ORIGINAL ARTICLE

INFLUENCE OF DEVICE TACTICS ON CARDIOVASCULARS ADJUSTMENTS DURING THE HEART OF SOCCER TRAINING IN YOUNG MESO-ECTOMORPH CONGOLESES

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ABSTRACT

Background: Cardiovascular capacity during soccer training depends on the morphologics characteristics of players and the specifics actions in a tactical device. **Objective**: This study aims to analyze the influence of the tactical device on cardiovascular adjustments during the soccer training. **Methods:** 14 young meso-ectomorph players were divided into two groups based on the tactical set: 1) 4.4.2 tactical device were 3 subjects have been enrolled and were submitted to a systematic rehydration, 2) 4.3.3 tactical device were 11 subjects have been enrolled also submitted to systematic rehydration. Their resting Heart rate (HRo) and Blood pressure (BP) were measured by the cardiofrequencemeter and the tensiometer (respectively). They were also submitted in the YoYo for the determination of VMA and $\dot{V}O_2max$. The mean were compared using the Mann Withney μ test. **Results:** It appears from this work that age, high, weight and BMI were statistically no different. The post training values were significantly lower in 4.3.3 tactical device compared to 4.4.2 device concerning HRo (71.17 ± 1.38bpm Vs 76.18 ± 2.96 bpm, p <0.01), the SBP (126.90 ± 1.34mmHg Vs 128.89 ± 1.86mmHg, p <0.05) and MBP (85.51 ± 1.95 mmHg Vs 87.84 ± 1.13 mmHg, p <0.05). On the other hand, the VMA and $\dot{V}O_2max$ post training were significantly higher in the 4.3.3 tactical device compared to the 4.4.2 device (16.58 ± 1.49 km.h-1 Vs 13.27 ± 0.81 km 1.h-1 and 57.82 ± 3.22 ml.kg-1.min-1 Vs 46.46 ± 2.78ml.kg-1.min-1) (p <0.001). **Conclusion:** This study shown that the training induces a significant reduction of the HRo, the SBP and the MBP and shown the significant increase of the VMA and $\dot{V}O2max$ in the 4.3.3 device in comparison than the 4.4.2 device in young meso-ectomorph soccers players. These results have shown that the tactical training device have a significant effects on cardiovascular adjustments on the young meso-ectomorph soccers players during training.
Key words: *Soccer training, tactical device, cardiovascular adjustments, cadets.*

1. INTRODUCTION

Several studies have established the specificity actions of players in the team sports. Indeed, Seabra (2004) and Ebomoua (1994) have reported that actions in soccer practice must be specifics [1-2]. This specificity of each player's actions during the practice of soccer leads to the occupation of a position to perform particular tasks. Indeed, it have emerged from the Dutch team players a profiles of actions according to the game compartments (they have adopted a soccer in block) [3]. The soccer training effectively contributes to the team's result [4]. These actions depend on the player's fitness level in individual plan at the moment of his insertion in the team. In regard of this topic, it had been reported that a good process and an optimal performance of the team necessarily pass through an good physical, technical, tactical and psychological preparation of these different components [5].

The practice of soccer using tactical devices is able to cause different energy expenditure and implement a particular mechanisms of cardiovascular adjustments in the subjects. But on this topic, few studies have been done in sub-Saharan Africa. Considering the aforementioned facts, we are proposed to carry out the following study: Influence of the tactical device in relation to the somatotype on the cardiovascular adjustments during the training of the young Congoleses soccers players.

1. MATERIAL AND METHODS

2.1 Subjects

The study focused on 14 males meso-ectomorph soccers players divided into two groups according to the practice setting: 1) - 4.4.2 tactical device were 3 subjects have been enrolled, 2) - 4.3.3 tactical device were 11 subjects have been enrolled.

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2.2 Procedure

This study was conducted in two stages, namely: preliminary investigation and effective investigation.

2.2.1 Preliminary Investigation: The preliminary investigation consisted in:

- Identify teams using the game systems according to the tactical devices mentioned above and collect the acceptance of participation in the study;

- Carry out anthropometric measurements before training according to the technique recommended by the KINO-QUEBEC committee [6] : weight, high, circumferences (calf, forearm, flexed arm, knees, ankle and elbow) using the STANLEY brand tape measure, skin folds (tricipital, sub-scapular, supra-iliac, abdominal and quadricipital) using Adiposometer, Body Mass Index (BMI), fat index (FI), fat-free mass (FFM) and fat mass (FM) using Keto 7. The somatotype of each subject was determined from the calculated values corresponding to each of its components, as: C1 for endomorphism [7], C2 and C3 for mesomorphism and ectomorphism respectively [8].

