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E Is for Everyone: The Case for Inclusive Game Design

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Introduction: Mia

Mia is a lovely 10-year-old with a beautiful dark complexion and expressive brown eyes. She is warm, bright, friendly, and loves to laugh. Unfortunately, the average person would not notice initially these things about Mia, because she is also nonverbal and unable to ambulate. She spends the majority of her time in a manual wheelchair with her arms strapped to the armrests. This is necessary because Mia can uncontrollably injure her own lovely face.

Mia has Cerebral Palsy with athetosis and spasticity. This presents as continuous uncontrollable writhing movements in her extremities, head, neck, facial, and oral muscles. It can also cause fixing, which can "lock" her in uncomfortable postures. Mia expends a tremendous amount of energy due to the fact that her body is in constant motion. Volitional movements, changes in emotion, illness, and stress can all cause an increase in these extraneous movements. Mia knows what she wants to do, but is a prisoner in her own uncooperative body (Angela Passariello-Foray, Mia's therapist, "Mia case study," private online forum discussion with author, November 11, 2006).

The work described in this chapter is based on a truly collaborative effort, and would not have taken place without the support and guidance of the following individuals:

The Henry Viscardi School in Albertson, New York: I would like to thank the amazing students at HVS—your names have been modified for privacy considerations, but you know who you are. Learn your rights and advocate! In addition, this work would not have been possible without the guidance and support of the occupational therapists at HVS: Maureen Aliani, Jane Carvalho, Janet Gambitsky, Kelly Gannon, Ahmee Ko, Marlana Lipnick, Kate McGrath, Jennifer Noronha, Angela Passariello-Foray, and Chris Marotta. In the most humble manner, they are breaking new ground daily by using technology in a revolutionary, yet sensible and responsible, manner. Thank you for sharing your genius with me. I hope this chapter does it justice. On the executive end of HVS, I thank Patrice Kuntzler, Jeanette Glover, and Jill Carroll, as well as Alberto Bursztyn from the Global Institute at Abilities! for facilitating this most wonderful collaborative effort.

Interactive Telecommunications Program, Tisch School of the Arts, New York University:

My work at HVS, and particularly the *Tetris* case study emerged from a collaborative effort with two dear friends and colleagues, Jennifer Kirchherr and Hsiao-Ho Hsu, with the seminal guidance of Michael Schneider and Christine Brumback. I would also like to thank Marianne R. Petit and Anita Perr for their ongoing support and tutelage in the field of Assistive Technology. And to Nancy Hechinger, thank you dearly for your invaluable mentorship and guidance.

The MacArthur Foundation: Katie Salen, my editor, was entrusted with the task of molding coherent prose from within my rambling mind. I credit her with all that was made right in the chapter, and take full responsibility for that which is not. Thank you, Katie.

Because of her condition, Mia is dependent upon others for all activities of daily living. She requires assistance for all of the things most people take for granted, such as eating, drinking, dressing, hygiene, communication, mobility, as well as playing games.

Mia is a student at Henry Viscardi School (HVS)[1] in Albertson, New York. This remarkable school educates approximately 200 pre-K to twenty-one-year-old students with a variety of physical disabilities and medical needs. Some students are more physically able than Mia, while others are as medically fragile. It is important to note that despite these medical needs, the children at HVS are as academically able as other typical students their age.

In the winter of 2004, I was invited with a group of my NYU[2] colleagues—Jennifer Kirchherr and Hsiao-Ho Hsu—to visit HVS. Our goal was to observe the daily routine of the students to see if we could help devise hardware and/or software applications to assist them in their school activities. While not engineers, we are trained in the design and prototyping of computer software and hardware. My background is in new media art and game design. Therefore, I was particularly interested in learning about the gaming habits of the children at HVS. In order to facilitate the collaboration, several students were given the option to join us in the occupational therapy room for an hour of computer gaming. I was to bring the Playstation, Xbox, and computers, and children who wished to participate were asked to bring their favorite game titles. What an amazing opportunity to witness game play in the special need sector, I thought to myself.

We arrived at the school grounds during the lunch break. On our way in, we passed through the school's cafeteria, where we found children huddled in groups around tables, laughing and teasing each other. Some students were sitting in pairs, and some were being attended by a caregiver. Many sat in wheelchairs and some used respirators, but this did not stop the place from vibrating with the all-familiar energy of school cafeterias! I was happy that we got to see this spectacle, as it reminded us that above all, kids will be kids. When we entered the occupational therapy room at the school, it became apparent why it had been chosen as our playground for the day. The spacious room housed a wall closet filled with hundreds of games and crafts. Swings hung from the ceiling and colorful mats covered the floor. Interestingly, I noticed a row of laptop computers connected to a plethora of joysticks and other devices I'd never seen before.

Maureen Aliani, one of the school's nine occupational therapists (OTs), explained that lunch period had just ended and—any minute now—we should expect children to march in with their favorite games.

Five minutes passed, and no one showed. One child passed in the hall and Maureen ran out to meet him: "Hey Miles, are you here to play games?" Miles looked into the room, noticed me, looked back at Maureen and said, "No thank you, Miss Maureen, I have a history class right now." No one else appeared after that.

Needless to say, I was disappointed and bewildered by the apparent lack of interest. But mostly I was saddened. My own childhood was greatly enriched by computer games; my next-door neighbor was the first to have a computer on our street, and a group of four friends always played together at his house. When my parents also brought a computer home, I was the only one with enough "experience" to operate computers and so became the house expert. Whether it was playing alone or with friends, playing computer games was a highly imaginative, socially engaging, and overall empowering experience. But mostly—it was fun!

Twenty years laters, video games are one of the most coveted forms of play for our youth, so why didn't the children at HVS want to play?[3] Thinking this over, I realized that I had no idea how Mia could play video games when her two hands were secured to her chair. Were video games inaccessible to such a degree that some children at HVS simply avoided them? Was the problem related specifically to video games, or was it a subset of a larger phenomenon? If so, what kind of design intervention would be needed to accommodate Mia and children with similar restrictions? And once applied, how would it affect their lives?

In order to learn about the role of video games in the lives of children with disabilities, I would first need to understand the underlying play habits of children like Mia.

