

The Rhetoric of Exergaming

Ian Bogost

The Georgia Institute of Technology

686 Cherry St.

Atlanta, GA 30332 USA

+1 404 894 1160

ian.bogost@lcc.gatech.edu

ABSTRACT

Recently videogames that use physical input devices have been dubbed “exergames” — games that combine play and exercise. This paper offers a historical perspective on exergames, from early arcades to the Atari 2600 through contemporary consoles, as well as a theoretical analysis of the different rhetorics such games deploy to influence players toward physically-active gameplay.

Categories and Subject Descriptors

K.4.2 [Computers and Society].

General Terms

Design, Human Factors, Measurement

Keywords

Exergaming, Dance Dance Revolution, Games for Health, Foot Craz, Power Pad, Nintendo, Atari, Playstation, physical input devices, rhetoric.

1. INTRODUCTION

The Dance Dance Revolution (popularly known as DDR) series of videogames are dance simulator games created by the Konami Corporation’s Bemani music games division. First released in 1998 as an arcade game, the game has enjoyed nearly 100 updated versions, including its appearance on videogame console systems like Sony Playstation, [23], Sony Playstation 2 [24], Sega Dreamcast [25], Nintendo 64 [26], Microsoft Xbox [27] and Nintendo GameCube [28].

DDR is a rhythm game; it is played by pressing sensors on a touch-sensitive dance pad in proper time with music. On-screen cues in the form of arrows show the player proper timing, superimposed on top of visually sensuous animated backdrops representative of the game’s characteristic electronic dance music. While the console versions of DDR allowed play using the directional pad, the physical interface of the arcade game turned it into a platform for public performance [15] — and a physically strenuous one at that.

Dance pad peripherals for home consoles emerged, underwriting more casual play than the arcades might allow, not to mention a reprieve for those uninterested (or unprepared) for public performance DDR. In the summer of 2004, high-end dance pad peripheral manufacturer Red Octane launched GetUpMove.com

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[41], a promotional and information website showcasing the uses of dance pads and the Playstation Dance Dance Revolution as a weight loss tool. Like many weight loss promotional campaigns, GetUpMove highlighted the most astounding successes, including a young woman who lost 95 pounds with no exercise program other than DDR.

The GetUpMove.com claims drew considerable media attention, including coverage from Fox News [16], USA Today [5], CNN [13], and Good Morning America [1]. In the aftermath of such widespread exposure, anecdotal market reports suggested that consumers were buying PlayStation consoles, dance pad peripherals, and copies of DDR titles solely for the purpose of exercise. This newfound trend was quickly labeled “exergaming” by the media, the “combination of exercise and videogames” [31].

The 2005 Consumer Electronics Show (CES) featured half a dozen exergaming vendors, and studies have been launched on the effects of such games on physical health and self esteem [43]. Such studies may become helpful justifications for games among an increasingly reviled games industry and an increasingly obese populous. But they tell us little about how these games attempt to motivate players to engage in physical activity.

The aim of this article is to interrogate contemporary exergames and other examples of physical input games from the last 25 years, to understand the various methods used to encourage physical activity through gameplay. For the purposes of the present study, I am not concerned with the physiological effects of these games — which games lead to more or “better” health effects. Rather, I seek to understand the ways that these games motivate their players to engage in physical activity.

2. A PREHISTORY OF EXERGAMING

The increasing media attention and market size of videogames and obesity (both separately and together) have fueled both public and commercial interest in exergaming over the last two years. This media blitz makes it easy to conclude that exergaming is a new phenomenon, but the earliest specimens are at least twenty-five years old. A brief pre-history of videogames that produce or require physical activity will help orient the reader to the past and present examples of exergaming.

Today we’ve become accustomed to videogames as a sedentary living room activity, akin to television watching. But in the video arcades of the 1970s and 80s, playing any game, from *Pac Man* [33] to *Pole Position* [34], meant standing up at the cabinet and putting significant body english into the play experience. Apart from cocktail-style arcade cabinets, videogaming was conducted in a fully upright position; playing a particularly successful round of Galaxian [32] might require a full 30 minutes of standing up

and jostling vigorously. More tangentially, the arcade's physical location as a separate, social space necessarily required travel by foot or bicycle for kids under driving age.

Playing a videogame is a participatory affair, and this physical connection with the game did not disappear entirely once players began sitting on living room couches playing Atari, Colecovision, NES, or PlayStation. In the early home consoles, the physical interface between player and screen still had some prominence. The Atari 2600 offered both joystick and paddle controllers (among other rarer ones), and all game cartridge labels for that system were imprinted with the proper controller to use ("Use joystick controller"). Despite this foregrounding of the human-computer interface, players lounged in a chair or couch found that the handheld joystick or joypad constrained movement more than it encouraged it. Over time, playing videogames seemed no more physical than watching television, with the possible and unfortunate addition of repetitive stress injuries.

Putting body english into an arcade game session isn't the same as jogging several miles, but arcades afforded much greater physical interaction, even with joystick-based games. Whether or not such activity could be deemed "exercise" is dubious at best, but it does suggest an intimate relation between physical movement — especially rhythmic, repetitive movement — and gameplay itself.

3. THE RHETORIC OF RUNNING

By the late 1980s the game industry had recovered from the 1983 crash and Nintendo had revitalized the industry with the popular Nintendo Entertainment System (NES). By this second wave of videogame consoles, explicit interest in alternatives to sedentary media consumption became more common. It was this environment that launched game titles created explicitly to promote or produce physical activity.

In 1987, Exus released the Foot Craz [18] pad controller for Atari 2600, the first predecessor of today's more familiar DDR-style dance pad (figure 1). Foot Craz was a small pad with five colored buttons that responded to touch. Exus released two games with the pad, their only two games for 2600. These titles came very late in the lifecycle of that console, and Foot Craz and its related games remain among the rarest Atari 2600 collectibles.



Figure 1 - The Exus Foot Craz, the first pad-style controller.

A year later, Nintendo released a new edition of its NES with a pad control peripheral, which Nintendo dubbed the Power Pad (figure 2).¹ Much larger and more complex than the Foot Craz, Power Pad was double sided, one side with a grid of twelve touch-sensitive circles, the other with eight circles in a star configuration. Nintendo and third-party developers released numerous games for Power Pad in the late 1980s and early 1990s.



