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Stamina, Motor Control and Psychophysiological Status of Elite Male Handball Players

Keywords: handball, endurance, coordination skills

Introduction

Team handball is an intermittent game that involves low- and high-intensity movements and actions. Handball players must have excellent motor abilities, tactical and technical knowledge and psychological parameters to serve efficiently in the field.

To my opinion extensive investigation is needed in handball teams, especially in terms of player positions to understand the demands created by the game. It has been shown earlier by Ziv and Lidor (2009) that at different positions players have different anthropometric characteristics, they run, move or jump inadequately, cover smaller or bigger areas in the field. These information may be useful for coaches already in the period of the preparatory season.

Zaparditis (2009) have found that there are significant differences among young players in physical and anthropometric characteristics considering their playing positions, while Chaouachi (2009) have found no significant differences in adult elite male handball players in motor abilities. These abilities were tested with the aid of like 30m sprint test, 20m shuttle run test.

In basketball there was no difference registered between players at different positions if the tests were easy and non-repetitive (like vertical jump, 30m dash etc.), but if these test were repeated few times after each other without stops, there was a significant difference among players in terms of speed, aerobic capacity, vertical jump (Ziv and Lidor, 2009).

Aim

Considering these findings the aim of our study was to create a test battery to find and visualize possible differences among handball players.

My *Hypothesis* are that:

There is difference in motor abilities, anthropometric characteristics and psychological skills among players in terms of playing positions.

Wings have the highest performance level in physical and psychological characteristics.

Method

Players of two different (NBI and NBI/B) handball teams participated in this study (average age: $23,32 \pm 3,91$ years). We divided our study in two parts. In the first testing session we measured the physical characteristics ($n=22$, W=8, B=8, P=4, G=2; W= wing, B= back, P= pivot, G= goalkeeper). The second testing session included the test of coordination and physiological skills ($n= 15$, W=5, B=5, P=4, G=1).

After somatic measurements (body mass, stature, BMI), the aerobic endurance was tested with the aid of 20m shuttle run test in training situation. The running speed was tested with 30m dash. Throwing strength was measured with a 1kg medicine ball (one hand, sitting position), and 20 vertical jumps (in one series).

Psychophysiological and coordination tests were carried out studying distributive attention with Multi-modal distributive attention tester (Type: EM.-05.54, EM-05.55), task dependent concentration, choice reaction time (60 stimuli, 5 kinds of colors, 2 kinds of voices, 2 kinds of leg-stimuli) with Complex sensomotor tester, Type: EM-05.58K). I used a stabilometer to studying balance (Type: EM-05.47M).

I applied the SPSS 20.0 program to statistical analyzing. I used ANOVA to the comparison of groups. Significant level was $p < 0.05$.

Results

Mean calculated aerobic capacity of W: 63.96 ± 7.5 ml/kg/min, P: was 61.43 ± 8.33 ml/kg/min, B: 52.58 ± 5.94 ml/kg/min, while G: 57.8 ml/kg/min (**Fig. 1**). There is a significant difference between results of backs and wings ($p=0.008$).

Wings were the fastest players in my study (mean= 4.33 ± 0.19 s), while B were somewhat slower (mean 4.81 ± 0.31 s) in the 30m dash as it can be expected by the characteristics of the game (**Fig. 2**). Significant differences were found between results of backs and wings ($p=0.008$) and wings and goalkeepers ($p=0.03$). Throwing the medicine ball G were the best (23 ± 0.14 m), while W were the weakest (19.31 ± 1.5 m) as we can see on **Figure 3**. The different demands of each position are the most visible analyzing data obtained from the shuttle run and jump test. In the serial rebound (vertical) jump test mean height of W was

50.61±3.17 cm, while B performed 41.26±8.12 cm in one series (**Fig. 4**). There are significant differences between results of W and B ($p=0.047$) and W and G ($p=0.049$).

Studying distributive attention with one hand B gave 254.6±27.59 correct answers in 5 min (excellent score), while P: 213.5±50.63, G: 243 were much less effective, W had much more mistakes (178.4±44.81). An attention test with both hands gave similar results.

There were no significant differences in choice reaction time test among positions. Mean time was the highest for auditory stimuli, while the shortest reaction time was achieved with legs between 607-710ms (**Fig. 5**).

No big difference was measured in the range of displacement from the middle point in the balance test between the dominant (2.04±0.49s) and not dominant legs (2.05±0.44s), using a stabilometer (**Fig. 6**). Positioning within the normal range was average, displacement to the front was 14.1s on the dominant, and 13.7s on the not dominant side, while imbalance happened more often backwards (mean: 14.3s dominant side, 15.5s not dominant side).