Lack of Play

Because of their disabilities, some of the children at HVS cannot play catch in the yard with their peers. A few are also not able to construct a Lego castle or even nudge a chess piece on their own. Instead they require an adult to carry out the physical aspects of these play activities for them. Jane, one of the OTs at HVS, explains that this lack of independent play starts at a very early age:

> We all start out by touching and putting things in our mouth and thus experiencing the world. This is our first form of play. So what happens when a child does not have all of these components, due to a disability? Can you imagine not having the opportunity to crawl on the rug, take your shoes off and run on the grass, or feel the water moving under your hand? These playful sensory motor experiences are the ones that shape our brains. But when they don't exist, the sensory-deprivation produces an inability both to explore, and later manipulate, the environment. (Jane Carvalho, Personal communication during Interview on October 31, 2006)

As a child matures, this lack of an opportunity to explore translates into deficiencies in the child's sensory-motor, cognitive-perceptual, and social-emotional abilities.[4] For example, not being able to run playfully in the yard, play catch, or toss things around produces difficulties in spatial relations, prediction, and directionality, which later affect the child's ability to navigate in space. At HVS, the therapists trace such perceptual deficits to the tremendous difficulties that some children have when learning to control their powered wheelchairs.

Lack of independent play also affects the child's self-image.[5] Typical children are bound to the rule sets that adults impose all day long—"finish your food," "brush your teeth," "time for bed," and so on. But moments of independent play allow them to disengage from these constraints, devise their own rules and use these rules as a framework for imaginative activities. However, for some of the children at HVS, attempting to play independently with traditional toys often yields frustrating results that only heighten an awareness of their disabilities. This leaves them with no choice but to concede to adult assistance (and thus supervision). In the long run, the children's inability to face challenges independently prevents them from learning resiliency, as well as from experiencing mastery. Instead, they get used to the caregivers' mediation and may, therefore, develop a sense of helplessness rather than control over their environment.

Ideally, a healthy child should have a balance between various play activities: mediated as well as independent, physical, and cerebral.[6] But a child with disabilities may require assistance to complete physical tasks, and therefore experience mostly mediated play, with little or no opportunity for independent play. This imbalance can affect the child emotionally, cognitively, and physically, and—as the next section illustrates—socially, as well.

Social Play

According to Chandler,[7] as typical children grow, they encounter and engage in several stages of play:

- *Solitary Play* is a form of play in which a child learns both to relate to and to manipulate his or her environment independently.
- *Onlooker Play* is the first form of Social Play, in which the child who is playing is observing the children around him or her.
- *Parallel Play* is a social activity in which several children are playing with the same materials, but not together.
- *Associative Play* is a social activity in which several children are playing together, but in a loosely organized fashion.
- *Cooperative Play* is the most developed form, in which children accept designated roles and are dependent on each other for achieving the goals of the play.

Although children encounter these stages of play within various sequences, children who experience problems with solitary play and sensory stimuli may not develop the appropriate self-esteem and confidence toward engaging in social play. This is one of several factors that can hinder the natural emergence of such social activities. For example, the extra time that some children with special needs spend completing simple activities of daily living (such as toileting, dressing, and eating) may come at the expense of the playtime that typical children enjoy. Furthermore, organizing social activities for children with disabilities may require a significant amount of effort and resources on the caretaker's behalf; such activities may not occur as often or as naturally as with typical children. The therapists at HVS find that when a peer-social setting eventually does become accessible, some may not know how to cope with it:

> Angela (OT): Even when our students are given the opportunity, as when the school organizes social events, some of them don't want to go. They come to therapy instead! We tell them 'Go Have Fun!' but they reply 'I have OT, I have OT' [trying to convince the therapists that it's time for their occupational therapy session]. They feel more comfortable with care-giving adults than peers of their own age. They simply don't know how to handle the social setting, and playtime is where they should have learned it.
>
> This has an enormous affect on their adult lives. When we start training them for job interviews, we find how hard it is for them to handle new challenges and new scenarios. Once again, they look for the familiar setting and wish to avoid the unknown. (Angela Passariello-Foray, Personal communication during Interview on November 7, 2006)

While listening to Angela's explanation, it became clear that I had made several mistakes in my initial visit to HVS. I'd invited the children to participate in an unknown social activity with a stranger, without providing any guarantees that they could actually engage in the proposed play activity. These factors placed the children in a vulnerable situation where *unmediated, independent* play was not likely to occur. It was not that the children at HVS did not like video games or did not want to play them. Rather, I had not provided the children with a comfortable social setting to engage in play. In fact, as the next section will illustrate, when therapists do provide the proper support, the children indeed happily engage in many forms of play, *especially* video games.

Pathways to Independent Gaming

Here lies the core difference in the manner that typical children and children with disabilities engage in play. While *all* children love to play games and crave these experiences, the *pathways* to these gaming experiences may be compromised, due to a disability. A typical pathway allows children to approach a play activity naturally with little risk of failure. But for some children with disabilities, there's no guarantee that the play activity is accessible to them. In other words, the pathway to the game or play experience is riddled with risks of failure and possible assertion of one's own disabilities. Such a pathway may deter the child from engaging in the activity to begin with. In addition, social settings provide witnesses to a potential failure, which further deters the spontaneous desire to engage.

As illustrated above, when a child with disabilities fails to engage in independent play activities, she does not gain the experience of play that typical children pick up during childhood. Instead, she learns how to depend on her caretaker and experiences highly mediated modes of play. In this sense, dependency and inexperience can be viewed as two sides of the same coin. Dependency on a caregiver causes inexperience in playing independently, and this inexperience creates further dependency on the caregiver. Hence, a vicious cycle commences, with each iteration of the cycle affecting development of self-esteem and confidence to engage in social settings.

To break this cycle, such children require better pathways to independent play, which can support the development of self-reliance and the confidence that leads to social aptitude. Many traditional play activities—such as playground sports and even board games—do not offer the necessary pathways, due to their constraining physical nature. Could digital games be any different?

Digital Technologies: New Pathways for Game Play

Digital technologies are allowing people with disabilities to do things that would have been considered science fiction in the past. Stephen Hawking's speech synthesizer (word-prediction device), for example, enables one of the most potent minds of our century to communicate his brilliance, despite an inability to talk or write. Like Hawking, many children at HVS also use regular desktop and laptop computers for communication. Some can control a mouse and keyboard, and only require that assistive software be installed on their computers. Others use a plethora of specially adapted hardware input devices, ranging from uniquely shaped joysticks to eye/face tracking camera systems (Eye Gaze and Head-Mouse). There's even a "Sip & Puff" straw that sends signals to a computer when the user inhales and exhales through it. These solutions all outfit a standard computer with assistive software and hardware, allowing users to operate typical applications such as Web browsers and word processing software. When more comprehensive solutions are required, Augmentative/Alternative Communication (AAC) devices are used. These are laptops that are dedicated to helping the user with communication tasks. Whether it's a simple $50 adaptive switch or an $8,000 AAC device, digital technologies allow millions of people to communicate and accomplish a myriad of everyday tasks, which can vastly improve their quality of life.

