentary: You're not studying, you're just…. *Language Learning & Technology, 9*(1), 80-96.

Rosewater, A. (2004, August 6). Hey, I'm practicing here, not playing: Video games so precise they help many drivers. *USA Today*, p. 6F.

Sager, M. (2005, Spring). "Next Level-Landon Donovan," *Striker*, 41-44.

Seidentop, D., & Tannehill, D. (2000). *Developing teaching skills in physical education* (4th ed.). Mountain View, CA: Mayfield.

Seifried, C. (2005). Using videotaped athletic contests within Mosston's teaching methods. *Journal of Physical Education, Recreation & Dance, 76*(5), 36-38.

Silberman, L. B. (2005a, May). *Athletes' use of video games to mediate their play: College students' use of sport video games*. Paper delivered at the 2005 Seminar Series, Caladonian University School of Computing and Mathematical Sciences, Glasgow, Scotland.

Silberman, L. B. (2005b, August). O*n the field and on the screen: Sport video game players in real and virtual play, training, and competition*. Paper delivered at the 2005 Massachusetts Institute of Technology (MIT) Summer Research Scholars Program Poster Presentation, Cambridge, MA.

Smith, S. P. (2005). Beyond games, gadgets, and gimmicks: Differentiating instruction across domains in physical education. *Journal of Physical Education, Recreation & Dance, 76*(8), 38-45.

Squire, K. (2005). Changing the game: What happens when videogames enter the classroom? *Innovate, 1*(6). Retrieved October 30, 2005, from http://www.innovateonline.info/index.php?view=article&id=82 .

Squire, K., & Jenkins, H. (2003). Harnessing the power of games in education. *Insight, 3*, 5-33.

Starkes, J. L., & Lindley, S. (1994). Can we hasten expertise by video simulations? *Quest, 46*, 211-222.

Van Deventer, S. S., & White, J. A. (2002). Expert behavior in children's video game play. *Simulation and Gaming, 33*(1), 28-48.

Voight, M. (2005). Integrating mental-skills training into everyday coaching. *Journal of Physical Education, Recreation & Dance, 7*(3), 38-47.

Woods, M. L., Shimon, J. M., Karp, G. G., & Jensen, K. (2004). Using webquests to create online learning opportunities in physical education. *Journal of Physical Education, Recreation & Dance, 75*(8), 41-56.

Youth Media Campaign. (n.d.). *Life's first great crossroad: Tweens make choices that affect their lives forever*. Retrieved November 1, 2005, from http://www.cdc.gov/youthcampaign/research/resources.htm.

Elisabeth Hayes (erhayes@education.wisc.edu) is a professor and Lauren Silberman (lbsilberman@wisc.edu) is a research scholar in the Department of Curriculum and Instruction at the University of Wisconsin in Madison, WI 53706.