

# Assisting people with disabilities in actively performing walking activities by controlling the preferred environmental stimulation with an air mouse

Ching-Hsiang Shih<sup>1</sup> Chia-Jui Chang<sup>2</sup> Yung-Chi Huang<sup>1</sup> I-Ying Liu<sup>1</sup>

<sup>1</sup>Department of Special Education, National Dong Hwa University, Hualien, Taiwan, ROC

<sup>2</sup>Department of Special Education, National Taiwan Normal University, Taipei, Taiwan, ROC

## Abstract

The wireless gyration air mouse is a hand-held commercial computer mouse device that embedded MEMS (Micro Electro Mechanical Systems) gyro sensor, which can measure the rotation, angle and speed of the wrist or elbow. The purpose of this study was to explore whether applying a gyration air mouse combined with preferred environmental stimulation would engage two people with disabilities who are obese and lack of exercises in walking actively.

**Keywords:** disabilities, air mouse, walking actively

## 1. Introduction

As the technology improves, many high-tech products are getting cheaper, powerfully functional, and commercially available. Among these high-tech products, some contain a sophisticated sensor or detector which can detect specific physical movements. For example, a computer mouse can detect the movement of hand on the desk, a mouse scroll wheel or trackball is able to detect the thumb/finger poke, an air mouse or Nintendo Wii Remote Controller can detect limb

action/movements, and a Nintendo Wii Balance Board can standing posture and focus, etc.

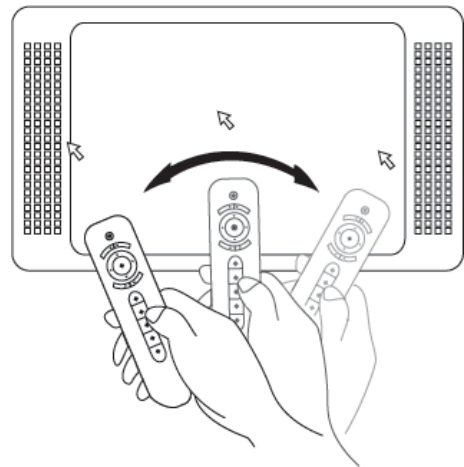


Fig. 1

The wireless gyration air mouse is a hand-held commercial computer pointing device that embedded MEMS (Micro Electro Mechanical Systems) gyro sensor. It is able to detect the pointing direction of hand movement in the air, and covert the movement into an operation for the computer cursor. The functions of wireless transmission enables users operate

the computer flexibly and unlimitedly in the air [1-4].

There are many types of air mouse commercially available. In addition to those with standard functions (i.e. precisely controlling the cursor by moving one's wrist) (Fig. 1), some air mice are even equipped with functions of optical mice. Therefore, they can be used on the desk, and in the air as well. (Fig. 2)



Fig. 2

Since an air mouse is capable of detecting its own movement and the functions of wireless transmission, it can be applied to other fields. However, it's not an easy task due to the factor that air mice available in the market were designed to be standard input devices for computers. Once air mice are connected with computers, computers will automatically recognize them as mouse devices and install the mouse driver. Thus, the usage of air mice will be restricted.

Nonetheless, by assistance of software techniques, air mice still can be applied to other fields without changing the original hardware and appearance, and also extend the scope of applications. For instance, air mice can be used in special education and habilitation as assistive technology devices to help people with disabilities to suppress improper behaviors [5] or develop positive behaviors [6].

For people with intellectual disabilities, being obese and low physical activities are the most common problems. Compared with average people, people with intellectual disabilities have a higher obesity rate. Hence, how to make people with intellectual disabilities actively engage in

proper physical activities is the main issue in this study.

This study applied high-tech software techniques to alter an air mouse to become a sophisticated movement detector. It was utilized to detect the walking of two children with disabilities who are obese and lack of activities and it was integrated with response-stimulation strategy (i.e. using the simple behaviors to control preferred environmental stimulation) to assess if they would be motivated to actively increase their walking through controlling their favorite stimulation.

## 2. Research Method

### 2.1. Subjects

Two participants Wang (17-year-old boy, severe intellectual disability) and Chang (16-year-old boy, middle-level intellectual disability) participated in this study. Both of them were obese and have poor physical fitness. Most of time, they were sedentary and not willing to exercise.

### 2.2. Research Tool

The equipment used in this study was as shown in Fig. 3 and included an air mouse (detect walking), a control system, and a flat panel display (display preferred videos).



Fig. 3

The air mouse chosen for this study was a small-sized, light-weighted and cheap product. It was connected to the control system via a 2.4G wireless trans-

mission with a 10-meter effective range. The air mouse was attached to a participant's foot to detect walking. Any slight walking would be detected and delivered to the control system through wireless transmission.

The control system is a standard Windows operation system (OS) computer, and Eee Box mini computer was used as the control system in this study. Control system would keep checking and monitoring data transmitted by the air mouse. Once data were judged as effective walking, videos preferred by the participant would be shown on the flat panel display. As the participant stopped walking, video display would be suspended immediately.

### 2.3. Research Design

This study used the ABAB Design of the single-subject experimental designs. Both participants conducted the experiment of A-B-A-B sequence, in which A represented the baseline and B represented intervention phases [7].

### 3. Discussion

In children and youth with disabilities, the risk of obesity is higher and is associated with lower levels of physical activity, inappropriate eating behaviors, and chronic health conditions [8]. Greaser and Whyte [9] noted that the prevalence of overweight in adolescents with intellectual disability is also based on the associated decreased mobility. Sustained imbalance of energy intake and expenditure causes overweight and obesity [10]. Adolescents with intellectual disabilities may incline to sedentary activities instead of physical activities and energy expenditure [11]. However, doing exercise is a good strategy that may improve the physical functions of people with mental retardation [12]. Generally, through the physical

activity, it may not achieve the balance of energy intake and expenditure, but also improve the physical functions and reduce the rate of obesity and overweight.

In this paper, it was presented that how we used a standard air mouse integrated with preferred environment stimuli to assist two people with disabilities in actively increasing physical activities. Compared with specifically-designed assistive technology devices, all the equipment in this study has more strengths, including the accessibility, lower price, variety, and so on.

The goals expected to be achieved are as follows: (1) Turning standard air mice into high-tech assistive technology devices; (2) engaging people with special needs in increasing their walking activities actively through controlling the favorite stimulation.

### 4. Acknowledgements

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