

Video gaming to promote fitness and increase exercise adherence among adolescents with disabilities: An exploratory study

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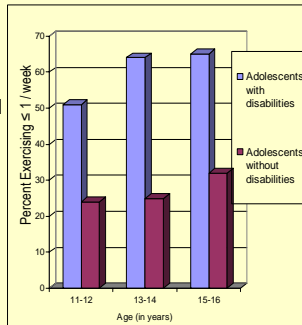
The Problem

Children and adolescents with disabilities have disproportionately lower levels of physical activity and fitness and higher levels of obesity compared to their nondisabled peers. These risk factors (physical inactivity & obesity) are associated with a high risk of cardiovascular disease, type 2 diabetes and many other health conditions, and both are powerful predictors for all-cause morbidity and mortality. Contributors to the problem include:

- few community- or school-based sports, recreation and fitness programs;
- inaccessible fitness facilities and recreation areas;
- scarcity of adapted sports and fitness equipment, and
- lack of knowledgeable personnel to provide safe and effective programs.

With fewer opportunities to participate in sports, recreation and fitness, youth with physical disabilities are more likely to spend available leisure time (i.e., after school, weekends) in sedentary behaviors.

Physical activity levels of adolescents with and without disabilities who exercise once per week or less.



One Possible Solution

One innovative approach is the use of video games that require physically active participation. While most video games require small hand and finger movements to play the game, physically active video games require players to engage in larger upper-body or full-body movements. Consequently, these video games require substantially greater energy expenditure than hand-controller-based video games.

Why Active Video Games?

- These games are very popular among youth and young adults, thus having high social validity;
- They can be played alone or in groups, do not require special areas, use widely available equipment, and can allow players

with and without disabilities to play together or compete with one another;

- The games run on widely available video game consoles so they offer a potentially cost-effective and innovative way to promote healthier, more active lifestyles for youth with disabilities.

But do they provide beneficial levels of physical activity?

Evaluation of the Sony EyeToy™

The EyeToy™ is an off-the-shelf, low-cost gaming peripheral which provides players the opportunity to interact with virtual objects displayed on a standard TV monitor. The EyeToy™ does not require any special markers, background or lighting. A universal serial bus (USB) camera and motion-sensing software allows the player to interact with objects in the displayed virtual environment. Typical games involve touching, striking, or blocking objects in the virtual world to score points.

Photo of television screen during EyeToy active game play



Procedure

Pilot testing was conducted using two subjects, a 59 year old male without a disability (the lead author) and a 26-year old female with a quadriplegic SCI at the C-6 level. Both subjects were tested seated playing the EyeToy Groove game in which hand, arm and upper body movements are used to touch intercept or follow onscreen targets in concert with

contemporary dance music. The same songs were used for both participants. Each subject played the game for multiple trials prior to testing. A trial consisted of a turn for one song using the typical game play format. Thus, a trial ends when a certain number of errors are made or at the end of set period. Subjects practiced at easy and medium levels of difficulty until they could sustain play for a turn. Subject heart rate was recorded using a Polar® S810 heart rate monitor with chest strap transmitter. Each subject completed multiple test trials with and without added resistance in the form of wrist weights. Five pound weights were used for the non-disabled subject and one pound weights for the subject with SCI.

Results

The graphs below display typical results for each subject. Playing these active video games produced approximately 50% increases in heart rate during play with added resistance, which is sufficient to produce some health benefit although not equivalent to typical moderate exercise. The primary problem with active video games is that the game format is designed for greater participation rather than sustained activity by one person. This results in episodic activity rather than the sustained activity required for cardiovascular benefit.