What is the "secret ingredient" that renders digital technologies so useful in this respect? Perhaps it is the manner in which they allow common tasks to be decoupled from their original physicality. For example, the "cut and paste" functions in a word processor do not actually require us to physically use scissors and glue, but rather *simulate* the act by using a keyboard/mouse interface. In this respect the software function offers an alternate (hopefully faster, more efficient, and easier) way to edit a document, such as the one you're reading now. This is particularly helpful to people with disabilities, as such solutions provide them with alternative and/or augmentative ways to accomplish tasks that would not have been possible to achieve in their original physical-operation form, including activities like typing, writing, vocalizing, operating household appliances, and also playing games.

Digital Play in the Therapy Room

At HVS, the OTs are no strangers to the importance of play and are well aware of the benefits that digital technologies provide. Traditionally, therapists have been using play as a motivational tool for children with disabilities to engage in therapeutic activities that are otherwise boring, repetitive, and even painful. For example, board games are used to practice hand–eye coordination, spatial relations, and other skills that children without such disabilities pick up as they play. Many different forms of traditional games are also used to assess the child's initial condition toward occupational treatment, as well as the child's progress over time.

But these traditional games also carry limitations. For children who cannot move the game pieces by themselves, the play activity is of a surrogate nature; the therapist conducts much/all of the game's physical actions in order to stimulate the child's cognitive processes.

However, using digital games that children can control independently enables them to act on their own and thus engage in a complete therapeutic experience that activates both motor and cognitive processes. These unmediated play activities are similar to a typical interaction between a caretaker and child during play: each party is *responsible for his or her own actions*. The children themselves find this play experience most invigorating, and are empowered by their accomplishments.

For example, some students at HVS cannot reach out and move chess pieces on their own. Instead, on every turn they must communicate their choice of move to an assistant, who then carries on the physical task for them. Playing the game in this manner develops valuable cognitive skills for the children, but it bears little value toward development of hand–eye coordination, muscular exercises, and other physical aspects. On an emotional level, not being able to control the play independently enforces the notion of helplessness that the child experiences on a daily basis.

In contrast, installing a digital chess game on an accessible computer may enable the child to move the simulated chess pieces on the screen *without assistance*. Here the child is in full control of the challenge by completing a cognitive desire with a physical act, which heightens the child's sense of accomplishment. From a therapeutic standpoint, the child improves hand–eye coordination, directionality, and visual perception. By practicing the operation of the computer on which the game is installed, the child also improves his or her overall literacy of using computers toward other nongame tasks.

In providing alternate means for children with disabilities to utilize their cognitive abilities, their pathway to the game mirrors that of a typical child. Aware of this fact, the children not only tap into the full learning potential of the game, but are also empowered by the fact that they can play the game in a "typical" manner. All of these factors render the digital game beneficial as a therapeutic tool, and an equally fun one for the children to play.

One other strength of digital games for children with disabilities is their ability to simulate physical space. Similar to the way a NASA pilot trains on a simulator for a real flight, therapists at HVS (and beyond) use 3D games to train the children to use their powered wheelchairs. Such activities help the children gain confidence as they make up for inexperience navigating in physical space.[8] The training also prevents many accidents from happening during the first few sessions with the real chair.

In fact, therapists at HVS use digital games for many training activities. I was surprised to learn that digital games are also used for helping children to do their homework. One of the *main* tasks of the OTs at HVS is to enable children to complete their school activities, be they reading class material or typing homework assignments. As mentioned above, students who cannot turn a page or use a pen often rely on computers as a means for reading and typing. But outfitting a computer for such a child is not an easy process; it first requires experimentation with various input devices and usage methods, as well as training in both cognitive and physical methods. The only way to achieve assessment and training is to have the child spend continual periods of time with the various devices. But like other therapeutic activities, this process is often boring, repetitive, and even painful for children. To solve this, therapists found that installing computer games on the children's computers can do much of the initial training. The children enthusiastically play the games using their adapted computer controllers (or keyboard/mouse in some cases), and inherently learn both general computer literacy skills and the unique aspects of their assistive technology systems. For occupational therapists interested in finding ways to engage kids in learning how to use the assistive devices they require, this kind of commitment to practice represents something of a holy grail. Consistent engagement with the assistive devices also enables the therapists to assess the systems and, over time, customize them to the child's particular needs. The therapists I worked with noticed that children who play computer games start using their devices at an earlier age and with greater success.

Overall the therapists at HVS are very excited about the benefits of digital games for therapeutic needs, and would like to see the benefits carry over from the therapy room to the living room, playground, and eventually workplace.

Beyond Therapy: Digital Games as Conduits for Social Belonging

When parents think of video games, they visualize a child sitting in a dark room shooting monsters. "Where are the good old days when children played with friends in a sunny backyard?" they ask. Such impressions can be disturbing to any parent who cares about the child's social activities, and this is doubly true for those who care for children who are already segregated by disabilities. If these children are already socially isolated, do we really want to place them in front of more isolating technologies? Shouldn't we be trying to get them to spend more time with their peers instead?

To better understand the potential of digital games as social conduits, we first need to dismiss the myth that *all* video game play is socially isolating. As Henry Jenkins explains:

> Almost 60 percent of frequent gamers play with friends. Thirty-three percent play with siblings and 25 percent play with spouses or parents. Even games designed for single players are often played socially, with one person giving advice to another holding a joystick. A growing number of games are designed for multiple players—for either cooperative play in the same space or online play with distributed players.[9]

In addition, Van Schie and Wiegman[10] found no evidence linking frequent game playing behavior with social isolation, while Colwell et al.[11] found that teenagers who reported frequent game playing are more likely to meet with friends after school.[12]

There are a number of mainstream games that capture the imagination of a large group of children across gender, race, age, and ability. In days past it was *Pong*, *Space Invaders*, *Tetris*, *Mario Brothers*, *The Sims*, and many more. These games often spark conversations and debate. Like a popular sport, video games provide a platform for competition and mentorship among peers and siblings. It is not uncommon to find children practicing a game at home, much like they would practice jump shots in the yard for tomorrow's big game. Here's one account of a child at HVS who uses video games as a way to connect with his brother:

> Jack goes out with friends to play baseball and stuff but I can't join him. We almost never played together as kids. But now we have a PlayStation and play together when he's home. I'm better at *SmackDown*—it's the only place where I have a chance to beat him [He laughs]. Also when we play together [against the computer], I tell him "you got my back in real life, but I got your back in here."