Conclusions

The wings showed the best performance in serial rebound vertical jumping, 20m shuttle run test and 30m dash test as my hypothesis. Interestingly enough the back court players have excellent results in cognitive functions and reaction times.

Negative correlation between serial rebound (vertical) jump test and body mass ($r=-0.51$; $p<0.05$), and serial rebound (vertical) jump test and 30 m sprint test ($r = -0.63$; $p<0.01$) and serial rebound (vertical) jumping test and $VO_2\text{max}$ ($r=0.63$, $p<0.01$) was found.

Data obtained from our study are very useful for the coaches to plan individual, special training programs for players in different positions. Each player positions have other characteristics.

Bibliography

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FIGURES

1.

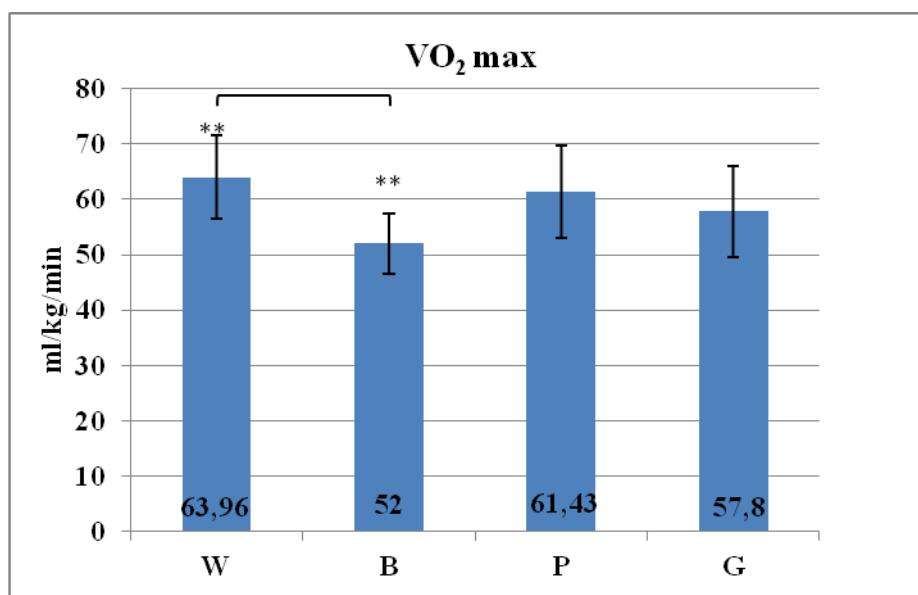


Figure 1. Results of maximal aerobic capacity between player positions

**<0.01

2.

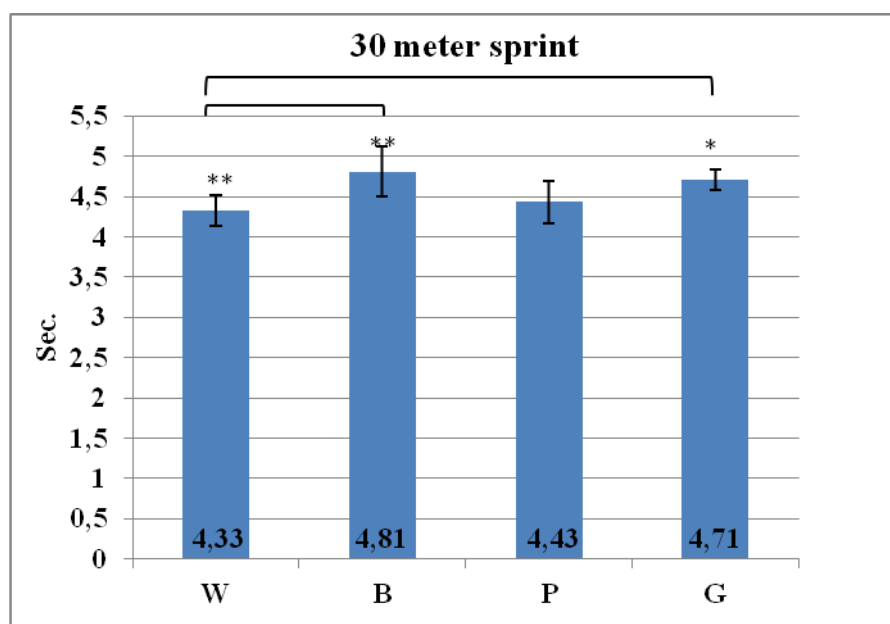


Figure 2. Results of 30m dash test (W=wings, B=backs, P=pivots, G=goalkeepers)

*p<0.05; **p<0.01

3.