2.2.2 Effective Investigation: The investigation consisted on following the training program and collecting the data.

2.3 Training

The subjects of the two groups were submitted to 5 training sessions of 2h40min each week for 1 year. The work was:

- for the defense type 4.4.2 technical device (4 defenders, 4 midfielders composed as 2 skippers, one pivot and one advanced libero, 2 forwards) with the pressing on the ball carrier, especially in the middle of the field and on the sides with 2 or 3 players, or collectively according to the tight, compact and mobile lines. This pressing requires a great physical abilities and particularly endurance (aerobic power);

-for the offensive type 4.3.3 technical device, characterized by displacements, diagonal sprints performed at high intensity (15 to 20m), the cross-races sprints, the permutations and individual breakthroughs, the one-two, more evolution on the sides of the creative playmaker, the variety of quick combinations, the long passes to the attackers in the back of the defense, the support of the axial midfield or the lateral midfield with sometimes 4 forwards, the individual counter-attack, the technical achievement, the explosiveness, the rhythm, the power.

2.4 Data Collection Technique

The study was consisted on two components, namely:

- The physiological measurements collected before and after training composed by: HRo (bpm), systolic blood pressure (SBP) (mmHg) and diastolic blood pressure (DBP) (mmHg). The mean blood pressure (MBP) was determined from SBP and DBP;

- The physical fitness assessment which was performed using the YOYO test [9].

Mann Withney μ test was used to compare the mean of cardiovascular variables of meso-ectomorph subjects trained according 4.4.2 and 4.3.3 technical devices.

3. RESULTS

3.1 Anthropometrics Characteristics

Age, high, weight, body mass index (BMI), fat Index (FI), fat-free mass (FFM), fat mass (FM), inverted weight index (IWI) of the meso-ectomorphs were presented as mean plus or standard deviation ($\bar{x}$ ± δ) in Table 1.

Table 1 : Age, high, weight, BMI, FG, FFM, FG, IWI of the meso-ectomorphs of the soccers players of devices 4.4.2 and 4.3.3 as mean plus or minus standard deviation ($\bar{x}$± δ).

	Device 4.4.2 (n=3)	**Device 4.3.3 (n=11)**	**P**
Age (years)	16.00 ±1.00	15.58 ±0.78	NS
High (cm)	178.33 ±5.85**	164.82 ±4.86	<0.01
Weight (kg)	63.00 ±2.64***	50.76 ±6.42	<0.001
BMI ($kg.m^{-2}$)	20.49 ±1.92	18.62 ±1.38	NS
FI(%)	11.43 ±0.47	11.52 ±1.07	NS
FFM (kg)	44.83 ±4.46	48.77 ±6.22	NS
FM (kg)	7.63 ±1.28	8 .60 ±1.99	NS
IWI ($cm.kg^{-\frac{1}{3}}$)	44.86 ±1.03	43.43 ±5.12	NS

NS: Not significant difference; **: Very significant difference at (P<0.001); ***: Highly significant difference (P<0. 001).

The Table 1 revealed that the age of the young meso-ectomorph soccer players in 4.4.2 and 4.3.3 technical devices did not show any significant difference. However, the high and weight of soccer players in the 4.4.2 technical device were significantly higher compared to their counterparts in the 4.3.3 technical device with the same somatotype (p<0.01 and p<0.001; respectively). There was no significant difference between the BMI, IG, MSG, MG, and IPI values of the young meso-ectomorph soccer players in 4.4.2 and 4.3.3 technical devices.

3.2 Cardiovasculars Adjustements

Table 2 presents the mean plus or minus standard deviation ($\bar{x}$± δ), HRo, SBP, DBP, MBP, VMA and $\dot{V}O_2$max soccer players of meso-ectomorphs devices 4.4. 2 and 4.3.3.

Table 2: HRo, SBP, DBP, MBP, VMA and $\dot{V}O_2$max of meso-tectomorphs juniors soccers players of two devices 4.4.2. and 4.3.3 as mean plus or minus standard deviation ($\bar{x}$± δ).

	Training					
	Before			After		
	Device 4.4.2 (n=3)	Device 4.3.3 (n=11)	p	Device 4.4.2 (n=3)	Device 4.3.3 (n=11)	p
HRo (bpm)	77.00±4.45	76.52±3.81	NS	76.18±2.96	71.17±1.38**	<0.01
SBP (mmHg)	129.34±5.22	129.33±4.84	NS	128.89±1.86	126.90±1.34*	<0.05
DBP (mmHg)	65.00±2.76	63.08±3.09	NS	64.72±1.21	62.29±2.98	NS
MBP (mmHg)	90.99±1.69	90.68±2.59	NS	87.84±1.13	85.51±1.95*	<0.05
VMA (km.h^{-1})	13.00±2.88	13.12±2.55	NS	13.27±0.81	16.58±1.49***	<0.001
$\dot{V}O_2$max (ml.kg^{-1}.min^{-1})	45.05±2.00	45.92±2.72	NS	46.46±2.78	57.82±3.22***	<0.001

NS. : significant difference; ** : Very significant difference (P<0.01); *** : Highly significant difference (P<0.001)

The results in Table 2 indicate that before training, there was no significant difference between 4.4.2 and 4.3.3 technical devices concerning HRo, SBP, DBP, MBP, VMA and $\dot{V}O_2$max. At the end of this training, the HRo and the SBP of the young meso - ectomorph players of the 4.3.3 technical device were significantly lower compared to those recorded with their counterparts in the 4.4.2 technical devices with the same somatotype (p <0, 01 and p <0.05). However, the meso-ectomorphs DBP of the two technical devices were statistically identical. Nevertheless, the young meso-ectomorphic's MBP, VMA and $\dot{V}O_2$max values in 4.3.3 and 4.4.2 technical devices were significantly different (p <0.05, p <0.001 and p <0.001 respectively).

