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Original article

Effect of a 26-month floorball training on male elderly's cardiovascular fitness, glucose control, body composition, and functional capacity

Mogens Theisen Pedersen [a,*], Jacob Vorup [b], Jens Bangsbo [a]

[a] *Copenhagen Centre of Team Sport and Health, Department of Nutrition, Exercise and Sports, Section of Integrated Physiology, University of Copenhagen, Nørre allé 51, Copenhagen N 2200, Denmark*

[b] *Health Science Research Center, University College Lillebaelt, Niels Bohrs Allé 1, Odense M 5230, Denmark*

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Abstract

Background: Floorball training offers a motivating and socially stimulating team activity for older adults, and 12 weeks of floorball training twice a week among men aged 65-76 years have been shown to have positive effects on a number of physiological parameters important for health. However, the effect of long-term participation in floorball training among male elderly has not been investigated. The aim of the present study was to examine the effect of 26-month of self-organized regular participation in floorball training on cardiovascular fitness, body composition, blood lipids, glucose control, and physical function among recreationally active men aged 66−78 years.

Methods: After completing a 12-week randomized and controlled intervention with floorball and petanque training in the autumn 2014 or spring 2015, 15 subjects chose to participate in floorball training (floorball group, FG), whereas 16 subjects resumed their usual lifestyle (control group, CG). FG took part in self-organized floorball training 1.7 sessions of 40 min/week, and CG continued their normal recreationally active lifestyle during a 26-month follow-up period. At baseline and after the follow up period subjects were tested for cardiovascular fitness, glucose control (resting blood samples), body composition (DXA-scanning), and functional capacity.

Results: In FG, the decline in VO_{2max} during the follow-up period was lower (242 ± 379 mL/min, $p = 0.01$), blood glycosylated hemoglobin (HbA1c) increased less (1.57 ± 2.93 mmol/L, $p = 0.02$), and leg bone mineral density increased more (0.028 ± 0.05 g/cm^2, $p = 0.02$) than those in CG. The effects on body mass, total lean body mass, fat mass, blood lipids, and physical function were similar in FG and CG.

Conclusion: Approximately 2 weekly floorball sessions with 40 min/session over 26-month appear to reduce age-related decline in cardiovascular fitness and glucose control and improve leg bone mineral density, suggesting that long-term participation in floorball training can be considered as a health-enhancing activity in recreationally active male elderly.

Keywords: Bone mineral density; Elderly; Floorball; Glucose control; VO_{2max}

1. Introduction

Increasing age is associated with a decline in physical function and health, including adverse cardiovascular events and development of type 2 diabetes.[1,2] Age-related changes also involve loss of muscle strength and coordination, metabolic dysregulation of blood lipids, accumulation of body fat and insulin resistance.[3−5] However, regular exercise can postpone the inevitable decline in physical capacity with age in older adults.[6−9]

It is important to be physically active regularly, especially for older adults. A 3-year longitudinal study showed that physically active older adults had higher muscle mass and less total and truncal fat.[10] Furthermore, a cohort study showed that sustained physical activity in older age was associated with improved health.[11] Significant health benefits were also seen among participants who became physically active relatively late in life.[11]

In the past decade, a number of studies have shown that soccer training organized as small-sided games led to a broad spectrum of positive health outcomes in both young and older adults,[12] as well as in people with lifestyle diseases.[13−18] Recently, other team games such as team handball,[19] basketball,[20] and floorball[21,22] have been shown to demonstrate

* Corresponding author.
E-mail address: mtpedersen@nexs.ku.dk (M.T. Pedersen).

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positive health effects on untrained young women, post-menopausal women and middle-aged men. Vorup et al.[9] showed that floorball training in older adults aged 65-76 years had positive effects on a number of physiological parameters important for health, including reduced plasma low density lipoprotein (LDL) cholesterol, triglycerides, body fat content, heart rate (HR) at rest and during submaximal cycling, as well as elevated muscle force and improved physical performance. These positive health effects of small-sided floorball and other ball games are intriguing, in particular since the small-sided ball games have been shown to be highly motivating due to the social connectedness and playful elements of the ball games.[23,24] However, the majority of studies examining health effects of small-sided ball games have been of moderate durations, typically 12-16 weeks.