Billy is lucky in the sense that he can control most video games. At HVS I only found a small number of students able to play mainstream video games in this manner. Interestingly enough, this group exhibits the same social interactions around games as those of typical children. For example, they meet up on Friday afternoons for competitions, arrange play-dates at each other's houses, and use their abilities to play these games in order to meet people outside of school. Of particular interest is Eric, who demonstrates remarkable skills when playing *Madden NFL 06 by EA Sports*—one of the most popular football video games of all times. Eric plays the game while sitting uncomfortably in his wheelchair, with limited motion in his arms and fingers. When competing against other typical players, he does not ask, or receive, any special treatment. Imagine the empowering feeling of a young man who can compete and win on equal terms as his nondisabled peers.

Breaking many of the stereotypes of a gamer, Eric is neither a "nerd" nor a recluse. He is one of the most social students at HVS. I asked Eric if there's a reason that he can play *Madden* so well. He explained that, although the game does not intentionally implement any accessibility features, it allows him to play in a way that emphasizes tactics over sheer speed. Eric stressed that he also plays many other games beyond *Madden.* I asked if he also plays *World of Warcraft.* He said that he does, but not nearly as much as *Madden.*

> When I go to Giants stadium with my brother and say that I play *Madden,* everyone knows what I'm talking about. *Madden* is about football and everyone knows football. But if I say that I play *World of Warcraft* no one will have a clue what I'm talking about! ("Eric"—Student, Personal Communication during interview on November 14, 2006)

Eric's response epitomizes the full social potential of video games as conduits for social acceptance. For Eric, the added value of *Madden* is its wide social appeal—a game that carries social weight beyond the gaming world. As Eric points out, this particular game has embedded itself in football culture. Most of the other fans whom Eric meets at the stadium are either playing the game or know someone who does.

To get better at the game, Eric uses the XBoxLive feature which allows him to play with other players online. He also uses a headset microphone to talk with his opponents and discuss strategies. The person on the other end does not know that Eric has a disability. As far as that person is concerned, he's "just" a great player.

While playing online allows Eric to practice against hundreds of other players with unique strategies, he also loves to play face to face with his friends from HVS. Having a popular game become accessible and remain so over a long period of time can allow children like Eric to nurture their skills and prove their abilities in a medium that matters to their peers.

Unfortunately, Eric's ability to play Madden 2006 is mainly a happy accident rather than an educated design decision by the manufacturer. There's no guarantee that the features that make the game currently accessible to players like Eric and his friends will be carried over into the next versions of the game. Eric and his friends are constantly worried of how new "improvements" to the game or console will affect their abilities to play them.

Common sense would dictate that improvements to popular games, much like improvements to popular media, should include better accessibility to the general public. A good example would be the addition of closed caption for television. But, unfortunately, when it comes to the medium of games, this is yet to be the case.

Accessibility Barriers

Eric and his group of friends are the minority at HVS, as most kids cannot access the mainstream games that this group plays. Even the slightest impairments can severely compromise their ability to play mainstream video games. For example, color blindness may prevent some gamers from perceiving important details on the screen. This problem exists across game genres, whether it's the inability to distinguish between the puzzle pieces in casual games like *Luxor*, or to identify who's on your team and who's the enemy in games like *Halo* and *Counter-Strike*.[13] This problem could easily be remedied if game companies were to provide either better color schemes or more distinct patterns for game elements that share similar colors. Doing so could help several of the children at HVS, as well as about ten million potential players in the United States who exhibit symptoms of color blindness.[14] There's an avid community of independent game developers that is creating small audio games for the visually impaired,[15] proving that it is indeed possible to achieve this feat. Still, there are no attempts by mainstream game companies to attend to this large and currently untapped demographic.

Hearing impaired players often cannot follow the auditory portions of the game, be they spoken dialogue or other game events (like the roar of a spaceship approaching from behind). According to the National Institute on Deafness and Other Communication Disorders in the United States, some sort of hearing impairment affects 28 million people; 17 out of every 1,000 of them are children under the age of eighteen. These gamers could benefit greatly from closed captioning (CC), a system mandatory for television programming. Independent developers such as Reid Kimball,[16] a former member of LucasArts, are raising awareness around this issue by writing their own game mods to implement the CC system. Thanks to their work, several games—such as *Half-Life2* and *Doom3*—have been made accessible in this manner. Although these examples show that it is possible to implement CC in mainstream games successfully, most games still lack this simple and powerful accessibility feature.

Children with limited motor abilities may only be able to play with one hand, or to control the game with one type of device (keyboard/mouse/joystick). Unfortunately, most games do not allow these players to remap the controls of the game to these devices (despite the simplicity of doing so), leaving them unable to play. Furthermore, children with disabilities generally find it hard to play on standard game consoles such as the Playstation, Xbox, and Nintendo GameCube, because there are fewer adaptive and AAC devices that are compatible with these platforms, as compared to personal computers. Most adaptive gaming products are made by a handful of small companies that modify existing controllers or fabricate devices of their own. Modification is sometimes done by hand, one device at a time, or in low quantity production cycles, affecting the variety, availability, and price points of such devices. It is important to note that many of these hardware accessibility issues can be attended with software solutions, such as allowing users to remap the keys of a controller or using known techniques that allow players to control a menu with a single switch (called Scanning-Routines). Yet, despite the simplicity involved in doing so, most game companies do not provide an adequate level of customization for the hardware devices used to play their games.

These are just a few of the many problems that the children at HVS face when attempting to play video games. In fact, most games are so inaccessible that children with poor vision or mobility cannot even navigate to the menu button that starts the game! This leaves the children with a very small number of mainstream games that are playable in light of their limitations. Furthermore, a game that works for one child may not work for his or her friend, and thus social play is further compromised.

In the therapy room, the OTs work hard to cherry-pick the few games that are both accessible and age-appropriate for their students. Some of the games I observed in use are made specifically for educational and/or therapeutic use, such as *Fripple Town* by EdMark and *Roller Typing* by EdVenture Software. But many such "edutainment" games cater to ages K–3, and are therefore not age-appropriate for the majority of the students.

For the older students, the therapists search the Internet for casual and small online games that are simple to operate, yet still interesting. Although therapists would prefer games from educational sites like PBS and Scholastic, they rarely find accessible games there, as the designers of these sites do not have children with disabilities in mind when producing their content. This leads the therapists to other generic game-aggregating sites like lilgames.com, where the focus is on quantity rather than quality—the logic being that, out of the hundreds of small games available online, at least a few should be accessible to play.