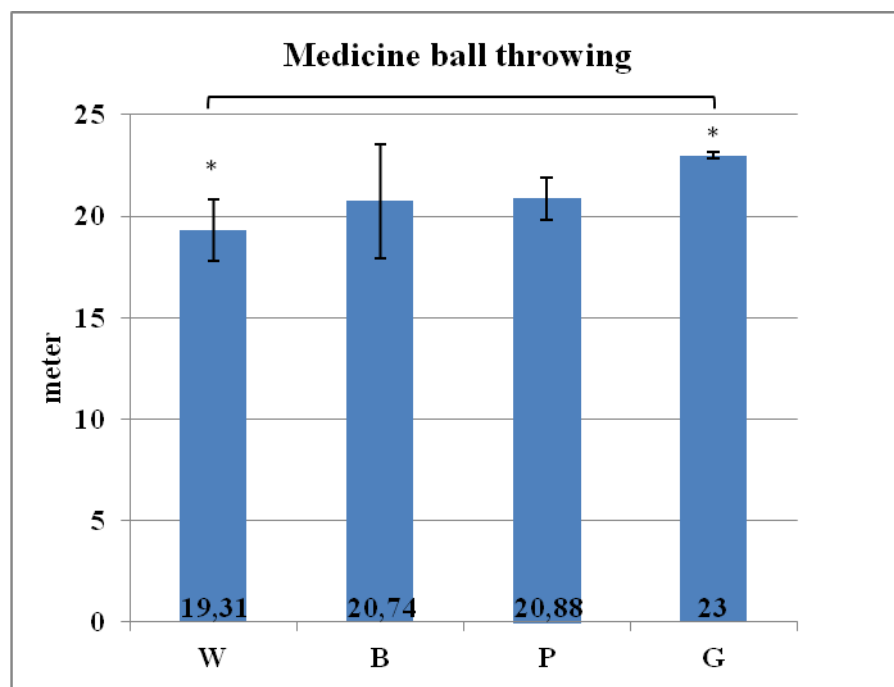


Figure 3. Results of medicine ball throwing test among positions

* $p < 0.05$

4.

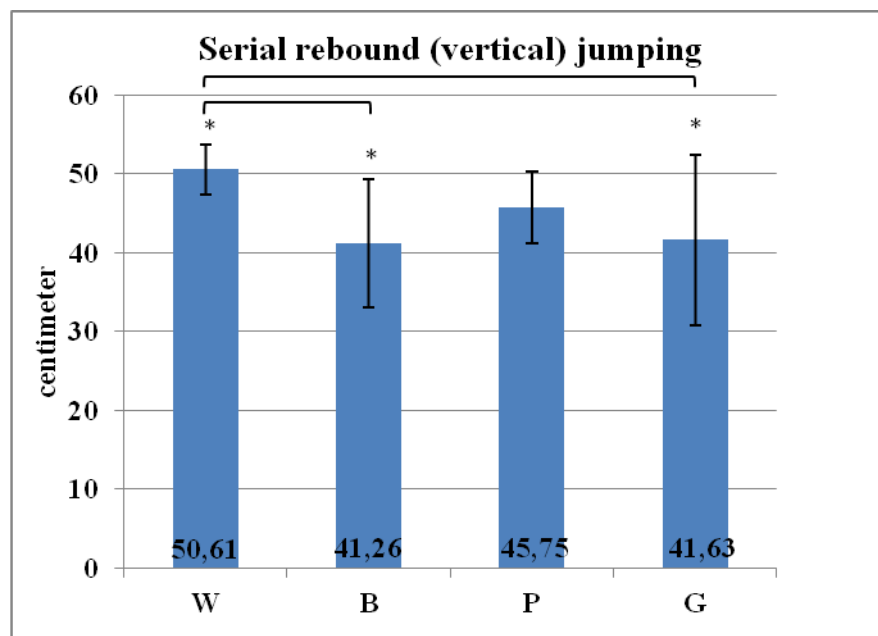


Figure 4. Results of serial rebound (vertical) jumping test

* $p < 0.05$, ** $p < 0.01$

5.

