

# The Wii Club: Gaming for Weight Loss in Overweight and Obese Youth

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## Abstract

Our 20-week “Wii Club” intervention for overweight and obese adolescents demonstrated weight loss, increased self-efficacy, and improved peer support from cooperative exergame play. Videogames that require motor activity in a social context may be a fun, effective tool to promote healthy weight and physical activity among youth.

## Introduction

ONE HOUR THIRTEEN MINUTES is the average amount of time spent playing videogames every day by 8–18 year olds in the United States.<sup>1</sup> If U.S. youth used this sedentary videogame time for physical activity instead, they would easily meet the recommended 1 hour per day of moderate to vigorous physical activity.<sup>2</sup> The vast majority of adolescents are far less active, with less than 5 percent of 15–17 year olds meeting activity recommendations.<sup>3</sup> An inactive lifestyle combined with excessive caloric intake has been linked to the obesity epidemic in the United States.<sup>4</sup> In fact, currently 33.2 percent of children and adolescents are considered overweight or obese,<sup>5</sup> alongside 69.2 percent of adults.<sup>6</sup> Inactivity in adolescence is associated with increased body fat, decreased fitness, lower self-esteem, and even poor academic achievement.<sup>7</sup> Over a lifetime, inactivity also contributes to coronary heart disease, type 2 diabetes, breast cancer, and colon cancer, accounting for 9 percent of premature deaths worldwide.<sup>8</sup>

Should we ban children and youth from playing videogames to reduce physical inactivity and obesity? This approach is likely a fruitless, misguided battle. For one, there is not clear evidence that electronic game play is associated with pediatric obesity.<sup>9,10</sup> Second, gaming is extremely popular, as demonstrated by \$25 billion in consumer sales in 2011,<sup>11</sup> with six in 10 kids playing videogames on any given day.<sup>1</sup>

However, converting inactive game play to active game play is a real possibility, given the surging popularity of videogames that require physical activity (i.e., exergames). Sales data alone reveal the immense reach of exergames: 96.5 million Nintendo (Kyoto, Japan) Wii™ consoles have been sold worldwide, and the top-selling game for Xbox 360 is a

Kinect (Microsoft, Redmond, WA) exergame.<sup>12</sup> “Dance Dance Revolution” (Konami Digital Entertainment, El Segundo, CA), which began as a niche arcade game in the 1990s, now comes in 54 versions sold to 21 million game players.<sup>12</sup>

But do exergames provide enough physical activity to translate into clinically significant health improvements? A systematic meta-analysis demonstrated that energy expenditure during exergame play across nine studies did reach criteria for moderate, but not vigorous, physical activity.<sup>13</sup> Another systematic review of 13 interventions and 28 laboratory studies found a range of light- to moderate-intensity physical activity during exergame play.<sup>14</sup> Exergaming produced clinically meaningful health change for children and adolescents over interventions lasting 10–12 weeks, with improvements in endothelial function,<sup>15</sup> aerobic fitness and blood pressure,<sup>16</sup> increased vigorous activity,<sup>17</sup> and increased total physical activity.<sup>18</sup> A 6-month intervention in overweight and obese 10–14 year olds in New Zealand even found a small but significant decrease in body mass index ( $-0.24 \text{ kg/m}^2$ ) and body fat percentage ( $-0.83\%$ ) from exergame play at Week 24.<sup>19</sup>

In contrast, a naturalistic 13-week U.S. study found that giving exergames to 9–12 year old children to play in their homes did not increase total physical activity, compared with children who received inactive games.<sup>20</sup> What is different about this study versus the prior studies is that it provided no structure or social support for game play. Rather, the intent was to imitate a real-life scenario, to see if putting an exergame in a house may be sufficient to increase children’s physical activity. The authors suggested that a prescription for physical activity may produce different results and that creating a social or competitive context within game play may motivate the player to undertake more sustained activity.<sup>21</sup>