Figure 2 - the NES Power Pad, circa 1988.

Among these early exergames, the vast majority remediated single-player sports activities, usually track. Running sports are either contests of speed or endurance, with track events usually privileging the former. Given the affordances of these pads, running games were easy targets for adaptation. An popular arcade game of the early 1980s was *Track & Field* [29], which allowed players to compete in six Olympic-style events. The game was the first to feature "hammer the buttons" style controls. In its most basic events, the player controlled a runner with two buttons on the arcade cabinet. One represented the runners left foot, one his right. To make the runner run, the player would alternately press the left and right buttons in rapid succession; the faster the player pressed, the faster the runner ran. The challenge of the game was to press the buttons in proper succession; simply banging on them randomly led to mediocre results.² *Track & Field* made an appearance on the Atari 2600 (along with a special controller) [30], but neither arcade and console versions of the game required particular physical prowess, save a tolerance for rapidly banging hard plastic buttons. Many games for Foot Craz and Power Pad borrowed this core game mechanic, replacing fingers with feet.

When Nintendo released the Power Pad in 1988, they offered a new bundle, the PowerPack, that included the NES system, light gun, Power Pad, and a three-game cart with *Super Mario Bros.*, *Duck Hunt*, and *World Class Track Meet*.³ *World Class Track*

¹ PowerPad was released as *Family Fun Fitness* in Europe.

² Some clever *Track & Field* players found an exploit: holding a plastic ruler over the cabinet buttons and then pressing a pencil or pen on top of the ruler, between the buttons allowed the player to achieve significantly better results just by moving a hand or fist back and forth across the ruler. Later versions of the arcade console sported bevels ovetop of the buttons to prevent this kind of play, which was perceived as socially disruptive and abusive of the hosting arcade.

³ Bandai had released *Stadium Events* in 1987; *World Class Track Meet* was Nintendo's rebranded 1988 reissue of the same title, converted for use with PowerPad.

Meet [10] was essentially a replica of *Track & Field*, designed for use with the Power Pad interface. Players could compete in four different track events — 110 m dash, long jump, 100 m hurdles, and triple jump. When played with the Power Pad, the game became a track and field simulator. Track events demand speed over endurance, and *World Track Meet* mimicked the gameplay of *Track & Field*; players performed better the faster they ran. However, since the pad only detected impact on the proper sensors, the player had to sprint in place — a nearly impossible task even without the trouble of a pad. *Track & Field* had used the alternate button mechanic as an abstraction of running track; rapidly pressing buttons was a procedural representation, or what I have elsewhere called a unit operation [12], for sprinting. The rapid movement of the fingers on the buttons was meant to simulate the rapid movement of the professional runner’s legs. Games that use the sprinting rhetoric as their primary motivation for exercise simply borrow the model “button-mashing for sprinting” and adapt it to the player’s feet. We can call this approach a *rhetoric of running*.

Real track runners do not exercise by practicing sprints alone. Their regimens usually include plyometric exercises for strength and power, medium-distance for endurance and flexibility, and laddered sprints for event-specific training. In fact, launching into a sprint is generally acknowledged to be one of the worst kinds of exercise, especially for those who don’t keep regular workout schedules. This model of exergaming is exacerbated by the nature of the pad itself — Foot Crazy, Power Pad, and DDR-style dance pads are smooth-surfaced on the bottom, making them very likely to move around underfoot, or even slip out from under the player. While it is tempting to assume that such design is rudimentary and a function of experimentation with new input devices, even the most recent Olympic sports game, *Athens 2004* for PS2 (played with the dance pad) [17] uses an identical procedural rhetoric.

4. THE RHETORIC OF AGILITY

Some exergames use modified versions of the sprinting rhetoric. Typically, these games interrupt the sprint mechanic with an orthogonal activity meant to enforce a physical transition, such as one might perform during aerobic exercises.

The most basic version of the interrupted sprint can even be found in games like *World Class Track Meet* and *Athens 2004*, in the form of jumping events like long jump or hurdles. In these events, players must cease to touch the pad sensors (or touch alternate pad sensors) to perform a jump. However, the power, and therefore distance and score, for such jumps is determined by the speed of the runner before the jump, and therefore the interruption itself is far less prominent than the sprint.

Other games offer more balanced running rhetorics. *Video Jogger* [19], one of the two titles Exus created for the Foot Crazy was such a one. The game depicted two elliptical tracks on screen, one above the other on screen. Each track featured an enemy character (represented as a circle). The player’s goal was to use the pad to run quickly around the track while avoiding the enemies. To do so, the *player* would have to switch between the tracks occasionally by striking another button on the Foot Crazy (see figure 3).

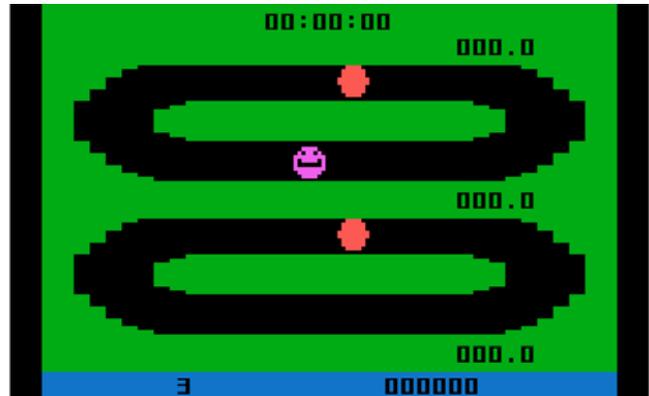


Figure 3 - *Video Jogger* by Exus.

The NES Power Pad game took this model further in *Athletic World* [6], a kind of amateur events game. Two of the game’s five events exhibit sprinting rhetorics, but the others require the player to run for short distances or even to stand and then shift to different positions on the pad, representing orthogonal physical action. For example, the Hop a Log event asks the player to run on a central log and then hop on right or left foot to logs on either side. In the Rafting event, the player’s character rides a raft down a river, stepping slowly from side to side to avoid obstacles. Occasionally, the player must jump or duck to avoid logs draped across the river (to duck, the player must lean down and press the two forward sensors on the pad while still keeping his feet on the center sensors). Games that rely on multiple, orthogonal physical gestures that disrupt one another can be said to exhibit a *rhetoric of agility*.