4. DISCUSSION

This study was conducted to examine the influence of the technical devices on cardiovascular adjustments during training in young soccer players. The initial assumption was that cardiovascular adjustments during training depend on the game system applied in a specific tactical device. For this purpose, we used a cross-sectional study to avoid the loss of some subjects depending on their mobility. Thus, the results obtained are not of less interest.

The practice of physical activity is determined by several factors including morphology related to body composition. The results of this study show that the age of young meso-ectomorph soccers players in 4.4.2 and 4.3.3 technical devices did not show any significant difference. However, the high and the weight of the soccerers in the 4.4.2 technical device are significantly greater compared to those recorded with their homologues of the same somatotype in the 4.3.3 technical device (178.33 ± 5.85 cm Vs 164.82 ± 4.86 cm, p <0.01 and 63.00 ± 2.64 kg vs 50.76 ± 6.42 kg, p <0.001, respectively) (Table I). These results reflect a better saturo-weight growth of the meso-ectomorph soccers players of the 4.4.2 technical device which can be explained by the food. The diet improves somatomedin, which increases the volume of cartilage cells and thereby promotes bone growth in length [10], increases the lipid content that is deposited in adipose tissue, and leads to body weight increasing [11]. However, no significant difference exists between the BMI, FI, FFM, FM and IWI values of the young meso-ectomorph soccers players in 4.4.2 and 4.3.3 technical devices.

Body composition in turn determines the physical form in its physiological aspects. The results show that prior to training, the young meso-ectomorph players in the 4.4.2 and 4.3.3 technical devices have statistically similar HRo, SBP, DBP, MBP, VMA and $\dot{V}O_2$max. At the end of this training, the young meso - ectomorph players of 4.3.3 technical device have significantly lower HRo and SBP compared to those recorded in their counterparts in the 4.4.2 technical device with the same somatotype (71.17 ± 1.38bpm Vs 76.18 ± 2.96 bpm p <0.01 and 126.90 ± 1.34mmHg Vs 128.89 ± 1.86 mmHg, p <0.05). These results reflect a decrease in HRo in the offensive type training that characterizes the 4.3.3 technical device. This training develops the aerobic power [12] which acts on the

parasympathetic system responsible for the reduction of HRo [13]. The reduction in SBP is dependent on the very important aerobic training in the 4.3.3 technical device which induces the proliferation of capillaries, improves blood redistribution thus lowering arterial pressure [14].

However, the meso-ectomorph DBP of the two technical devices are statistically identical. Nevertheless, post-training MBP values of young meso-ectomorph soccers players in the 4.3.3 technical device are significantly lower than those of their counterparts in the 4.4.2 technical device (85.51 ± 1.95 mmHg Vs 87.84 ± 1.13 mmHg, $p < 0.05$). These results show a reduction in MBP that is explained by aerobic physical activity. They corroborate with those of (Bury, 2003 ; Wilmore and Costill., 1998) in which the physical exertion provided in a weekly aerobic training program (50-70% of $\dot{V}0_2max$) comprises 3 to 5 sessions of at least 30 minutes induces the reduction of BP [15 , 16].

The VMA and $\dot{V}O_2max$ of the young meso-ectomorph players in the 4.3.3 technical device are significantly higher than those obtained with their counterparts of the 4.4.2 technical device with the same somatotype (16.58 ± 1.49 $km.h^{-1}$ Vs 13.27 ± 0.81 $km.h^{-1}$ and 57.82 ± 3.22 $ml.kg^{-1}.min^{-1}$ Vs 46.46 ± 2.78 $ml.kg^{-1}.min^{-1}$; $p < 0.001$) (Table II). These results are due to the offensive training characterizing the 4.3.3 technical device with the long passes to the forwards in the back of the defense, the support of the axial mediums or even lateral midfielders with sometimes 4 forwards, the individual counterattack, the technical achievement, explosiveness, rhythm, power. These training tasks are probably responsible for the increase of the alveolar surface favorable for the diffusion of O_2, the hemoconcentration associated with the increase of the number of erythrocytes and the hemoglobin level, the blood redistribution and the Muscle consumption of O_2 [17].

5. CONCLUSION

In sum, this study has shown that in training induces a reduction in HRo, SBP and MBP parallel to an increase in VMA and $\dot{V}O_2max$ much more in the offensive type of 4.3.3 technical device than in the defensive type of 4.4.2 technical device for the young meso-ectomorph soccers players. These results suggest the influence of the training device on the cardiovascular adjustments of the young soccers players.
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