Badminton specific fitness training improves badminton performance and reduces body fat in Danish college students – a comparison of regular high school badminton and specific badminton fitness training

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Introduction

An inactive lifestyle can lead to poor physiological fitness and to an increase in the prevalence of type II diabetes and cardiovascular disease, and in modern society metabolic related risk factors are becoming an increasingly larger health problem. Exercise training is well established as a cornerstone for decreasing and preventing risk factors associated with cardiovascular and metabolic disease. Badminton is a popular sport with more than 200 million players worldwide, but the beneficial effect of recreational badminton activities on health and performance is not well known. In contrast, a number of studies have recently shown recreational soccer to have a major impact on bone- muscle- and cardiovascular health, most likely due to the intermittent and intense nature of soccer. In addition, the rate of perceived exertion is lower during soccer compared to jogging and interval running, despite similar relative heart rates. Interestingly, the activity profile of badminton is similar to that of soccer consisting of repeated high-intensity actions. Thus, it would be of interest to investigate the longitudinal effects of recreational badminton on performance and health, as this has not previously been done. Thus, the aim of the present study was to investigate a newly developed Danish Badminton Fitness concept (B-FIT) on health and performance among Danish high school students, some recreationally active but none involved in regular badminton activities.

Methods

Design: Forty-four high school students were included in the study, which consisted of an 8-week intervention period (INT) with specific testing before and after. Two freshman high school classes (n=28) were engaged in B-FIT whereas a third freshman class (n=16) completed a standard high school 8-week badminton program (BAD) as planned by the teachers. Students with a compliance less than 85% (7 of 8 sessions attended) were excluded from the analyses.
Training: B-FIT consisted of core and resisted badminton specific full body exercises in 13 double stations (26 exercises in total). Each station comprised of 30s work periods with 15s of recovery (~50 min in total). In addition, ~25 min of badminton match play per training session. BAD consisted of ~50 min of badminton match play in combination with ~25 min of running and light core training per training session.
Testing: Testing was completed on two separate days (>36 h apart) before and after INT, with anthropometrics, jump height and B-SPEED[10] on one day and 5+20m sprint test and B-ENDURANCE[9] on a separate day.
Anthropometrics: Weight, body fat percentage and body fat+skeletal muscle mass (SMM) was measured using a body composition analyzer (InBody230, BioSpace, Korea) under standardized conditions.
Specific badminton performance: Specific on court badminton performance was evaluated with a specific on court speed test (B-SPEED[10]) and an endurance test (B-ENDURANCE[9]).
Briefly, B-SPEED consisted of 5x4 maximal actions to four sensors located in each corner of the court, performed in a randomized order. B-ENDURANCE consisted of two actions to each of the four sensors located in each corner of the court separated by 10 sec of recovery. Time to complete each rally of eight strokes decreased until exhaustion.
Non-specific performance tests: Three counter movement jumps (CMJ) were completed. In addition, a 5+20 m sprint test was completed using photocells (Witty, Microgate, Italy), each subject completed three2 runs separated by a minimum of 60 seconds of recovery.

Results

Training: Total time spent on training during INT was not different between B-FIT and BAD (677±14 vs. 688±19 min).

Anthropometrics: B-FIT decreased ($p<0.05$) body fat mass by 0.7±0.4 kg after INT, which corresponded to a 0.9% point decrease in body fat percentage. BAD did not change body fat mass (0.1±0.4kg) or body fat percentage after INT. B-FIT and BAD increased ($p<0.05$) SMM by 0.4±0.3 and 0.7±0.4 kg, respectively, with the increase in BAD tending ($p<0.1$) to be higher than in B-FIT.

Badminton specific performance: B-FIT and BAD both improved ($p<0.05$) B-SPEED performance (7.2 vs. 3.0% respectively) with no difference between groups. B-FIT improved ($p<0.01$) B-ENDURANCE performance by 42%, which was more ($p<0.05$) than BAD, who did not improve (6%; $p=0.70$).

Counter movement jump and 20m sprint ability: No change was observed in the sprint test or CMJ in B-FIT and BAD.

Discussion

The present study demonstrated that 8-weeks of B-FIT, but not BAD, decreased fat mass and fat percentage in high school students. In addition, badminton specific performance (B-SPEED) improved with both B-FIT and BAD whereas only B-FIT improved B-ENDURANCE.

The superior B-END performance after a period of badminton specific training (B-FIT) is supported by Walklate et al.,[2] reporting improved performance in a 300-meter shuttle run test as well as a custom-made badminton sprint test, while straight line sprinting was unchanged in Australian elite players following four weeks of badminton-specific repeated-sprint training. In addition, Young et al., [3] observed training specific improvements in sprint performance (improved change-of-direction but not straight-line sprint performance) among recreationally active male subjects, emphasizing a need for badminton specific training for improvements in badminton specific performance.

Our data showed a decrease in body fat mass of 0.7±0.4 kg, which is lower than reported after 12 weeks of football training in sedentary males (2.7 kg)1. Discrepancies may be due to differences in training period (12 vs. 8 weeks) and weekly training volume (2-3x60min vs. 1x90 min per week). Nonetheless, despite a short intervention period in the present study, with only one weekly training session, B-FIT is effective in inducing health related changes in body-composition and improving badminton specific performance.

Perspectives

B-FIT can be integrated in normal PE lessons once a week in students PE lessons, and is effective in improving badminton specific performance and body composition, which may have a broad impact on general fitness and health. Further studies should provide an insight into the effects for groups of subjects of different age, gender, social background as well as the long-term effects and compliance in recreational B-FIT training, including the influence of training volume and intensity on the range of physiological adaptations.

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2. Walklate BM, O'Brien BJ, Paton CD, Young W. Supplementing Regular Traing with Short-Duration Sprint-Agility Trainning Leads to a Substantial Increase in Repeated Sprint-Agility Performance With National Level Badminton Players. *J. Strength Cond. Res.* 2009;23(5):1477-1481.
3. Young W, McDowell M, Scarlett B. Specificity of sprint and agility training methods. *J Strength Cond Res* 2001;15(3):315-319.