Athletic World could be called a camp games simulator; the events resemble casual activities kids might play at summer camp or during an end-of-year “field day” party. As such, the rhetoric of sprinting is abandoned in favor of what one might call a rhetoric of agility; the rules of the games require players to shift smoothly and carefully — sometimes quickly, sometimes not — between one physical state and another. In *Video Jogger*, a simpler example of an agility rhetoric, the player must run at a slower pace from time to time to avoid the enemies on the track. Likewise, he must stop running entirely to switch tracks. In *Athletic World*, the player transitions much more frequently between jogging, stepping, kneeling, and jumping. In these games, players are rewarded for nimbleness over speed. Moreover, since players need to make physical contact with the relatively small and closely spaced sensors on the Power Pad, precision was arguably more vital than in some real-world activities.

The most unusual of physical input games to deploy the rhetoric of agility is *Street Cop* [9], another NES Power Pad game. In *Street Cop*, the player takes the role of a policeman on the beat, looking for crooks and hoodlums (figure 4). Play takes place on a horizontal street with three different “lanes” the player and other characters can occupy. To control the cop, the player walks, jogs, or runs on the center pads. To shift lanes, the player steps right or left, then resumes walking. To switch directions, the player must press an alternate sensor on the Power Pad; to catch a criminal, he presses another sensor. In an interesting hybrid control method, the player can also use buttons on the regular NES control pad for either of the latter two actions.



Figure 4 - A typical screen from Bandai's *Street Cop*.

Street Cop was a clear attempt to use the Power Pad for non running-sports-related gameplay. A *Defender*-style inset radar shows the player where to find criminals on the street; the player had to jog or walk to reach the criminal without passing him, avoiding innocent bystanders. While there is no clear analogue between physical agility and walking a beat, the gameplay encourages deliberate shifts between jog steps, side steps, and the diagonal action steps.

World Class Track Meet translated a deliberate limitation in arcade play into the basis for physical play. A more unusual method of invoking the rhetoric of agility is to couple games to a different physical input device. Amiga first tried this with the Joyboard, a platform the player stood on and leaned in different directions in lieu of normal joystick functions. To use the Joyboard, the player had to substitute balanced full-body movement for joystick movement. The device came with a skiing game designed specifically for it, *Mogul Maniac* [2] (figure 5). The side-to-side motion of skiing was ideal for the Joyboard, although in practice the device didn't respond terribly effectively. Amiga prototyped two more games for the Joyboard, neither of which was released. *Off Your Rocker* [3] was a simon-says style game in which the player leaned in the proper direction to mimic on-screen color and sound cues. *Surf's Up* [4] was a surfing game in which the player had to carefully direct a surfboard to avoid wiping out.

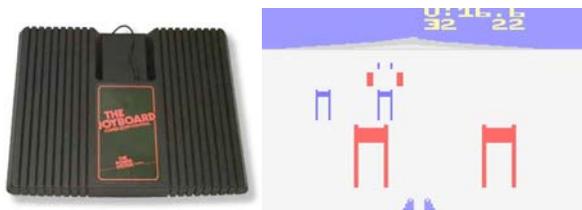


Figure 5 - The Joyboard controller (left) and a screen from the only game released for it, *Mogul Maniac* (right).

Despite the paucity of games developed specifically for the Joyboard, the device could also function as standard input device for Atari 2600, so Joyboard owner could attempt to use it with any of the hundreds of games in the VCS library. Success was bound to be limited, especially since the device didn't map precisely map to the standard joystick controls, but such an agility test remained possible. Later, LJN released the Roll 'n Rocker for the NES, a

peripheral very similar to the Joyboard. The player stood on the device (which looked something like a Pogo Ball, a popular toy at the time) and leaned side to side, front to back to control a character on screen. A standard Nintendo controller plugged into the side of the Roll 'n Rocker, giving the player access to button controls.

Unlike the Joyboard, the Roll 'n Rocker was not designed for use with specific games; it was sold as a generic accessory that players could use with most NES games. And unlike *Athletic World* and *Street Cop*, the Roll 'n Rocker leveraged an abstract notion of agility, taking the common need for rapid directional-pad movement necessary to play most NES games and transferring that action from thumb to full-body. Like *World Class Track Meet*, Roll 'n Rocker relied on a one-to-one analogue between standard controller input and physical controller input. In so doing, it relied on the internal mechanics of popular NES games like *Super Mario Bros.* [40] or *Contra* [22], which required quick-fingering on the standard controller. In such games, success is dictated by quick presses on the proper buttons; Roll 'n Rocker attempts to borrow the carefully crafted agility constraints of standard videogames and couple those to the physical body. The device was a commercial failure, perhaps a testament to the difficulty of leasing existing games for physical input.

It is worth noting that nothing prevents a player from using a DDR-style dance pad as a standard input for the PlayStation 2 or Xbox. The pad provides four direction control, and at least two button controls. Playing a game like *Gran Turismo* [41] on the dance pad produces a sensation much like surfing. Ill-fated attempts to create generic physical input devices, such as the Roll 'n Rocker and the Nintendo PowerGlove, may have discouraged manufacturers of contemporary dance pads from suggesting their use with other genres of games.

5. THE RHETORIC OF REFLEX

I've already argued that arcade games serve as predecessors for exergames in the general sense. But we can find even greater precedent in non-screen based arcade and carnival games.

Among the commonest types of such games is *Whack-a-Mole*, the game of hitting small animals that pop out of holes in the game cabinet with a large mallet. This game finds its roots in carnival games like shooting galleries and ball tosses, where players had limited time or resources in which to strike a certain number of targets. In the 1990s, as once-popular video arcades shifted to younger audiences, more versions of these games appeared. Today, one popular *Whack-a-Mole* derivative is *Spider Stompin'*. Generally relegated to younger kids' areas of arcades like Chuck E. Cheese's, *Spider Stompin'* has an octagonal platform emblazoned with web graphics. Scattered around the web are plastic buttons that the player can press. Usually the buttons are surrounded by graphics of spiders, so that stepping on them gives the player the impression that they are squashing spiders. A large score area stands straight up from the front of the platform. During play, the spider buttons light up. The player must depress the button with his feet before the light goes off. Different difficulty levels regulate the number of spiders and the speed at which they disappear.