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Indeed, a supportive social context is an important facilitator of physical activity among youth.<sup>22</sup> A structured, social intervention may be the key to making exergames most effective in increasing physical activity to promote healthy weight during adolescence.<sup>23</sup>

### **The Wii Club: A Controlled Physical Activity Intervention for Overweight Youth**

In August 2009, our research team at Georgetown University was awarded a Robert Wood Johnson Foundation Pioneer Portfolio grant from its national program, "Health Games Research: Advancing Effectiveness of Interactive Games for Health." This grant was part of a national program to advance the research, design, and effectiveness of games that promote health, especially focused on design principles that affect behavior change. For our grant, we tackled childhood obesity, recognizing that pediatric obesity interventions often fail to engage youth long enough to produce clinically meaningful weight loss. Invigorated by the burgeoning evidence that one-time bouts of exergaming produced energy expenditure and increased heart rate to levels needed for aerobic fitness,<sup>24,25</sup> we used social cognitive theory<sup>26</sup> to design a multi-month exergame intervention. We aimed to use the social environment of gaming as a promoter of individual behavior change, a process fueled by an increase in self-efficacy and motivation toward exercise.

Our initial pilot study leading to the grant proposal demonstrated higher caloric expenditure during social versus solitary Nintendo Wii exergame play.<sup>27</sup> In fact, accelerometry data revealed that these 12–18-year-old adolescents expended as many calories playing Wii tennis against a partner as they did participating in a beginner's lesson on a tennis court.<sup>27</sup> Therefore, we knew that the social context of game play is a powerful promoter of physical activity among young players. However, this pilot study was only 4 weeks long, which was insufficient to produce weight loss.

To design the Wii Club intervention,<sup>28</sup> we assembled a team of developmental psychologists and pediatricians and targeted sedentary, overweight and obese students at a public high school in a low-income neighborhood in Washington, DC. Our pediatrician co-investigator set 5 lbs as an attainable goal for weight loss during the intervention. Using referrals from the school wellness center and word of mouth to teachers and students, we recruited 74 students whom we assigned to a cooperative exergame, competitive exergame, or control condition. Those in the exergame groups were encouraged to come to the Wii Club during lunch or after school each weekday over a 7-month period, although the final sample dropped to 54 students and attendance averaged 26 sessions over 20 weeks because of rolling admission and attrition. The control condition continued regular daily activities with no involvement in the exergame intervention.

Each day the students in the exergaming conditions were randomly assigned to a partner to either work together (the cooperative condition) or compete against each other (the competitive condition) to earn points and burn calories, which were continuously reported on the Wii game. Each day, students played a unique prescribed 30–60-minute exergame routine on the EA Sports Active (Electronic Arts, Redwood City, CA) for Nintendo Wii, including cardio, sports, yoga, and strength training games played in a circuit

fashion. The exergame routines were designed to gradually increase in intensity, length, and difficulty throughout the intervention to create continued challenge for the participants. Midway through the intervention, an expansion pack of additional games was released by Nintendo, so these were added to the routines to maintain novelty and engage students' interest.

The major finding of the intervention was a 3.6 lb weight loss in the cooperative exergame condition versus a 1.9 lb weight gain in the control condition, which equated to a 5.5 lb difference between the cooperative versus control conditions.<sup>28</sup> In contrast, the competitive condition's weight remained stable. It is interesting that attendance did not mediate the condition effects on weight loss. In investigating potential psychosocial factors contributing to the condition effects, we discovered the cooperative exergame players increased in self-efficacy toward exercise and that both exergame groups increased in peer support.<sup>28</sup> Compared with the competitive players, the cooperative players also experienced higher intrinsic motivation toward exergame play, which, in turn, was associated with higher energy expenditure.<sup>29</sup>