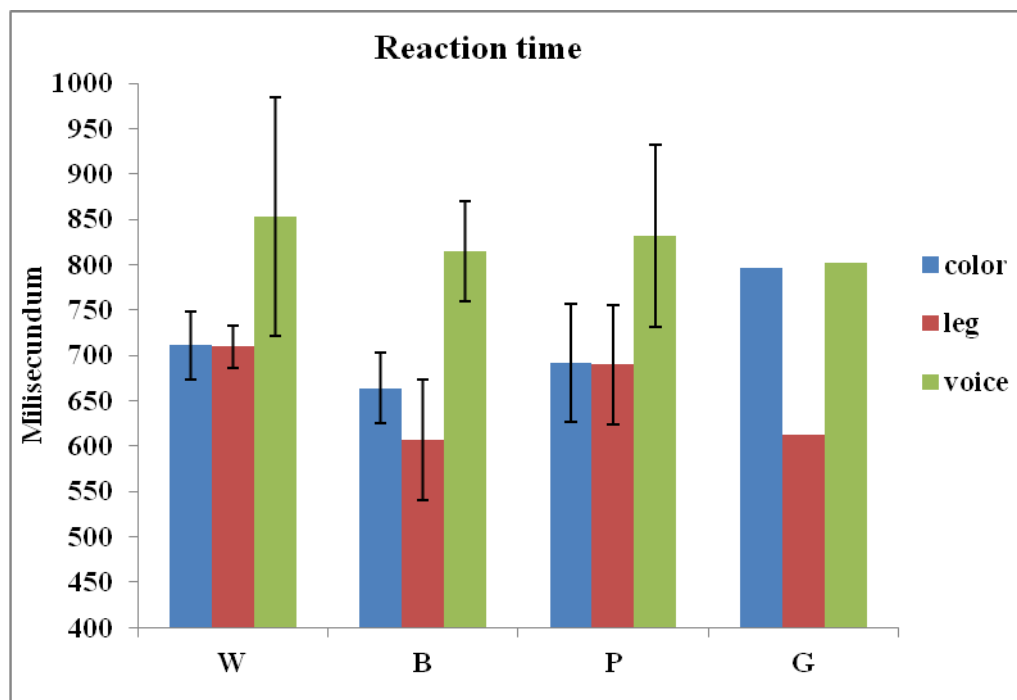


Figure 5. Results of choice reaction time for different stimuli

6.

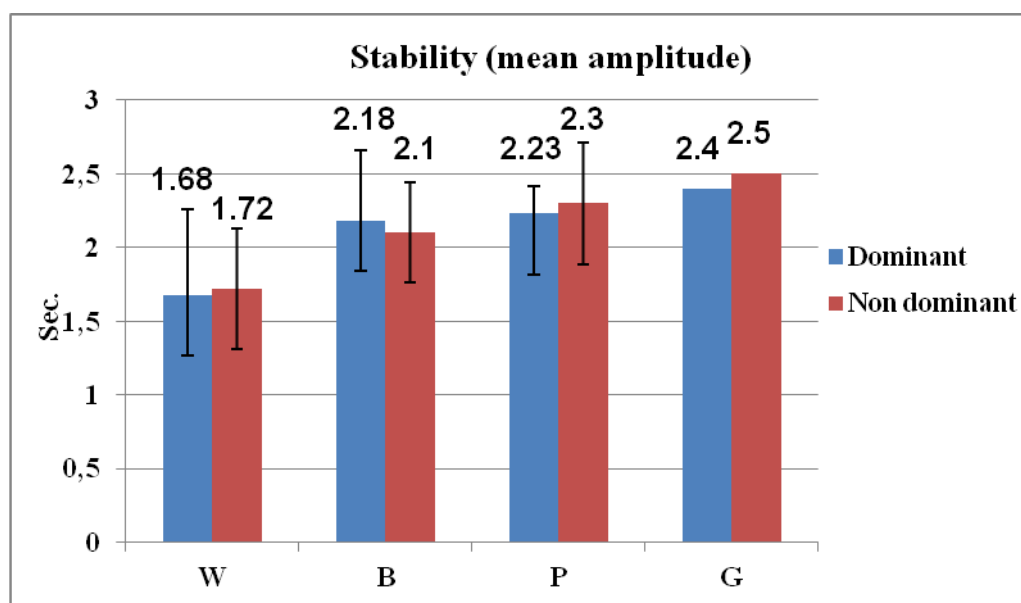


Figure 6. Results of mean amplitude of dominant and non dominant leg in the stability test