Games like *Whack-a-Mole* and *Spider Stompin'* don't require constant physical activity like *World Class Track Meet* or *Video Jogger*. Instead, they demand carefully timed physical responses to external stimuli, usually visual stimuli. Games that require

physical input based on time-sensitive responses could be said to exhibit a *rhetoric of reflex*.

Reflex videogames go back as far as exergames themselves; one of the two games Exus released with the Foot Craz was *Video Reflex* [20], a highly abstract version of *Spider Stompin'* (see figure 6). In *Video Reflex*, the screen displays five color blocks, each corresponding with one of the color-coded sensors on the Foot Craz.

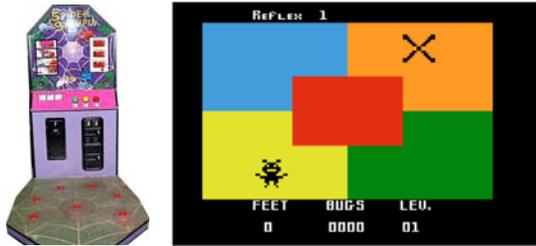


Figure 6 - the Spider Stompin' arcade game (left) and a screen from Exus's Video Reflex (right).

During play, bugs appear on the color blocks, and the player presses the corresponding sensor to squash the bug (a footprint icon appears in the selected square). Nintendo also created a *Whack-a-Mole* knockoff for the Power Pad, *Eggsploade* [38]. In this game, chickens occupy a 3 x 4 grid that corresponds with the 12-sensor side of the Power Pad. The player presses the appropriate sensor to deactivate bombs set under chickens before they explode. *Eggsploade* is an exact replica of *Whack-a-Mole* or *Spider-Stompin'*.

Even contemporary exergames have deployed the rhetoric of reflex. The Eye Toy camera peripheral for the Sony PlayStation 2 first shipped with a set of minigames called *Eye Toy: Play* [45], many of which use reflex rhetorics. For example, “Kung Foo” asks the player to disable ninjas and monkeys that fly on screen, and “Plate Spinner” requires the player to keep a variety of plates on sticks from falling down. Both require sporadic but decisive responses to on-screen stimuli, but not constant, sequential movement like *World Class Track Meet* nor constant, disrupted movement like *Athletic Games*.

Interestingly, *Eye Toy: Play* is often reviled as a single player game but heralded as a perfect party game for a large group of people. Because the Eye Toy detects input not from a small number of fixed sensors on the floor beneath a single player, but rather from a large sensor array in the focus field of the camera itself, many players can take part at the same time, using any parts of their bodies to trigger events on screen. Such activity could technically be construed as an exploit, since the game requires configuration for a single player before it starts. But this exploitative play brings to mind similar behavior in the arcade or carnival, by which multiple players might play *Whack-a-Mole* or *Spider Stompin'* at the same time, insuring much greater success than one player alone. While games with running or agility rhetorics typically score by time, like one might achieve in a track meet, games with reflex rhetorics typically score by points; for example, one point for the number of bugs squashed. While players can certainly compete for the lowest time in *Athletic World*, points provide a more concrete basis for competition or collaboration. In the arcade, games like *Whack-a-Mole* and *Spider Stompin'* often give out tickets based on final scores, much like skeeball. Players can save these tickets and exchange them for toys as an incentive for continued play and repeat visits.

Exergames driven by reflex rhetorics thus might be more social and more competitive than other varieties.

6. THE RHETORIC OF TRAINING

Perhaps the most obvious application of exergaming is the direct remediation of traditional workout methods in videogame form. Bandai made the first such attempt 1988, with *Dance Aerobics* [7] for the NES Power Pad. *Dance Aerobics* used the Power Pad as an input device to monitor traditional aerobic exercise. Bandai reportedly hoped the title would appeal to a female audience, and both the game and its marketing bear exclusively female characters.

Unlike all the other games previously discussed, *Dance Aerobics* did not attempt to turn the input device into transparent window through which the player interacts with the game. Instead, the game made it very clear that the Power Pad was intended to be used as a measurement device for the player's progress. *Dance Aerobics* features an aerobic instructor character on screen, just as a trainer might lead a group in a real aerobics class or a home video. The game even depicted a Power Pad underneath the on-screen character to help calibrate the player's actions in relation to those of the computer (figure 7).

During play, the on-screen character first showed the player a number of repetitions of a particular aerobic exercise, such as side-steps or toe-touches. After a countdown, the player must mimic these exercises in time with the on-screen trainer. To enforce the workout, each gesture required the player to contact a specific set of sensors on the Power Pad. A box of remaining mistake credits appeared persistently on the side of the screen; failing to complete an aerobic gesture properly would dock the player a mistake.



Figure 7 - A typical screen from Bandai's Dance Aerobics. Note the depiction of the Power Pad on screen.

Dance Aerobics assumes that running out of mistake credits indicates that the player has not been completing the designated exercises, and the session is subsequently terminated. But as with many of the running exergames, it's actually quite difficult to strike the proper sensors — or to insure one doesn't release the wrong sensors by leaning up off of it. The decision to enforce rules on an exercise regimen seems absurdist at first — an imprecise leg stretch should have more value than no action at all. But the game enforces precise sensor presses as an extremely rudimentary unit operation for an aerobic trainer. In a real gym, the trainer leading a session can scan the room and assess the performance of individuals in a class. A trainer might provide general encouragement (“keep it up!”) or single out a particular

student in need of reproach (“come on, Sally, get your feet up higher”). This kind of “soft” feedback is impossible in *Dance Aerobics*, since the game can get only rudimentary feedback from the player — digital sensor touches on the Power Pad.

Despite this limitation, *Dance Aerobics* is clearly different than the other types of exergames discussed above. The game could be construed to have a reflex rhetoric; the player is required to touch specific sensors given a particular time horizon. But unlike *Video Jogger* or *Eggsplode*, *Dance Aerobics* relies on an external cultural referent rather than an abstract system to structure its rules: the personal trainer.