While some of the games mentioned above are of good quality, they are rarely the default choices of the children themselves, who would much rather play the same mainstream games (*Tetris*, *Mario Brothers*, *The Sims*) that their siblings, peers, and even parents play at home. Interestingly, the therapists also prefer that the children play mainstream games instead of the smaller online games; while not explicitly educational, their complexity and depth could provide adequate motor and cognitive training that the children lack so much, and thus embed much-needed therapeutic value. Furthermore, mainstream games could allow children to engage in social activities and—like Eric and Billy—use video games as vehicles for peer learning and self-empowerment. Unfortunately, most mainstream games are simply not accessible to the children at HVS.

As seventeen-year-old Josh explains, the fact that mainstream video games are not accessible is especially disheartening:

> I'll never be able to run in the yard. Even when I play basketball in a wheelchair, I look weird and can only do it with other disabled children and a lowered basket. But I can play some video games like anyone else and it *looks* OK—no-one cares if I'm "crippled"—everyone is looking at the screen. It's annoying that so many games have stupid little things [access problems] so I can't play them. What the hell! Fix them already! How hard can it be to make the game work a bit slower or allow me to choose my own keys [to control the game]. They should amend the disability act that all video games include basic features like this. Don't even get me started! ("Josh"—Student, Personal Communication during interview on November 14, 2006)

Like Josh, many of the other children and therapists are deeply bothered that video games are not accessible, despite the fact that they bear a potential that traditional playgrounds never had. The potential stems from the fact that the children have better means of accessing computer software than they have for manipulating Lego sets, monopoly boards, and tennis rackets.

As a designer, I wanted to experience firsthand what it would require to make a *mainstream* game more accessible—a game that the children see others playing at home, and would also like to participate in. My main concern was that there are two hundred children at HVS, each with his or her own unique set of learning challenges. Was it even possible to develop a video game that could accommodate all of their individual requirements? And if such a feat could be achieved, would video games fulfill their full potential as conduits for both independence and social engagement?

Case Study: Adapting a Mainstream Game

Putting on my designer hat, I decided to learn about the design issues firsthand by attempting to adapt a mainstream game and make it accessible for as many children as possible at HVS. But which game to choose?

I knew that the game would be introduced during therapy sessions, but hoped the children would want to play it at home as well, with their siblings and parents. To allow the widest range of possible social connections to occur, it was important to find a game to which the therapists, parents, and siblings could relate positively. For example, I could not choose a violent game, as this could potentially alienate parents and therapists. Lastly, my resources were limited to a one-person programming team and a short production period, so I had to choose a game that I could produce on my own. One game that immediately came to mind was *Tetris*; I knew that the adults had probably enjoyed the game in the past, so familiarity with it was a bonus factor. I also wagered that the children would love the game once they got into it, despite the lack of fancy graphics and fireworks-style explosions.

Once I selected a commercial game to modify, I needed to figure out how to make it accessible to about 200 children with varying access circumstance and methods. Furthermore, making the game accessible would only be half of the task; I had to make sure that in modifying the game I retained its playability. What good is an accessible game that everyone *can* play if no one *wants* to play it?

Can They Play It?

A quick survey revealed that most of the school's children had either never played *Tetris* or tried the game once and did not enjoy it. To my surprise, there were quite a few children that had not even heard of the game.

I wanted to observe children in action, so I set up a regular *Tetris* game on one of the computers in the occupational therapy room. This computer was connected to a couple of assistive devices that cater to children who cannot operate a keyboard and/or a mouse. One of these devices was a switch interface—basically a number of large buttons that, when pressed upon, simulate designated keyboard keys. The computer was also connected to a special joystick device that simulates a mouse; moving the joystick on its axis operates the mouse cursor. To accommodate children who use these devices, I took four large buttons (switches) and I drew a big arrow on each of them. Using software that comes with the switch device, I mapped the buttons to the arrow keyboard keys, for example, pressing the large button with the left arrow is similar to pressing the left arrow key on a keyboard. I also changed the game's graphical interface to include four buttons with arrows on the screen.

Hovering or clicking on the buttons with the mouse/joystick would mirror the operation of pressing the keyboard keys. This allowed users to play the game even if they could not use a keyboard.

I expected most children to be able to operate the game using these adapted devices, but—to my surprise—this was not the case; some could not apply enough force to manipulate the controls in a timely manner. Some could not repeat the same motion more than a few times, due to fatigue and/or unwanted spastic movements. Some had to overcome tremors and did not have fine motor control over their fingers. On the cognitive end, some children had difficulties accomplishing hand–eye coordination between the physical device and the screen, asking "Which button do I press now?" Some children had difficulties with spatial relations, and could not figure out how to rotate the pieces into the desired slot. A few could not even perform left–right directionality, such as not moving a piece to the left even when it should have been an obvious move. Some children could not perceive the goal of the game ("Where did these blocks suddenly disappear to!?"), probably due, in part, to their overall lack of computer literacy. These were just a few of the many difficulties observed that day. Regardless of the particular difficulty, most children were easily frustrated and quickly gave up on the game's challenge after only a few minutes. While some children tried harder than others, it was apparent that the game was not enjoyable.

Returning from HVS that day, I was at a loss as to figure out how a game could be made to accommodate all of the difficulties that the children exhibited. Observing them at play was a sobering experience that made me realize how little knowledge I held in the field of assistive care. But although the particular circumstances I observed were foreign to me, I reminded myself that, at its core, this was still a game design problem; overall I'd observed over a hundred unique reasons that the children could not play the game. From a design standpoint, did each of these issues require a discrete solution, or did they stem from a larger design problem? If the former was true, I would have little chance to implement over 100 new features in the game in the time allotted (and no other designer could be expected to do it either). But if I could trace these issues back to a larger problem, there was a fair chance that I could implement the required changes to improve the game's accessibility for the children at HVS.