Although the desired 5 lb weight loss was achieved, the study faced many obstacles as expected in a real-world physical activity intervention set in a school. Participant retention was a major challenge, with students facing countless distractions from Wii Club participation including concern over getting home before dark, academic commitments, family and work obligations, loss of interest in playing the Wii, and waning desire to be physically active (with sweating as a common complaint). Participants were incentivized with monthly cash gift cards, daily healthy snacks, and continuous positive feedback from research assistants, but many students lost interest or found other activities more desirable. Despite these problems, retaining 54 participants over the intervention is promising given the level of physical activity expected of these otherwise sedentary and overweight or obese adolescents. Even those adolescents who remained in the Wii Club faced constant obstacles to healthy living. This intervention did not provide education on healthy eating, so any calories expended during game play could easily be compensated for by additional caloric intake. This compensation was observed especially for students attending the Wii Club during lunch, where often a slice or two of pizza was consumed following the 30-minute exergame workout.

To maintain consistent game exposure across participants and conditions, exergame routines were prescribed to students. Participant input was taken into consideration in designing routines, but players were not allowed free play. Because choice is a key intrinsic motivator for continued game play,<sup>29</sup> prescribed routines may have been less motivating compared with free choice.

### **Recommendations for Further Study**

Although the findings of the Wii Club are promising, this is one study of one group of adolescents from one high school playing one exergame, so replications and extensions are needed. The Wii Club intervention focused solely on adolescent physical activity and on building peer relationships through cooperative or competitive game play. The support of parents, siblings, and friends and the incorporation of healthy eating into the physical activity intervention may further

improve adolescents' health behaviors and promote healthy weight. Additionally, the study used weight as the primary outcome for health. Although monitoring weight was appropriate given the overweight and obese status of the participants, health parameters, including direct measures of body fat and cardiometabolic risk factors, and measures of fitness, strength, and endurance would provide a more comprehensive understanding of health changes during the intervention.

As demonstrated in the Wii Club, intrinsic motivation and self-efficacy were important factors for sustained involvement in the physical activity intervention and eventual weight loss.<sup>28</sup> Future interventions should examine the role of psychosocial health in adolescents' adoption of an active and healthy lifestyle. Additionally, an ancillary study of the Wii Club intervention revealed short-term increase in executive function skills immediately following an acute bout of competitive exergame play, versus the cooperative and control conditions.<sup>30</sup> Exergames contain both the cognitive challenges of game play itself<sup>31</sup> plus aerobic activity that provides acute cognitive benefits.<sup>32,33</sup> Therefore, potential cognitive benefits from exergame play are another outcome of interest.

### Conclusions

Exergame research is an emerging and promising field. When we designed our Wii Club, the Microsoft Kinect had not yet been released. This game console promises an even more interactive and perhaps physically challenging experience. Regardless of the next emerging platform, however, the game design principles should be adaptable across the exergame spectrum. Perhaps the structured intervention with a prescription to exercise cooperatively with a friend is an important ingredient to making exergames effective physical activity tools. If we had made the Wii Club part of a weight loss intervention that involved goal setting for improved health, maybe the Wii Club participants, including those in the competitive condition, could have lost even more weight.

Our study provides a first step in documenting weight loss from sustained exergame play. Many questions remain. As more investigators and funding agencies recognize the potential of these games as physical activity and weight loss tools, we will better understand the design principles and gaming contexts that promote healthy behaviors among modern digital youth. Exergaming may bring the digital world, and therefore the teenagers, into our battle against pediatric obesity and physical inactivity.

### Acknowledgments

Support for this research was provided by the Robert Wood Johnson Foundation's Pioneer Portfolio through a grant from its national program, "Health Games Research: Advancing Effectiveness of Interactive Games for Health," to Georgetown University. We especially thank Ms. Amanda Terry, Ms. Kimberly Watson, and Mr. Patrick Scanlon for data collection and entry; Dr. Rusan Chen for his statistical guidance; and Ms. Coleen Lucas, Dr. Kirsten Hawkins, and the staff of the Wellness Clinic at H.D. Woodson High School in Washington, DC, for participant recruitment and data collection efforts.

### Author Disclosure Statement

No competing financial interests exist.

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