A personal trainer is usually a professional hired by an individual or a group to create a specialized exercise regimen. As a tutor and a guide, the trainer is both micro- and macroscopic guidance; the trainer both recommends the proper exercises and insures that the client carries them out properly, for the most effect and to avoid injury. While admittedly rudimentary, *Dance Aerobics* enacts precisely this rhetoric. Exergames with a rhetoric of reflex only call for physical action given specific, often random computer generated events. In a game with a training rhetoric, both the physical gestures and the pauses between those gestures bear equal relevance. Players of *Dance Aerobics* will quickly note the deliberate pacing of the aerobic maneuvers, a rhythm that even extends to the character animation, which is staccatoed to match the familiar beat-counted rhythm of aerobic exercise.

The major obstacle to *Dance Aerobics* was technological; the input device hasn’t changed considerably in the 17 years since its release, but computer graphics certainly have. In 2004, ResponDesign tried their hand at a personal training game, *Yourself! Fitness* [44], built for the much more modern Xbox and PlayStation 2 consoles, as well as the PC.

ResponDesign was founded by fitness and athletic shoe executives who became the first independent developer/publisher of fitness games. The company is based in Portland and has a partnership with nearby Nike that allows them to take advantage of the latter’s advanced consumer focus group and athletic experts. ResponDesign’s first title, *Yourself! Fitness*, is an attempt to reinvent the home fitness video as videogame.

The game features Maya, an intricately modeled and motion-capture animated “virtual personal trainer” who serves as the game’s hostess and primary interface (figure 8). Maya is a fascinating specimen in herself, a sort of anonymous amalgam of cultural and racial representation who could pass for Caucasian, Persian, or Latina. Maya appears strong yet non-threatening; she is toned yet soft, approachable.⁴

Unlike all of the games previously discussed, *Yourself! Fitness* employs no control inputs whatsoever, save the inconsequential use of the standard controller to make menu selections. Despite the massive innovations in computer technology during the twenty years since *Dance Aerobics*, control inputs remained largely the same: game consoles are capable of detecting digital button pushes and, on more recent consoles, levels of pressure on analog control sticks. Instead of trying to make strides in the basic technology used for human input, ResponDesign instead decided to let the human player provide most of the input to the program.

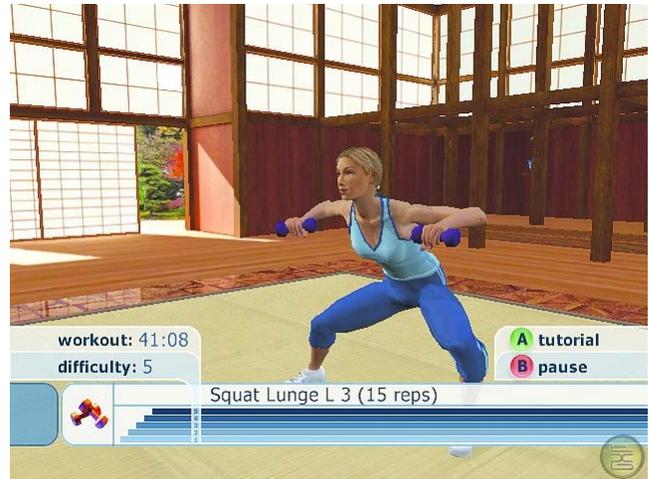


Figure 8 - Maya leads an exercise in *Yourself! Fitness*.

The player sets up a profile with height, weight, vital signs, and exercise goals. Maya then crafts a customized training program that typically requires less than 30 minutes per day. The majority of the routines are standard aerobic exercises. Unlike the rudimentary 8-bit *Dance Aerobics*, *Yourself! Fitness* offers smooth animation of exercise steps. This graphical improvement might risk undermining the regimented nature of the exercise, but the game also alters Maya’s behavior. The exercises she, her voice instructions, and her rate of activity are generated from physiological inputs provided by the player. Before beginning a session, Maya first asks the player to take a heart rate measurement and asks how the player feels. If the player doesn’t feel up to working out, she might give a pass for the day. The game leaves it up to the player to monitor their performance during the actual exercises; there is no “mistake allocation” as in *Dance Aerobics*. Instead of monitoring an aerobic workout at the microscopic level by simulating the ongoing incantations of a stereotypical aerobic instructor, *Yourself! Fitness* simulates the one-on-one interview style of a personal trainer. Whereas *Dance Aerobics* strives to keep the player on measure with the imaginary class that the on-screen character leads, *Yourself! Fitness* attempts to monitor the player’s perception of his or her physical condition and adjust current and future exercise sessions to accommodate both the condition and the player’s fitness goals.

In its attempt provide a holistic fitness regimen, the game also offers menus and recipes for healthful eating. While well-intentioned, the menu feature shows how desperate the game is to numerize the player’s behavior. Maya asks the player to input the number of calories he or she plans to consume per day and builds a menu based on that input and other saved settings. Given the computational power of the console, it is surprising that the game forces the player to synthesize such an easily computable concept as calorie intake. This mechanic would seem to complement the exercise management portion more successfully if it were to help the player build a diet profile that determined proper daily calorie range and provided menus accordingly.

As part of the reinvention of the exercise video, *Yourself! Fitness* tries to abet the inevitable boredom of that medium — what creator Phin Barnes called “the same woman saying the same thing on the same beach with the same wave crashing at the same time, day after day” [11]. To combat this boredom, the game allows the player to unlock new exercise “arenas” and music

⁴ I am indebted to Vish Unnithan for this observation.

much like players of racing games can unlock new tracks. Where a racing game like *Gran Turismo* or *Athens 2004* rewards performance — your finish position in the race — *Yourself! Fitness* rewards consistency — the number of workouts you do without missing. In *Yourself! Fitness*'s version of a rhetoric of training, unlockable content replaces the incremental sensor presses of *Dance Aerobics*. Whereas the latter punishes inconsistency with game over — a curious way to encourage exercise indeed — the former rewards regular exercise with a change of scenery. Whether or not unlocking new environments is a sufficient motivation for regular exercise is an open question.

7. THE RHETORIC OF IMPULSION

Yourself! Fitness is a smart business maneuver. The game updates the aging exercise video for the videogame console. In fact, ResponDesign's ability to land the funding to create the game in the first case seems predicated on this very market shift — same idea, different medium. ResponDesign clearly hopes that the female consumers who dominate the home fitness market will take advantage of junior's Xbox after bedtime. With a creative distribution partnership with Nordstrom and a research and marketing partnership with Nike, ResponDesign is indeed exploring new terrain in getting videogames to market.

