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ORIGINAL ARTICLE

Abnormal blood pressure response to exercise in badminton athletes

Réponse de la pression artérielle anormale à l'exercice chez les athlètes de badminton

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KEYWORDS
Arterial blood pressure;
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Health and fitness

Summary
Purpose. — This study aimed to examine blood pressure changes in response to exercise and to identify blood pressure abnormalities in collegiate male and female athletes.
Material and methods. — Sixteen collegiate badminton players 16—22 years of age and with 3—8 years of badminton experience participated in the study. Participants' blood pressure was recorded before and after a multistage fitness test.
Results. — Following exercise, blood pressure significantly increased; mean maximum systolic blood pressure (SBPmax) and SBP delta (the difference between post- and pre-exercise SBP) were < 140 mmHg and < 45 mmHg, respectively. All other metabolic markers did not differ significantly between male and female players, except for post-exercise heart rate (HR) with males' post-exercise HR significantly higher than females'. Some badminton athletes showed diastolic blood pressure > 100 mmHg, an abnormal blood pressure response to exercise.
Conclusion. — The findings support the notion that blood pressure response to exercise may be an important diagnostic parameter in normotensive athletes at risk of developing hypertension and/or cardiovascular diseases. Monitoring athletes' exercise blood pressure by coaches, trainers, or sports scientists thus constitutes an important part of athletes' fitness evaluation.

Abbreviations: BMI, body mass index; DBP, diastolic blood pressure; DBPmax, maximum DBP; HR, heart rate; SBP, systolic blood pressure; SBP delta, SBPpost — SBPpre; SBPmax, maximum SBP; SBPpost, post-exercise SBP; SBPpre, pre-exercise SBP; WHR, waist-to-hip ratio.

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MOTS CLÉS
Pression artérielle ;
Pression artérielle diastolique ;
Pression artérielle systolique ;
Hypertension chez les athlètes ;
Athlètes universitaires ;
Santé et remise en forme

Résumé
Objectif. — Cette étude visait à examiner les changements de pression artérielle en réponse à l'exercice et d'identifier les anomalies de la pression artérielle chez des sportifs étudiants des deux sexes.
Méthodes. — Seize joueurs universitaires de badminton âgés de 16 à 22 ans et avec 3 à 8 ans d'expérience de badminton ont participé à l'étude. La pression artérielle des participants a été mesurée avant et après un test d'effort à plusieurs paliers.
Résultats. — Après l'exercice, la pression artérielle a significativement augmenté ; la pression artérielle systolique (SBPmax) et l'augmentation de celle-ci lors de l'exercice étaient < 140 mmHg et < 45 mmHg, respectivement. Tous les autres marqueurs métaboliques ne diffèrent pas significativement entre les sportifs masculins et féminins, à l'exception de la fréquence cardiaque post-exercice qui était significativement plus élevée chez les hommes que chez les femmes. Certains joueurs de badminton présentaient une pression artérielle diastolique > 100 mmHg, ainsi qu'une augmentation excessive de pression artérielle à l'exercice.
Conclusion. — Nos résultats montrent qu'il est important de mesurer la réponse tensionnelle à l'exercice chez des sportifs en apparence normotendus à risque de développer une hypertension artérielle et/ou les maladies cardiovasculaires. La surveillance de la pression artérielle des athlètes pendant l'exercice par des entraîneurs, des formateurs ou des physiologistes du sport constitue donc une composante importante de l'évaluation de la condition physique des sportifs.

1. Introduction

Fitness testing is an integral part of any exercise program because it provides coaches with a reference point about athletes' sport-related strengths and weaknesses, and facilitates establishing appropriate exercise programs aiming to improve or enhance an athlete's performance [1—4]. Fitness testing data also help assess an individual's response to exercise training and determine an athlete's cardiovascular health. Although measuring heart rate (HR) is often included in fitness testing to determine functional cardiac capacity, blood pressure is another relevant vital sign to be monitored. Normally, systolic blood pressure (SBP) increases linearly with increasing exercise intensity, while diastolic blood pressure (DBP) shows no or slight changes regardless of exercise intensity [5—8]. Nevertheless, SBP > 210 or > 190 mmHg in men or women, respectively; maximum DBP (DBPmax) > 100—105 mmHg; SBP increase of < 20 mmHg; maximum SBP (SBPmax) < 140 mmHg; and reduced SBP delta to < 45 mmHg are reportedly abnormal responses to, or during, exercise; these responses indicate future risk of acquiring hypertension and/or cardiovascular diseases [9,10] (note that SBP delta = SBPpost — SBPpre, where SBPpre and SBPpost indicate blood pressure before and after exercise, respectively).

Recently, abnormally high blood pressure readings were reported as part of some athletes' fitness testing, suggesting that hypertension is likely becoming prevalent in athletes [11—13]. The above reports highlight the importance of monitoring exercise blood pressure in athletes who regularly participate in moderately to highly intensive exercise programs. Thus, coaches, trainers, or sports scientists should include blood pressure monitoring in athletes' fitness testing. Monitoring blood pressure thus may identify those athletes who may have abnormal blood pressure readings not only at rest but also during exercise, or those who may be at risk of developing subsequent hypertensive or cardiovascular diseases. Because of this diagnostic potential, fitness testing which includes blood pressure monitoring may identify cases that may require further cardiovascular investigation or treatment.

Reports documenting exercise-induced blood pressure responses by athletes are still scarce [14—16]. Therefore, this study aimed to document general health, fitness, and exercise-induced blood pressure responses of, and to identify abnormal blood pressure in, collegiate male and female athletes.

2. Material and methods

2.1. Participants

Sixteen Filipino collegiate badminton athletes (male = 8, female = 8), with age ranging from 16 to 22 years and with 3—8 years of badminton experience, voluntarily participated in this study. Participants were informed about the testing protocol before undergoing fitness testing. All participants provided written informed consents before testing, which was performed according to the Declaration of Helsinki for human experiments.

2.2. Anthropometric measurements

All measurements were taken by the same operator to ensure reliability. Body weight to the nearest 0.1 kg was measured using a calibrated digital Bioelectric Impedance Analysis scale (i.e., Tanita Inner Scan Body Composition Monitor, Model BC541, Tokyo, Japan). Standing height, waist girth, and hip girth were measured according to ISAK protocols [17]. Waist-to-hip ratio (WHR) was calculated using the waist and hip girth scores. The body mass index (BMI) was determined using height and weight data.

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