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A COMPARATIVE STUDY BETWEEN TALENTED YOUNG GREEK AND GERMAN HANDBALL PLAYERS IN SOME PHYSICAL AND ANTHROPOMETRIC CHARACTERISTICS

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ABSTRACT: This international comparative study between talented young handball players in Germany and Greece investigated specific physical and anthropometric characteristics. This investigation of both elite profiles will allow us to determine the differences in the selection system for elite young handball players between the two countries. One hundred and sixty-two players participated in this study, 88 Greek young male players and 74 German young male players. For anthropometric tests the players were measured for body height, body mass and body mass index, arm span, hand length and hand spread. Physical fitness measurements were 30 m sprint, standing long jump, sit and reach flexibility, and 20 m shuttle run test. The results of this study demonstrate that Greek players were taller and heavier ($p<0.01$), had longer arm span and hand length ($p<0.01$), and performed better in 30 m sprint ($p<0.01$), standing long jump ($p<0.01$) and aerobic capacity ($p<0.01$). German players outperform in hand spread ($p=0.03$). While some of these differences can be explained by the different strategies and training methods, and also the training environment, the results do have important implications and effects in the physical condition of junior players.

KEY WORDS: elite handball players, testing processes, talent identification, physical characteristics, anthropometric characteristics

INTRODUCTION

Contemporary handball requires a high level of general and specific fitness. The actual length of a match is about 40 minutes, with consecutive attacks and defences, performed with high intensity. During a game, direct contact with opponents takes place, and players perform a lot of accelerations, turns and jumps. The diversity of efforts requires comprehensive preparation in terms of endurance, speed and strength. The energy required for handball competition derives from both aerobic and anaerobic processes. Good levels of general fitness, as well as a high aerobic and anaerobic capacity, form the foundation for success in handball [2,4,10].

The high performance of this modern complex handball sports game depends on several athletic aspects. Fitness profile is one of these important aspects for handball players, which requires players to have well-developed basic and specific motor abilities, cardio-respiratory capacities, speed endurance [4,7,18], a good level of sprinting and maximum jumping in defence and offence, flexibility, as well as agility and coordinative abilities, which are indispensable for the efficient solving of game situations. Furthermore, a high level of aerobic capacity ensures the slower onset of fatigue and a fast recovery, whereas anaerobic capacity is responsible for endurance in high-intensity repetitive activities [6,11].

Despite the importance of physical fitness features of young handball players, they are poorly evaluated. From the relevant literature it seems that there is little information available concerning the motor abilities and specific anthropometric characteristics of young handball players [9,18].

The aim of this international study was to compare the physical and anthropometric profile in the middle of the competitive season, of talented young handball players in two different European countries (Germany and Greece). Evaluation of the above-mentioned profile of this study's sample allows us to understand the difference between selection systems of talented young handball players in both countries and possibly answer the following questions: (1) How are the elite handball players selected in both countries? (2) Are there differences between the young talented German and Greek handball players?

The results of the physical condition tests could allow coaches to diagnose and identify players' abilities and possibly help to design

training programmes for improving specific players according to playing positions, as well as to record the players' improvement during a competitive season.

MATERIALS AND METHODS

The aim of this study was to compare the physical fitness characteristics of young Greek and German handball players. It was hypothesized that the differences between the groups would detect the strategies and training methods which could improve their physical fitness characteristics. The fitness profile is an important factor for coaches to monitor and plan training programmes. The German and Greek players underwent a training programme of 2-3 sessions per week, session duration 90-120 minutes.

Subjects

One hundred and sixty-two players participated in this study: 88 Greek young male players and 74 German young male players. Greek players showed a mean (±SD) of 14.04 (0.36) years for age, 1.75 (0.06) m for height, 69.76 (12.13) kg for weight and 22.85 (3.35) kg/m^2 for body mass index. German players showed a mean (±SD) of 14.11 (0.58) years for age, 1.68 (0.09) m for height, 62.44 (11.25) kg for weight and 22.32 (4.47) kg/m^2 for body mass index (Table 1). Apart from body height and mass and body mass index, the players were measured for arm span, hand length and hand spread as anthropometric tests (Table 2). Physical fitness measurements were 30 m sprint, standing long jump, sit reach and 20 m shuttle run test (Table 3).