But games like *Dance Aerobics* and *Yourself! Fitness* still rely on a traditional rhetoric of personal exercise: the subject of the exercise must muster internal motivation to begin, pursue, and continue the exercise regimen. Both games attempt to improve the player's success in individual aerobic sessions, and the latter strives to encourage players toward regular exercise. Yet both assume traditional, somewhat tired methods of promoting physical activity.

Earlier I mentioned that games with a rhetoric of reflex like *Whack-a-Mole* and *Eggsplode* often use abstract, numeric scores as a motivator for continued play. In such games, score-based motivation only emerges once the gameplay ends; the player reviews his score after a session and chooses whether to try to surpass it or to quit. More recent exergames have moved away from traditional exercise methodologies and focused instead on more abstract methods of encouraging and sustaining game-based exercise during individual play sessions themselves. Such games could be said to exhibit a *rhetoric of impulsion*; each gesture the player or the game makes designed specifically to elicit an additional physical response from the player. Like games with rhetorics of running, these games can engender long stretches of physical activity; but like games with rhetorics of reflex or agility, they also respect breaks in motion and use such breaks to shift and vary players' physical gestures.

A simple example of a rhetoric of impulsion is *Short Order* [39], which game bundled with *Eggsplode* for the Power Pad. *Short Order* is a cross between the playground game hopscotch and the classic arcade game *Burgertime* [16]. The goal of the game is to assemble hamburgers to order from a small number of basic components — bun, burger, lettuce, tomato, cheese. The game displays the target burger, whose difficulty varies as a function of its height (number of components). The player sees the completed burger for a moment, and then must recreate it from memory. To select a burger component, the player must jump and land on two proper contiguous sensors on the grid side of the Power Pad. Unlike a reflex game, no time limit faces the player, but a wrong step will end the sequence and cost the player a life.

Short Order impels the player to carefully consider and execute his next jump to insure that it selects the desired hamburger part. After that part is placed, the player immediately concentrates on the next one, until the burger is completed. At the end of the sequence, the game moves on to a larger, more difficult burger.

A simple game, *Short Order* affords only one physical action as an input, but it structures each response to the Power Pad device so that each and every action has a consequence in the game. Even though the game's scoring mechanism bears resemblance to the reflex scoring of *Eggsplode*, *Short Order* contextualizes each physical gesture so that it bears concrete meaning: the player intuitively appreciates the process of constructing a hamburger. It is an everyday activity with a known and measurable outcome and to which the player can relate directly. In comparison, completing a various round of jumping jacks in *Yourself! Fitness* only has meaning in the context of physical fitness.

Dance Dance Revolution, the darling of exergaming with which I began, offers a superb example of an impulsion rhetoric. To use *Yourself! Fitness* effectively, the player must already be self-motivated to start and continue a fitness regimen. But DDR produces exercise as an emergent outcome of play itself.

DDR's core mechanic — step on the pad corresponding to an on-screen arrow at the right beat in the music — does bear some resemblance to the aerobic exercises of *Yourself! Fitness*. Aerobics are often done to the beat of music, and the offshoot fitness program Jazzercise explicitly ties aerobic exercise to jazz dance. But despite the appeal of using popular music as a backdrop, these and related programs still create no compulsion for participants to continue physical activity during or between sessions. DDR's principle innovation in the rhetoric of exergaming aims to fill this missing hole in traditional exercise programs.

DDR's scoring mechanism is two-fold. One the one hand, the player must take care to keep a global energy meter at a positive level. For every arrow the player misses, some of this energy is depleted; lose it all and the game is over, just like making a mistake in *Short Order* or running out of mistake credits in *Dance Aerobics*. The energy meter provides negative motivation to the player, disincentivizing him from quitting outright.

On the other hand, the game provides direct feedback for each and every step the player makes. Depending on the accuracy of the player's footing, a textual readout on screen responds to each step: Perfect, Great, Good, Almost, or Miss. Unlike *Dance Aerobics* or the various running games discussed above, DDR distinguishes degrees of success for individual steps based on the time difference between ideal and actual player steps. More importantly, the game supports "chains" of success based on individual step scores. Multiple "Perfect" or "Great" scores in a row chain together into a combo, and the numeric total is displayed prominently at center screen. These incremental scores are the DDR equivalent of the personal trainer's affirmation after a single rep; they reinforce not only the player's current gesture, but also the general rhythm that produced that gesture. And because the combo score is numeric, the game encourages the player to maintain that level of activity for as long as possible. To reinforce the numeric feedback, a trainer-like voiceover provides encouragement at key points, using phrases like "You're doing great!" Unlike Maya in *Yourself! Fitness*, who knows nothing about the player's individual gestures, DDR generates its verbal feedback procedurally based on the player's global energy level

and individual combo patterns. This allows the game to provide encouragement or praise based on the player's current performance, rather than the last set of reps he had completed.

Despite the similarity between DDR's voice feedback and the verbal feedback a personal trainer might provide, the game both mechanizes and extends the concept of the trainer into a fluid extension of the player's body. By providing succinct, motivational feedback with each physical gesture, DDR grafts the personal trainer to the player's perception. One might compare DDR to a lightweight heads-up display for joggers that would project proper footfalls onto the pavement and then provide immediate constructive feedback on the runner's pacing.

Many of the original Eye Toy games offered reflex play, but the most recent title, *Eye Toy Antigrav* [21] evolved the peripheral into a tool for an impelling exergame. Whereas previous Eye Toy games used the camera to show the player's image on screen, *Antigrav* uses the camera solely as an input device to control an on-screen character, positioned to replicate the player's real-world movement. Harkening back to the Amiga Joyboard, *Antigrav* is a hoverboard game. The player's character rides the board through a complex 3D world, making turns and avoiding obstacles by turning his body, ducking or jumping. While similar in principle to the basic agility play in a game like *Athletic World*, *Antigrav* takes advantage of the more granular movement made possible by the Eye Toy sensor (figure 8).

