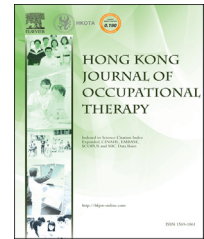




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ORIGINAL ARTICLE

Effect of Cyber-Golfing on Balance Amongst the Elderly in Hong Kong: A Pilot Randomised Trial



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KEYWORDS

balance;
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Summary *Background/Objective:* Recent evidence showed that golf can develop balance amongst the elderly. This study aimed at evaluating if exergaming, in particular cyber-golfing, can be a feasible and inexpensive alternative to this valuable exercise.

Methods: Twenty healthy community-dwelling elderly were recruited, and they were randomly assigned to either the experimental group ($n = 10$) or the control group ($n = 10$). Daily cyber-golfing training for 2 weeks was assigned to the participants of the experimental group, where regular table games with equal lengths and durations were arranged for the control group.

Results: The results revealed that the participants in the experimental group showed significantly better post-training performances in the functional-reach test, $F_{(2,17)} = 5.16$, $p = .04$, and single-leg-stance test, $F_{(2,17)} = 5.32$, $p = .03$, than those in the control group.

Conclusion: The results of this study suggest that cyber-golfing might be an alternative to golfing, which is capable of enhancing balance ability amongst community-dwelling elderly. The potential of exergaming as a clinical tool for geriatric rehabilitation was discussed.

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Introduction

Ageing population and high falling rate amongst the elderly have raised serious concerns globally as well as in Hong Kong (Fong, Siu, Au Yeung, Cheung, & Chan, 2011; World Health Organization, 2007). Multiple risk factors contribute to the elderly fall problem (Zecevic, Salmoni,

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Speechley, & Vandervoort, 2006). Amongst all, poor balance and standing stability are major attributes that can be improved by proper exercise (Panel on Prevention of Falls in Older Persons, American Geriatrics Society and British Geriatrics Society, 2011). Golf is a sport that can develop balance, aerobic fitness, and physical health amongst the elderly. Owing to insufficient golfing facilities in Hong Kong, this valuable sport is inaccessible to many elderly. In recent years, the advancement of exergames allows people to exercise at home, and cyber-golfing appears to be an affordable alternative for the elderly (Anderson-Hanley et al., 2012; van Diest, Lamoth, Stegenga, Verkerke, & Postema, 2013). The aim of this study was to examine the effect of cyber-golfing on balance ability amongst the elderly in Hong Kong.

Amongst sports, golfing has many benefits. A previous research has identified better balance and standing stability in professional golfers as compared with amateurs, and significantly greater strength and flexibility over hips, torsos, and shoulders in skilled golfers than in novices (Sell, Tsai, Smoliga, Myers, & Lephart, 2007; Stemm, Jacobson, & Royer, 2006).

Golf may be particularly helpful to the elderly. A study of golf exercise for the elderly suggested that golfing improved the proprioception of their knee joints and their standing-balance control (Tsang & Hui-Chan, 2004). In addition, there were noticeable energy expenditure and glucose consumption after 18 holes of play (Murase, Kamei, & Hoshikawa, 1989). These studies appear to indicate that golfing may prevent the elderly from falling by enhancing their static-balance control.

Exergaming, also known as active video gaming, may be one option to encourage physical activities in the elderly. It is a combination of "exercise" and "gaming," which shows positive effects on general health and physical functioning.

Exergaming has been proven to improve the cognitive function in the elderly. A group of adult trainees improved significantly more in physical and cognitive (in terms of executive control and processing speed) functions than their control counterparts after engaging in 24 sessions of 1-hour exergame training (Maillot, Perrot, & Hartley, 2012; Verheijden Klompstra, Jaarsma, & Strömberg, 2013). Another study revealed that, after exergaming, in particular cyber-cycling, the elderly achieved better cognitive function than traditional exercisers, using the same amount of effort (Anderson-Hanley et al., 2012).

Furthermore, a systematic review found that the elderly with a history of heart failure, whilst enjoying exergaming, experienced improved balance and reported better quality of life and empowerment (Verheijden Klompstra et al., 2013). Lamoth, Caljouw, & Postema (2011) also discovered that the period task performance and balance amongst a group of healthy elderly were better after exergaming.

In summary, these findings indicated that exergaming could be a feasible alternative to facilitate physical participation of healthy community-dwelling elderly in Hong Kong with a view of bettering their balance ability.

As previous research had established that golfing might prevent the elderly from falling by enhancing their static-balance control, this study hypothesised that cyber-golfing might have a similar effect on their standing-balance

control. A 2-week cyber-golfing training programme targeted to improving static balance in community-dwelling elderly in Hong Kong was implemented and its effects examined.

Methods

Participants

A convenient sample of 20 healthy community-dwelling elderly from an elderly day activity centre was recruited. Their mean age was 69 years old with a range from 65 years old to 78 years old. Thirteen of them were females and seven were males. All participants reported no major physical illness, could walk without assistance, and had no previous golfing or exergaming experience. The approval was given by the Human Research Ethics Committee of the Hong Kong Institute of Education, and a written informed consent was obtained from each participant.

Procedures

The participants were randomly assigned into either the experimental or control group. In the experimental group, 10 participants received daily cyber-golfing training for 2 weeks. For the control group, regular table games with equal lengths and durations were arranged. For the participants in the experimental group, two 30-minute demonstration sessions were conducted before the experimental procedures. Standby assistance and demonstration of the golf swing were given at the beginning of and during the demonstration sessions.

All participants received pretraining and post-training evaluations on their risk of fall by the timed up-and-go test (TUGT), and their static balance by the single-leg-stance test (SLT) and the functional-reach test (FRT).

The evaluations and the demonstration and training sessions were supervised by a trained research assistant.

Cyber-golfing

An Xbox 360 Kinect (Microsoft Corporation, Hong Kong) was used. An exergame called "Tiger Woods PGA Tour 13" was adopted in the training sessions. The 10-hole gaming mode was selected. All participants were required to finish the whole game in each session, which lasted for 30–45 minutes.

Measurement

TUGT

The participants were required to sit on a chair with their hips all the way to the back of the seat with arms resting. A piece of tape was marked on the floor 3 m away from the chair as the point of return. Upon the signal "go," the participants stood up, walked at a regular pace to the tape, turned around, walked back to the chair, and sat down. The time of the procedure was recorded (Morris, Morris, & Iansek, 2001; Ng & Hui-Chan, 2005; Podsiadlo & Richardson, 1991). An untimed practice trial was given before testing.

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