I began by considering the basic premises of game design: the craft of creating a game is based around the designer's ability to scaffold a series of challenges within the abilities of the player. The "trick" is to balance the difficulty of the challenge with the reward of conquering it. In practical terms, this means that a challenge that is *too easy* will result in a bland gaming experience, and one that is too hard will result in frustration. But what actually *happens* when the challenge is too difficult? Consider a marathon race. During the first few miles the runners are in good shape, but as the race continues, each runner reveals his or her weakness; some get dehydrated, others suffer muscle cramps, joint ache, low-blood pressure, and so on. Notice that all of these weaknesses can be traced back to the difficulty parameters of the race—its length, the terrain, the temperature, humidity, and so on. And it is only when these parameters create a challenge of great difficulty that these various weaknesses present themselves. This notion also carries over to video games. For example, if the parameters of a car racing game were made too difficult (via the speed of rivals, the force of the car's acceleration, etc.), some players would not be able to manage the controls physically, while others would have hand–eye coordination problems, lose focus, or simply tire out. By the same token, it was feasible that the children at HVS exhibited weaknesses that stem from game parameters that were too difficult. For a racing game, the solution would entail changing the parameters to slow down the rivaling cars, or increasing the capabilities of the player's car. What would the solution be for *Tetris*? How could the game play of *Tetris* fit within the ability range of children with disabilities? More precisely, what exact design factors were preventing the children from utilizing their *existing abilities* when playing *Tetris*?

By using this framework to analyze what I had observed with the initial *Tetris* sessions, I discovered that most of the symptoms exhibited by the children stemmed from two temporal aspects of the game: speed and pace.

1 *Speed:* In Level 1, a *Tetris* block takes roughly one to five seconds to reach the stack, depending on the board's configuration. This shape may require roughly one to ten interface operations (press and release actions via keyboard/mouse/joystick) to be manipulated into the desired position. This means the player may need to achieve operations at up to roughly one-tenth of a second (10 ms). Whether it's due to a cognitive, perceptual, motor, or other issues, some children at HVS simply cannot perform at this speed, even with assistive devices. Accuracy was also a problem, as some children couldn't release the block in time. This meant that the children required even more operations per second. For example, overrotating the piece (by not releasing the control in time) may require up to six extra operations to correct. Overall, even if a child knew exactly where the next *Tetris* shape should go, the game was simply too fast for the child to complete the action.

2 *Pace:* Some games like chess are turn-based, where the player performs an action and then waits for a response. But in *Tetris* the pace is constant, as the blocks just keep coming. Because of this, the children at HVS exhibited physical fatigue after only a few minutes. Furthermore, the game's ongoing pace did not allow intervention from the therapists, so there were almost no mediation opportunities to ease the initial frustrations of the children.

To rebalance the game to fit within the demonstrated abilities of the HVS players, I decided both to slow it down as well as to change its pace from that of a continual-action game to a puzzle game. I did so with one simple modification. In a typical *Tetris* game, blocks automatically fall downward toward the stack. I modified the game so the blocks "floated" in the air until the user explicitly dropped them with the down arrow key. This simple modification eliminated the temporal aspect of the game, allowing kids unlimited time to make a move, and also enabling mediation by therapists or peers to occur when needed.

Although, in theory, this should dramatically increase the accessibility of the game, it also presented a rather significant change to its core playability. I had concerns as to whether my changes would completely destroy the game and render it undesirable for the children at HVS. Would *Tetris* hold its timeless allure without its temporal challenge?

Will They Play It?

I brought the modified version of the game to HVS, and the OTs arranged for several students to try it out. Maya was the first to arrive: a sixteen-year-old with cerebral palsy (CP), a condition that affects her entire body. She's in a powered wheelchair, and her speech is hard to understand by those who do not know her well. Maya has little motor coordination with her hands, so pressing down on a keyboard key or a switch device requires her to exert effort equivalent to lifting a heavy box. While Maya had never played *Tetris* before, it took her less than a minute to figure it out, and she spent the next twenty minutes playing it. She used the four large buttons, and from the outside it looked more like she was exercising than playing a game.

The OTs explained to me that, despite her poor coordination and speech difficulties, Maya is planning to go to a typical college next year. She is one of the brightest children in the school, but her physical disability often blocks her from exercising and exhibiting her true talents. It is very hard for the OTs to find age-appropriate games for Maya, as most games with simple interfaces are made for younger children. This modified version of *Tetris* was one of the first games to provide an appropriate cognitive challenge for her. By removing the physical barrier, the modified game allowed Maya to enjoy and excel at its cognitive challenge. Lifting this barrier released a floodgate of excitement and joy, as Maya was definitely having a great time playing a game that she'd seen others play many times before but could never access herself. Witnessing Maya conquer the game so quickly was a powerful experience. I thought to myself, here is a girl that is obviously brighter and more will-powered than most typical children that I've met in the past.

The OTs next introduced me to Katerina, who—despite health issues—has full control of her hands. Due to visual deficits and perceptual issues, it takes Katerina a bit longer to process her physical surroundings. At first she did not fully grasp the game's goal and its operational aspect (such as using the top arrow to spin the shape, or why the rows disappear upon completion). But where play of the original *Tetris* game produced frustration, the modified version provoked discussion. Because there was no time limit (due to the floating blocks), Katerina and I were able to discuss strategies for solving the board and also to practice using the controls. In essence, the game allowed for a very important period of mediation to occur, which helped Katerina overcome her initial frustrations. After that, Katerina continued to play the game independently. Today, she plays the original version without adaptations.

As the day continued, it became apparent that most of the children successfully played the game. Over the next few weeks, the therapists continued to test it during therapy sessions. As time went by, we noticed that some children (like Katerina) started to improve to a point where the modified version became too easy. To remedy this, I added a feature to have the blocks either "float" (not fall down automatically) or fall regularly as in the original version of the game. I also added the ability to control the rate at which the blocks would fall, which allowed the therapists to adjust the challenge to an individual child's ability. Some of the children who started with floating blocks eventually tried to play with the shapes dropping at a slow speed, and then work their way up. This scaffolded feature was especially important to the children with cognitive issues, who were physically able to control the game but needed time to learn its basic rules. Many of these children just needed help overcoming their initial frustrations. Once they gained a bit of confidence, their abilities increased exponentially, and they eventually mastered the mechanics well enough to play the game as it was originally designed.

As a designer, I was amazed at how such a small change to a game's temporal aspect could have such a large impact on its accessibility. Notice that I did not directly attend to the multitude of child-specific symptoms. Doing so would have been impossible, even if I were an expert in the field of physical disabilities and child development. Instead, I identified the large design barriers from which the majority of these problems stemmed. By attending these barriers, I allowed the therapists and children themselves to fine-tune the game toward their own specific needs.

I realize that *Tetris* is a relatively simple game in comparison to many of today's mainstream game titles. Yet, by being attentive to the notion of designing inclusively for a wider range of abilities can vastly improve the accessibility of even the most complex games—perhaps not for everyone, but for many. At this chapter's end, I've provided a link to a Web site that includes a list of game-accessibility features (by several design experts, as well as by me) that could be implemented to any game with minimal resources, in order to increase its player audience.