Antigrav shares much in common with racing games, and one way of measuring score is by elapsed time to complete a course, much like *World Class Track Meet*. But within levels, players can gain powerups and additional points by capturing bonus objects throughout the course. The levels are carefully designed such that acquiring these objects requires careful, constant changes in the orientation of head and arms. For example, on a slope up a hill a player might need to reach an arm out to the side and slowly extend it up, then down in an arc as he speeds through the turn. While *Antigrav* doesn't provide the same level of incremental encouragement as DDR, each passing moment of gameplay reorients the player's focus toward a very short-term goal, such as acquiring the next bonus item. This incremental impulsion seeks to persuade the player to continue the full-body physical engagement the game requires, even in the face of fatigue.



Figure 9 - A player in *Eye Toy Antigrav* leans to catch bonus objects.

Generic physical input devices can also effect impel continued physical engagement. Earlier I cited the Roll 'n Rocker as an example of a controller that failed to fully translate the reflex requirements of fingers on directional pads to feet on a balance board. More recently, Powergrid Fitness has created a more complex attempt at a general purpose controller, the Kilowatt that both demands physical exertion and correlates that exertion to any console game.

The Kilowatt (figure 8) is a large device that facilitates an isometric workout. It has no moving parts, but instead uses force sensors to translate pressure a player exerts on the devices' handlebar into in-game movement. Most of the exergames discussed above offer aerobic exercises, but isometric workouts are anaerobic, building strength in much the same way as weightlifting. The principle behind the Kilowatt workout is no different than that of the Roll 'n Rocker — leverage the internal motivational structures of any videogame to induce player's to use their full bodies rather than just their thumbs. But unlike the Roll 'n Rocker, the Kilowatt actually provides a reasonably analogous control mechanism for most games. Moreover, it impels players to continue both gameplay and exercise because of the nature of isometric exercise: it hurts! Unlike aerobics, which can cause a player to break a sweat or raise his heart rate, isometric exercise can be felt immediately in the upper body. This sensation of "knowing it's working" orients both the player's gameplay and workout goals simultaneously.



Figure 10 - The Powergrid Kilowatt isometric workout videogame controller. This is the smaller version, intended for home use.

Even Nintendo's most recent experiment in unusual peripherals — the GameCube Bongo controller — leverages a rhetoric of impulsion to motivate physical interaction. The Bongo controller contains two touch sensors, one for each drum surface, and a microphone sensor meant to detect a two-hand clap directly above it. The Bongo launched with *Donkey Konga* [36], a music-rhythm game that mimics the gameplay of DDR and Namco's home version of a Japanese taiko drum simulator, *Taiko Drum Master* [35]. This game musters some of the same rhetoric as DDR, but banging the drum surface proves a much less exerting experience than moving one's whole body on the dance pad. But the second bongo-compatible game, *Donkey Kong Jungle Beat* [37], asks the player to use the bongo as a controller for a platform fighting game. Striking the right bongo moves Donkey Kong to the right, left moves him left, and both together make him jump. Clapping grabs bananas in the near vicinity, which are needed to advance to subsequent levels. At level close, the player is also rewarded with special medals based on the number of bananas collected.

Like DDR, *Jungle Beat* offers incremental scoring that encourages players to prolong successful maneuvers as much as possible. In *Jungle Beat*, collecting a banana by clapping scores double points compared with walking over it. And collecting multiple bananas while flying through the air increases that multiplier. Furthermore, the player must regularly do battle with small enemies and large bosses at the end of levels, all requiring both positioning maneuvers and *Track & Field*-style alternating strikes on the left and right drum faces. While bludgeoning a plastic drum may make for sore hands more than toned triceps, the game uses its internal rules for rewarding players to impel further physical activity, even when that activity borders on agony.

Yourself! Fitness attempts to motivate players through unlockable backgrounds and music, content only vaguely related to the title's aerobic gameplay. Exergames with rhetorics of impulsion like DDR and *Antigrav* tend to recontextualize the idea of exercise by creating repeating incentives to continue physical exertion. Nevertheless, *Yourself! Fitness* may offer a much more consistent, formal kind of aerobic exercise; it does use well-established exercise routines after all. But the physiological value of exergames must not be maximized blindly; rather, more long-term gain may come from consistent physical activity at a lower level of professional fitness. The strength of games like DDR lies precisely in their ability to engender physical activity through play without demanding the player to adopt a complex understanding of fitness.

8. THE LIMITS OF THE LIVING ROOM

This paper has been concerned with the way that a wide variety for exergames use gameplay and input devices to motivate physical activity. Such an analysis would be incomplete without considering the environment in which these games are played in the first place. Today, the majority of games sold are played on videogame consoles (as opposed to personal computers). Consoles need to be connected to televisions, and televisions are generally large, immobile appliances that an entire household shares. The TV is usually is positioned in a living room or den surrounded by couches and chairs; many such rooms also house a coffee table or other large furniture between the couches and the television. In the United States especially, it is common to eat or drink while watching TV, and coffee tables support the coffee, beer, soda, and other sundries to be eaten while watching primetime comedies, weekend sports events, or the nightly news. The living room is generally an inactive, static space with large, heavy furniture dividing a large, open space into many smaller, closed spaces (see figure 11).



Figure 11 - An "ideal" arrangement for a contemporary living room, as depicted in a popular furnishing retailer's catalog.

Each and every one of the exergames discussed in this paper requires considerable physical space for successful, safe play. All but the Eye Toy and Bongo require something to be physically placed on the floor under the player. And all save the Bongo demand considerable freedom of movement around the player, including open space on all sides to avoid injury in the case of a misstep.

Given the average living room, it seems that many families would need to move furniture — especially coffee tables — out of the way to facilitate successful exergaming. A device like the Powergrid Kilowatt is heavy, difficult to move, and takes up as much room as a large exercise bike or home weight machine. The infeasibility of such devices cannot be taken for granted in an analysis of exergaming. Even DDR dance pads are bulky devices that must be stashed under furniture or stored awkwardly in closets. And large peripherals like bongo drums and Joyboards hardly make for aesthetically pleasing display accessories.