Testing protocols

After standard anthropometric tests, all players warmed up for 15 minutes, then the testing session began with the sit and reach test for flexibility followed by 30 m sprint, standing long jump and at the end 20 m shuttle run test.

Anthropometrics

Body height, body weight and body mass index (BMI) as standard anthropometric tests were measured for each subject. Arm span was measured from the right to the left middle finger tip with the arms extended and abducted. Hand spread was measured from the tip of the thumb to the tip of the fifth finger with all fingers abducted. Hand length was considered as the distance from mid-stylion to dactylion. BMI was computed as the ratio of body mass to the squared standing stature (kg/m^2). The length characteristics were measured to the nearest 0.1 cm.

30 m sprint

Electronic photocells (Brower timing system, USA) were placed at the start and 30 m. The sprint test from a standing position required subjects to run as fast as possible for a total distance of 30 m and they stood with one foot at the starting line.

Standing long jump

The standing long jump assessed the explosive power of the lower limbs. The subjects stood on the jumping line and jumped as far as they could. Subjects were allowed the use of countermovement with the arms and legs. Measurements were recorded in metres from the line of takeoff to the back of the heel of the foot landing nearest the jumping line.

Sit and reach test

Lower back and hamstrings flexibility was measured with the sit and reach test to the nearest cm. Players were instructed to sit with their knees extended and to perform a maximal trunk flexion, aiming to reach as far forward as possible. A 90º angle was kept for ankles, while a value of "0" was set at the position of just reaching the toes.

20 m shuttle run test

The players ran continuously between 2 lines set 20 m apart at running speeds increased by a pre-recorded beep at appropriate intervals. Velocity was started at 8.5 km.h^{-1} for the first minute, increasing by 0.5 km.h^{-1} every minute thereafter. Players were instructed to complete as many stages as possible and the test was stopped when a subject was unable 3 consecutive times to reach a 3 m zone situated ahead of each 20 m line at the moment of the audio signal [8].

Statistical analysis

Descriptive statistics were derived for all test variables using SPSS (15.1). Differences in physical fitness characteristics between the groups were assessed by an independent samples t-test. Statistical significance was accepted at an alpha level of p-value ≤ 0.05.

RESULTS

The results of this study are presented in the following three tables. The results from tables one and two revealed no significant difference between the two teams in terms of age and body mass index, but a significant difference between Greek and German players was found for height, body weight, arm span, hand length at p ≤ 0.01 and hand spread at p ≤ 0.05.

Physical fitness characteristics results from table 3 were significantly in favour of Greek players in the 30 m sprint, standing long jump, and

TABLE I. DESCRIPTIVE PERSONAL DATA FOR THE SUBJECTS

Variables	Greek (n = 88)	German (n = 74)	*p*-value
Age (year)	14.04 ± 0.36	14.11 ± 0.58	0.37
Height (m)	1.75 ± 0.06	1.68 ± 0.09	0.00**
Weight (kg)	69.76 ± 12.13	62.44 ± 11.25	0.00**
BMI (kg/m²)	22.85 ± 3.35	22.32 ± 4.47	0.39

Note: Values are mean ± SD, BMI - Body Mass Index ** Significant at 0.01 level (2-tailed)

TABLE 2. ANTHROPOMETRIC CHARACTERISTICS FOR THE SUBJECTS

Anthropometrics Variables	Greek (n = 88)	German (n = 74)	*p*-value
Arm Span (cm)	179.61 ± 7.31	168.86 ± 9.81	p<0.01
Hand Length (cm)	19.27 ± 0.84	18.07 ± 1.37	p<0.01
Hand Spread (cm)	22.94 ± 1.27	23.45 ± 1.65	p=0.03

Note: Values are mean ± SD

TABLE 3. PHYSICAL FITNESS CHARACTERISTICS FOR THE SUBJECTS

Characteristics Variables	Greek (n = 88)	German (n = 74)	*p*-value
Sprint 30m (sec)	4.79 ± 0.25	5.05 ± 0.44	p<0.01
Sit and reach (cm)	32.86 ± 7.72	30.69 ± 7.23	p=0.07
Stand Long Jump (cm)	203.38 ± 21.54	178.80 ± 28.75	p<0.01
VO_2max Shuttle Run Test	50.93 ± 3.99	44.55 ± 6.43	p<0.01

Note: Values are mean ± SD

20 m shuttle run test at $p \leq 0.01$. No significant differences were detected between the two groups in the sit and reach test.