Now that a pathway was cleared for the children to play with a video game on their own terms, I was curious to see if this pathway would also enhance social interaction through cooperative play.

Cooperative Play

I was, initially, not sure how to assess the social impact of the game. Fortunately, the first sign that my modified version of *Tetris* allowed for social interaction happened unintentionally. Due to a scheduling mix-up, two children showed up to play the game at the same time. (We initially had them separated into twenty-minute intervals). Both kids were around fifteen years old and used powered wheelchairs. Although they both have CP, Eric has fair control of his upper extremities and can communicate freely. An avid gamer, he had played *Tetris* before and masters almost any video game he picks up. Jonah, on the other hand, has a more severe condition that results in involuntary and coarse motion, greatly limiting his ability to communicate verbally. I expected Eric to take over the game immediately and leave Jonah in the background. But instead, Eric let Jonah sit at the controls. Jonah had never played the game before, and Eric started explaining it to him. We did not intervene. This mentorship went on for over thirty minutes, with a growing sense of excitement. With every shape that fell into place, Jonah became more visibly excited—occasionally turning around to us with a huge smile, but mostly laughing audibly at the screen, at times shouting—"*I love this!*" Eric, who picked up on Jonah's joy, became even more motivated to provide Jonah with strategies. Despite the fact that it took Jonah a considerable amount of effort and time to operate the buttons, not once did Eric take over the controls.

The game produced a tangible social relationship between two children that did not usually interact with each other. Eric happily surrendered his control over the game in favor of taking on a mentorship role. Jonah gladly accepted Eric's guidance and was uninhibited by the fact that he was the less skilled player. The therapists later explained that the two children do not usually hang out in school, primarily because they don't share common interests. Playing *Tetris* with Eric represented one of the few times that Jonah participated in this sort of spontaneous social interaction.

Beyond the Therapy Room

I had been able to make the game accessible to children in the therapy room. But to allow for a fully independent play experience by the children, the game needed to be accessible in the child's own environment. When playing a game in the therapy room, the therapist is there to help iron out any problems that may arise. This help ranges from making sure that the child has proper access to the controls to providing subtle suggestions and tips as the child plays the game. I was particularly worried about the latter, as I wanted the children to be able to conquer the challenges with absolutely no help from others. When typical children play alone in their rooms, they learn to rely on their own faculties. But some of the children at HVS are dependent upon their caregivers, and therefore exhibit low frustration levels and low confidence in their own abilities. To overcome this, I needed to scaffold a gaming experience that would encourage the children to remain engaged in the game even when difficulties arose.

As a first solution, I categorized the seven types of *Tetris* blocks according to their visual complexity. The square blocks and straight lines were categorized as the easiest; the *z*/*s* shapes were the most difficult. I modified the game to release the easy shapes first. Only once the player had completed a few full rows with simple shapes would the game introduce more complex ones. I added a menu-settings option to turn this feature on and off, for those children who wished to practice in this manner.

Another modification attended the fact that some children have conditions that flare-up or recede on a daily basis. Among other things, this fluctuation also influences their ability to play games. While a typical child can count on a constant improvement in playing the game, the lack of this sense of security in the quality of performance can be very frustrating. To address this, I used a traditional game design technique called Dynamic Difficulty Adjustment (DDA), where the game engine tracks player performance and adjusts itself accordingly. In a race game, for example, the lead car will slow down just enough to make sure that the player, who is running in second place has a chance to win the game. In *Tetris*, I created a system that tracked the player's ability over time, identified the current performance in the context of previous games, and modified the shape selection toward easier solutions when needed. To implement this feature, the player creates an anonymous user account that allows the game engine to store game play information. This online account also stores data of other game settings, including various controller settings, colors and sizes of the blocks, whether they should float or fall, and at what speed. These settings could be customized by the therapist during therapy and retrieved by the child when playing at home. Although not implemented due to privacy concerns, this user account could potentially be used to track the child's game play and to produce reports based on usage patterns.

Back at HVS, I presented the new version to the therapists and explained the customizable functionality. I also explained how the game could be downloaded from the Web and installed on the computer in the child's home. It was my hope that the above features would scaffold game challenge for the child in a way that would allow for truly independent play. The following interview with the OTs took place about a month later. I asked Jane to describe a memorable case study from the past month, and the conversation evolved from there.

Jane (OT):

Danielle is a sweet 15-year-old girl who is in the ninth grade at HVS. She is verbal and very eloquent, however she can't even breathe on her own. She is on a ventilator and requires nursing care 24/7.

The more I get to know Danielle, the more I realize that she lacks the fundamental social skills to interact with kids her age. Instead, she has gotten used to interacting with adults, because usually the attention is directed towards her. She constantly needs reassurance of how well she is doing and how smart she is. Her insecurity is probably rooted in her lack of essential life experiences—such as being able to play freely and easily. Because Danielle is a high achiever and seeks intense attention from her teachers, her classmates resent her. They often make remarks about her being a goody-goody, and how she is annoying.

With her, I particularly liked the idea of *Tetris* because I see the other students playing the game around her, and I think that this is something that—if she could do it—can help connect her with the other kids.

When I first asked her to play *Tetris* she said "I don't want to play because I'm awful in that game, I stink at that game!" She didn't even want to try because she had played the regular version before and had failed. I am sure Danielle has attempted to play other games in which she failed and eventually simply gave up.

I proceeded to explain to her about the adapted version created by Amit and insisted that she try. Reluctantly, she accepted and started to play, and she couldn't believe it. She said out loud, "I love this game! I'm really good at this game!"

As this was happening, there was another student playing at the same time, and he kept saying to her, "I'm so good at this game." She started accumulating points, and I could see that it was something that she could say, "Hey, you know I'm good at this game too—my classmate is doing well and so am I." It was clear that they where enjoying a good moment of parallel play.

How refreshing to see her so happy playing a game that most of her peers also enjoy! I think that she learned that there's a positive way to connect with the kids.

Kate (OT):

The boy that was playing on the other computer was my kid, and two weeks ago he was also saying, "I don't like this game I'm not going to play it. I'm no good at it." But the following week I set it up for him again, expecting the same response; but he said, "Oh yeah, I was doing it at home. I got an amazing score." Now he demands to play the game during therapy and write his high scores on the board for everyone to see.