Logistical and technical limitations also stand in the way of exergame play. In general, people place living room seating at an ideal position and distance to facilitate comfortable television watching from a seated or reclined position on a chair or couch. Even if no coffee table or other impediment stands in the way of the would-be exergamer, the player will likely stand three or more feet closer to the television, possibly compromising a clear view of the screen. As HDTV adoption grows — especially given Microsoft and Sony's aggressive push for HD on next-generation consoles — more potential exergamers will upgrade their CRT sets for plasma, LCD, or rear-projection HDTVs. These appliances are expensive and often come with furniture designed specifically for them. A/V experts recommend that HDTV monitors be positioned so a viewer's eyes are in-line with the center of the image when seated before it.⁵ These new sets — especially the lower-priced rear-projection LCD and DLP units — often suffer from greatly reduced vertical viewing angles, making the screen dim or even unviewable to an upright player on a DDR dance pad or facing an Eye Toy camera.

Play on a personal computer is possible, but fraught with equal if not greater challenges. *Yourself! Fitness* is available for PC, Xbox, and PlayStation 2. Since the game targets a non-traditional demographic for videogame consoles, the PC version was probably released to accommodate players who don't have a console or don't want one. Most families do not enjoy neat and tidy offices with space for physical activity, and furthermore most don't have a computer monitor as large as their television to facilitate proper visual feedback from a safe distance.

The technological limits of exergame feasibility do not occur in a vacuum. In American homes of the last 60 years, living room designs assume certain lifestyle considerations. One or more adults are expected to rise early in the morning, shower, shave, eat, and commute to work. Kids leave even earlier for school, keeping the house unoccupied for much of the day. Upon return from work or school, those households lucky enough not to be dysfunctional might enjoy a meal together before relaxing — not working up a sweat — in front of the television. As telecommuting and home offices become more common, many professional struggle already to find proper space to devote to

⁵ See <http://www.myhometheater.homestead.com/viewingdistancecalculator.html>.

work at home, even further reducing the space available for avocational activities like television, pleasure reading, and videogaming let alone health-conscious activities like aerobics, workout devices, or exergaming. For better or worse, the large majority of suburban American homes with the time and money to afford videogame consoles and exergaming software and hardware are simply not designed to support it; physical exertion is something relegated to the neighborhood sidewalk, the local gym or, more commonly, nowhere at all.

Perhaps the most dire rhetoric of exergaming comes from the ideological structures that push us to work more and move less. The postwar work ethic we short handedly call “The American Dream” and easy access to long-term credit encourages families to buy homes that they can only afford by spending increasingly longer hours at work. Larger homes require us to move deeper into the suburbs, requiring ever-longer commutes across increasingly crowded urban sprawl. Working and commuting longer reduces the time we have with our families and ourselves, leading to a downward spiral of less and less physical activity of any kind. Thus no matter the efficacy of any of the rhetorics of exergaming, the most important one may reside in the complex social, political, and material structures that determine the spaces we occupy.

9. REFERENCES

- [1] ABC News. Toys to Get Kids off the Couch. *ABC News Good Morning America*, December 15, 2004.
- [2] Amiga. *Mogul Maniac*, 1983.
- [3] Amiga. *Off Your Rocker*, unreleased.
- [4] Amiga. *Surf's Up*, unreleased.
- [5] Associated Press. Video Game Fans Dance of Extra Pounds. *USA Today*, May 23, 2004.
- [6] Bandai. *Athletic World*, 1987.
- [7] Bandai. *Dance Aerobics*. Nintendo, 1988.
- [8] Bandai. *Stadium Events*, 1987.
- [9] Bandai. *Street Cop*, 1987.
- [10] Bandai. *World Class Track Meet*. Nintendo, 1988.
- [11] Barnes. P. Fitness Game for Xbox and PC. Games for Health Conference 2004, Madison, WI.
- [12] Bogost, I. *Unit Operations: An Approach to Videogame Criticism*. MIT Press, Cambridge, MA, 2006.
- [13] Chang, A. Video Game Helps Players Lose Weight. *CNN*, May 24, 2004.
- [14] Data East. *Burgertime*. Midway Games, 1982.
- [15] DDR Freak. Tournament performance and strategy. <http://www.ddrfreak.com/library/contributor-article.php?postID=7890162>.
- [16] Donaldson-Evans, C. Players Break a Sweat With Video Games. *Fox News Channel*, July 9, 2004.
- [17] Eurocom. *Athens 2004*. SCEA, 2004.
- [18] Exus. *Foot Craz*, 1987.
- [19] Exus, *Video Jogger*, 1987.
- [20] Exus, *Video Reflex*, 1987.
- [21] Harmonix Music Systems. *Eye Toy: Antigrav*. SCEA, 2004.
- [22] Konami. *Contra*, 1988.
- [23] Konami. *Dance Dance Revolution*, 1999.
- [24] Konami. *DDRMAX: Dance Dance Revolution 6thMIX*, 2002.
- [25] Konami. *Dance Dance Revolution 2ndMIX Dreamcast Edition*, 2000.
- [26] Konami. *Dance Dance Dance Revolution Disney Dancing Museum*, 2000.
- [27] Konami. *Dance Dance Dance Revolution Ultramix*, 2003.
- [28] Konami. *Dance Dance Dance Revolution Mario Mix*, forthcoming.
- [29] Konami. *Track & Field* (arcade), 1982.
- [30] Konami. *Track & Field*. Atari, 1983.
- [31] Lawrence, S. Exercise, Lose Weight With ‘Exergaming’. *Fox News*, January 18, 2005.
- [32] Namco. *Galaxian*. Midway Games, 1979.
- [33] Namco. *Pac-Man*. Midway Games, 1980.
- [34] Namco. *Pole Position*. Atari, 1983.
- [35] Namco. *Taiko Drum Master*, 2004.
- [36] Nintendo. *Donkey Konga*, 2004.
- [37] Nintendo. *Donkey Kong Jungle Beat*, 2005.
- [38] Nintendo. *Eggsplode*, 1990.
- [39] Nintendo. *Short Order*, 1990.
- [40] Nintendo. *Super Mario Bros*, 1985.
- [41] Polyphony Digital. *Gran Turismo*. SCIE, 1997.
- [42] Red Octane. GetUpMove.com (promotional website). <http://www.getupmove.com>, 2004.
- [43] Red Octane. Dance Video Game Supports Academic Success. GetUpMove.com research report, June 29, 2005.
- [44] ResponDesign. *Yourself! Fitness*, 2004.
- [45] SCEE. *Eye Toy: Play*. Sony Computer Entertainment Europe, 2003.