DISCUSSION

The aim of this study was to compare anthropometric and physical fitness characteristics of young Greek and German athletes. Germany is presently at the top of world handball since it is first in the IHF Ranking Table, both in men (281 points), and juniors (198 points). On the other hand, Greece is in 29th position in men (10 points) and 24th in juniors (19 points). Therefore comparison between young athletes of the two countries seems interesting.

The results from this study demonstrate that physical fitness components are generally better in young Greek players compared to young German handball players. While some of these differences can be explained by the strategies and training method difference between the players and also the training environment, the results do have important effects in junior players.

The present study showed that Greeks were significantly faster and performed better in the standing long jump than German players. These two factors are important elements of performance in team handball. Players are required to cover distances of 20-30 m at a maximal speed from the phase of defence to the phase of attack, or after a ball loss, to prevent a fast break. In addition, players perform throws in a long and vertical jump in an effort to reach the goalpost as close as possible, or in their effort to overcome the opponent's defence block.

In the present study, Greeks showed significantly better estimated aerobic capacity than Germans. A high aerobic uptake is required in team handball, as players have been reported to cover between 4 and 6.5 km per game [12,]. Handball players require high levels of aerobic capacity to aid recovery after high-intensity bouts of activity and maintain the ability of optimal output in shooting, which is significantly affected by time [5,17].

It is possible that German coaches responsible for detection and selection do not use physical performance as an important criterion in this stage of development. It seems interesting that German players had considerably lower performance in the 30 m dash, standing long jump and shuttle run test compared to their Greek counterparts.

The Greek athletes proved to be significantly taller and heavier and had broader arm span than their German fellow athletes. One of the basic conditions for high-level performance is the athlete's body structure and anthropometric features which positively affect the development and improvement of the motor and technical characteristics of each sport [1].

Body size as expressed by body height and body mass plays a theoretically important role in performance improvement, as athletes with these specific characteristics are at a higher level in terms of defence and attack [7].

Tall players seem to perform better than short ones, as it is generally accepted that body height positively affects on all of important skills in handball [1,16]. As a result, tall players have an advantage in space coverage and power production due to their body motor systems.

Data from the 2007 World Cup showed that the average height of the first 12 teams was 191.0 cm, and the difference between the tallest (Germany) and the shortest (Tunisia) team was quite large, 4 cm [13].

It is interesting that German athletes, although they are shorter and have a shorter arm span than the Greeks, outperform the Greeks in hand spread (22.94 vs. 23.45 cm) (Table 2). Hand spread is a significant anthropometric feature in handball, as it is correlated with ball throwing velocity (a basic factor in handball), more than the other body sizes [15,19]. Flexibility of the abducted fingers and the ability to grab the ball firmly is an important factor for a fast shot [3].

A possible explanation is the size of the ball used. Greeks at these ages use ball no. 2 (54-56 cm perimeter, 325-375 g), and Germans use no. 3 (58-60 cm, 425-475 g). Additionally, it is possible that the kind of training and sporting background (more ball training) leads to greater finger flexibility.

During the last 5 years, the Greek Handball Federation has begun efforts to identify and select young handball athletes from all over Greece, through a specific talent programme. Results of the present study may show the correct direction of this programme.

One cannot easily explain why the young Greek players perform better than the Germans, based on the present results. Although the data show some anthropometric and physical performance advantage in favour of Greeks, more information would be necessary in terms of the federations' structures, selection programmes and procedures, as well as athletes' training experiences. This study only dealt with anthropometric and some physical performance measures and did not include technical, tactical, environmental, psychological or

perceptual measures and a maturation index. It is important that talent identification and selection during the age of development have long-term planning.

CONCLUSIONS

The present study compared some basic anthropometric and physical fitness characteristics of selected young Greek and German handball players. The results demonstrate that significant differences in favour of Greek players in anthropometric (body height and mass) and physical fitness characteristics (standing long jump, 30 m sprint and aerobic capacity) exist between the two countries at the present time at these ages. It would be highly interesting to observe the development of both countries' athletes until the age of peak performance. Perhaps in the course of this development one can trace the key to German handball success compared with the Greeks.

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