Even when a kid is playing a game at home, he's actually participating indirectly with a social activity because that's what they'll be talking about tomorrow morning—eventually they will sit in front of the game together, eventually the kid will be able to show what he's achieved through practice. (Kate McGrath, Personal communication during Interview on November 7, 2006)

Ahmee (OT):

I agree. I was working with twin brothers who had just graduated. I put them right next to each other so they would play *Tetris,* and at the end of the period I would write their scores and keep a log. They wanted to beat each other, so I gave them the Web site for the new game, and they started practicing at home all the time, so that when they came in they'd be better than the other brother. These are two children that always shied away from challenges; but this sense of mastery provided them with confidence to challenge each other, and with the resiliency to try harder if they failed. I think that the social component of a mainstream game was crucial for this to happen. (Ahmee Ko, Personal communication during Interview on November 7, 2006)

Jane (OT):

It's interesting to see how the family members also play the game. One of my students uploaded the game at home, and both her parents ended up playing with her for the entire evening. When she went to sleep, her father wanted to play some more. Can you imagine her joy that she can play the same games as her parents? Can you imagine the parents' joy? (Jane Carvalho, Personal communication during Interview on November 7, 2006)

It was great to learn that the game allows children to exhibit mastery and connect among themselves, with their siblings, and even with their parents. There was one girl that I was particularly interested in learning about:

Angela (OT):

Doing "normal things" is mostly a far-fetched notion for a girl that communicates with the world by using a head-pointer—which is simple a stick attached to a visor on her forehead. To be honest, I did not expect Mia to be able to play *Tetris*. But that didn't stop us from trying. We set up four large switches on a slant-board and drew big arrows on them. The idea was to have Mia attempt to push the switches with the head-pointer by moving her head. Initially, Mia required maximum instruction and assistance to play the game, but was eventually able to play with minimal intervention from me. She was so pleased to be playing this game. She got so excited every time she heard the sound indicating that lines were disappearing and points were mounting. She indicated her score with her head pointer and tried to catch the eye of other therapists and students in the room as if to say, “Look what I did on my own.” Who knew! Mia is playing a game with the other kids. (Angela Passariello-Foray, Personal communication during Interview on November 7, 2006)

In consequent weeks, Mia became very good at using her head-pointer device to play *Tetris*. Happily playing the game every day, she learned new techniques for controlling the four switches that Angela set up for her on a slanted board. At some time, Mia began demonstrating levels of control even beyond her ability to operate her communication device. Noticing this, Angela encouraged Mia to try to control her communication software using the *Tetris* method. It turned out to be a good idea. It allowed Mia to operate everyday computers and speech communication devices with more speed and accuracy than ever before.

I could not have wished for a better example of transfer from the therapy room into the real world. It’s a nice example of how *just having fun* can have a serious impact on someone’s life.

Conclusion

According to Fröbel, play is the work of children. From early childhood, play activities are a vehicle for the exploration of one’s own abilities—to imagine, to win, to lose, to collaborate, to persist, and to master. As a child grows, the accumulation of these abilities contributes to a sense of self-identity. When a child cannot engage in play activities in a typical manner due to a disability, these aforementioned benefits are transformed into deficits: mastery turns into dependency, collaboration into isolation, and so forth. As the HVS therapists explained, because of this lack of play, some of their students do not know what to do when an opportunity for social play arises, affecting their ability later to engage in social activities such as those present in the workplace.

Aware of the dangers that lack of play poses, parents and therapists artificially re-create moments of play through supported activities both at home and in therapy sessions. Although vastly beneficial and always encouraged, these mediated activities intrinsically negate independent play, which naturally occurs for typical children. Granted, it is hard to create moments of independence for children with disabilities; leaving a fragile child alone on the playground with other children could be hazardous to the child’s health. And how can a child with limited mobility build a Lego castle without assistance? It is, therefore, very challenging for a mediator to be supportive while allowing for situations of independence.

Enter digital games. By nature, digital games use technologies that many children with disabilities are already capable of operating, using adaptive input devices. As the chapter illustrates, while these technologies are used primarily to enable children to communicate, they can also be used to deliver play experiences of an independent nature, as well as to improve the nature of supported play. Allowing children to act on their own ideas (either independently or during mediated play) vastly improves their sense of self-reliance and self-esteem. Furthermore, games of a mainstream nature (like *Tetris*) bring added value to the play experience, as the child can participate in an activity that is also performed by typical peers, siblings, and parents. In that sense, the game becomes a conduit for social inclusion. As Josh explains: “Even when I play basketball in a wheelchair, I look weird . . . But I can play some video games like anyone else, and it *looks* OK.”

While it is still too early to measure scientifically the impact of video games on the maturation of the child, the therapists at HVS have already established video gaming as a seminal therapeutic method in their sessions. At HVS, video games are used daily to produce tangible results; they are used for improving the student's fine-motor functions, hand–eye coordination, and other perceptual abilities, while also providing practice with cognitive skills. There's a clear carryover from the gaming environment to the real world, as children are motivated to practice with their communication devices by playing games using them. This has shown later to improve their abilities to use these devices for communication, as well as for standard school curriculum. In that sense, video games at HVS have revealed themselves to be valuable learning systems for problem solving, physical wellness, communication skills, formation of identity and sense of self, peer learning, and overall growth.

This chapter does not claim that video games are the *only* form of play for children with disabilities, but rather that they provide a viable complementary activity to existing mediated forms of play. As the chapter illustrated, digital gaming provides a new level of independence that may normalize overly adult-dependant play habits. In that sense, it enables children with disabilities to harvest the full benefit of a given play activity. If play is indeed the work of children, then video games provide new means of employment.

Next Steps

What can be done? And who should take on a leading role?

The initial change required is one of *attitude*. At a time when the overall effects of video games on typical youth are still being debated, we should acknowledge their unique benefits for children with disabilities. While some games are, indeed, overly violent for young children, this does not render the entire medium harmful. The real harm is done when we do not utilize the tools at our fingertips due to a lack of knowledge or imagination. With this in mind, caregivers and legislators should examine the medium without prejudice or moral panic. On the design front, game companies should become aware of the simple features that may make their products accessible to the millions who cannot access them (generating more money along the way). Perhaps most importantly, children themselves should know their rights and advocate for change.

Transforming this attitude into practical action requires various forms of engagement from the aforementioned groups, ranging from advocacy to collaboration. Whether you are a game designer, therapist, parent, policy maker, or a child that deserves better, please visit http://makebettergames.com for a pragmatic game plan for how *you* can help to make games more accessible.

There are no people with disabilities, just varying degrees of abilities.—Henry Viscardi Jr.

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