Only 2 studies have investigated the long-term (>1 year) health effects of small-sided ball games training. One study showed that 1 year of soccer training, conducted as small-sided games, reduced body mass index (BMI) and improved maximal oxygen uptake (VO_{2max}), heart function, anti-oxidative capacity, leg strength, rapid force development of leg muscles, and functional ability among older healthy men aged 63-74 years.[25–27] In the other study, 12 weeks of floorball training 2 times a week of 60 min increased bone mineral density (BMD), intermittent exercise capacity, and VO_{2max} of pre- and post-menopausal women, and these adaptations were maintained after additional 40 weeks of floorball training with a reduced frequency to 60 min/week.[22] Nevertheless, the long-term health effects of training with small-sided floorball games of older men are not known. Furthermore, little information exists about training interventions lasting more than one year in older adults. Especially we want to study the effect of long time real life implementations of a controlled study without the interference of researchers in the implementation.

Thus, the aim of the present study was to examine the effect of 26-month regular participation in floorball training on cardiovascular fitness, body composition, blood lipids, glucose control, and physical function, in recreationally active men aged 66−78 years. It was hypothesized that regular floorball training would result in physiological adaptions considered important for health and functional capacity compared to a recreationally active lifestyle.

2. Methods

2.1. Subjects

This study is part of a parent study. The subjects were recruited from a study by Vorup et al.[9] (referred to as the original study), which examined the effect of 12 weeks of floorball training or petanque training on blood lipids, muscle strength, body composition, and functional capacity of men aged 65−76 years.

Thirty-one subjects from the original study aged 72.9 ± 3.5 (mean ± SD; range: 66-78) years with a height, body mass, and BMI of 1.78 ± 0.05 m, 81.5 ± 11.9 kg, and 25.7 ± 3.9 kg/m^2, respectively, volunteered to take part in follow-up investigations about 26 months after completing the original study.

Before the original study (baseline), the subjects were recreationally active (walking or cycling for transportation on a daily basis, and some had gymnastic, fitness or swimming activities on a weekly basis), but none had been involved in any type of regular (>1 weekly sessions) physical training for at least 10 years. This was supported by accelerometer measurements (AX3, Axivity Ltd., Hoults Yard, UK) showing that weekly running activity before the intervention period was low (7.0 ± 25.4 min/week), and walking was the most preferred physical activity (611 ± 205 min/week). Subjects were taking 9578 ± 3099 steps/day, which places this group in the highest quintile in men aged >65 years with regard to steps per day.[28] For exclusion criteria readers are refered to the original study. At baseline, 7 subjects took medicine to lower blood pressure, one subject was prescribed medicine to lower blood cholesterol and 3 subjects took medicine in connection with type II diabetes. During the 2-year study period subjects on medication did not change their intake of medicine.

The study was approved by the Committee on Health Research Ethics, Region of Copenhagen (H-2-2013-149) and conducted in accordance with the guidelines of the Declaration of Helsinki. Subjects were informed of any risks and discomforts associated with the experiments before giving their written informed consent to participate in the study.

2.2. Design

Twelve subjects were enrolled in the original study in September 2014 (first recruitment round). To increase power, another 19 subjects were enrolled in March 2015 (second recruitment round). The follow-up examination was conducted in March 2017. Thus, the mean follow-up time from baseline was 26 ± 3 months. At the end of the original 12 week training intervention in December 2014 or June 2015[9], the subjects in the floorball and petanque group were given the opportunity to participate in floorball training 3 sessions weekly. A flow diagram of the recruitment process including the original study is presented in Fig. 1. Fifteen subjects chose to participate in floorball training (floorball group, FG), whereas 16 subjects did not want to participate in the floorball training (control group, CG), and resumed their usual lifestyle. FG consisted of 10 subjects from the original floorball group, 4 subjects from the original petanque group and 1 drop-out from the original study. CG consisted of 6 subjects from the original floorball group, 7 subjects from the original petanque group, and 3 drop-outs from the original study (Fig. 1).

2.3. Training

In FG, training sessions consisted of floorball games performed indoor on a wooden surface sized 13 × 20 m. Floorball is a team sport like field hockey, but played indoor and with plastic sticks (http://www.floorball.org). A training session lasted 60 min preceded by a 10-min warm up period. The

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