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Influence of the Tactical Device in Relation to the Somatotype on Cardiovascular Adjustments in the Training of the Congolesesmeso-Endomorphs Cadets Soccers

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Abstract: ***In order to analyze the influence of the tactical device on the cardiovascular adjustments to the training of the meso-endomorphs juniors soccer players, 30 teenage footballers divided into two groups according to the tactical device: 1) -19 submitted to the training in the device 4.4.2 defensive type with systematic rehydration, 2) -11 submitted to training in the device 4.3.3defensive type with systematic rehydration. They were all measured by RHo and BP on the one hand and YOYO's test (Zryd and al., 2013) for the determination of VMA and $\dot{V}O_2max$ on the other hand. The averages were compared using the Mann Withney µ test. The results obtained showed that at postmen age, height, weight and BMI equal values were significantly lower in tactical device 4.3.3 than in device 4.4.2 in ca. 65.33 ± 1.52 bpm vs 73.00 ± 3.66 bpm, p <0.001), the SBP(127.66 ± 2.11 mmHg Vs 130.63 ± 3.20 mmHg, p <0.05) and MBP(92.10 ± 1.01 mmHg Vs 93.83 ± 1.38 mmHg, p <0.001). However, the VMA and $\dot{V}O2max$ post were significantly larger in tactical device 4.3.3 than in device 4.4.2 (19.21 ± 1.07 $km.h^{-1}$ Vs 16.11 ± 1.36 km. h^{-1} and 67.26 ± 3.75 $ml.kg^{-1}.min^{-1}$ Vs 56.36 ± 2.58 $ml.kg^{-1}.min^{-1}$) (p <0.001). In sum, this study has shown that the training induces a reduction of the FCo, the SBP and the MBP parallel to an increase of the VMA and $\dot{V}O_2max$ much more in the device 4.3.3 of offensive type that in the defensive device 4.4.2 among meso-endomorphs juniors soccer players. These results suggest the influence of the tactical training device on cardiovascular adjustments in the training of juniors soccer players.***

Keywords: Soccer training, tactical device, cardiovascular adjustments, juniors, meso-endomorphs

1. Introduction

It has been generally established that in the practice of team sports, actions are zone and position specific. In this regard, **Ebomoua (1994), Cazorla (1998)** and **Seabra (2004)**, **Ebomoua (2004)** reported that actions in soccer practice must be specific. This specificity of the actions of each player in the practice of soccer leads to the occupation of a position to perform particular tasks. Indeed, it emerged from the profiles of actions according to the compartment of the game of the players the Dutch team (having adopted a soccerin block) **(Relly and Ebomoua, 1994)**. The effectiveness of football coaching contributes to the team's score **(Bongbele and al., 1998)**. These actions depend on the fitness of the player on the individual level to his insertion in the team.

The practice of soccer using devices is likely to cause different energy expenditure and implement mechanisms of particular cardiovascular adjustments in subjects. But on this subject, few studies have been done in sub-Saharan Africa. Considering the aforementioned facts, we proposed to carry out the following study: Influence of the tactical device on the cardiovascular adjustments during the training of the Congolese meso-endomorphs juniors soccer players.

2. Methodology

2.1 Topics

The study focused on 30 males and female meso-ectomorphic footballers divided into two groups according to the practice setting: 19 subjects training in a team whose tactical device is 4.4.2, 11 subjects training in a team whose device is 4.3.3.

2.2 Procedure

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

2.2.1Preliminary investigation:
The preliminary investigation consisted in:

- Identity teams using the game systems according to the acceptance of participation in the study;
- Perform anthropometric measurements before the training technique recommended by the kino-quebec committee **(leger, 1985)**: weight, waist, 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 the adiposometer, body mass index (bmi), fat index (ig), fat-free mass (msg) and body fat (mg) using keto 7. The somatotype of each subject was determined from the calculated values corresponding to each of its components, notably: c1 for endomorphism **(heath and**

carter, 1986), c2 and c3 respectively for mesomorphism and ectomorphism **(karpovich and sinning, 1983)**.

2.2.2 Effective Investigation

The investigation consisted in following the training program and collecting data.

2.2.2.1 Training:

The subjects of both groups were subjected to 5 weekly training sessions of 2 hours 40 minutes. n for 1 year. The work was:

- For the defensive device 4.4.2 (4 defenders, 4 midfielders including 2 skippers a pivot and an advanced libero, 2 forwards) with the pressing on the ball carrier, especially in the middle of the field and on sides with 2 or 3 players, or collectively thanks to tight, compact and mobile lines. This pressing requires great physical abilities and particularly endurance (aerobic power);
- For the offensive type device 4.3.3 characterized by displacements, high intensity diagonal strokes (15 to 20m), cross-races, permutations and individual breakthroughs, 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 even lateral midfield with sometimes 4 strikers, the individual counter-attack, the technical feat , the explosiveness, the rhythm, the power.

2.2.2.2 Thedata collection technique

The study consisted of two components, namely:

- The physiological measurements made before and after training were those;
- Resting heart rate hro in beats per minute (bpm) systolic blood pressure (sbp) in millimeters of mercury (mmhg) and diastolic blood pressure (dbp) in millimeters of mercury (mmhg). The mean arterial pressure was determined from sbp and bbp;
- The physical fitness assessment was performed using the yoyo test (cazorla, 1998) before and after training.

2.3 Statistic analysis

Mann Withneyμ tests and analysis of variance were used to compare respectively two means and averages of cardiovascular variables in subjects of the three or four different somatotypes who underwent training by post.

3. Results

Age, height, weight, index body mass (BMI), fat index (FI), fat-free mass (FFM), fat mass (FM), inverted weight index (IWI) of both somatotype during training on the cardiovascular adjustments of wingers were presented as mean plus or minus standard deviation ($\bar{x} \pm \delta$).

Table I: Age, height, weight, BMI, IG, MSG, MG, IPI meso endomorphs of the footballers of devices 4.4.2 and 4.3.3 in the form of mean plus or minus standard deviation ($\bar{x} \pm \delta$)

	Device 4.4.2 (n=19)	Device 4.3.3 (n=11)	p
Age (years)	15,96±0,57	16,03±0,50	NS
Size (cm)	171,33±6,02	169,63±3,52	NS
Weight (kg)	64,33±7,36	60,09±6,71	NS
BMI ($kg.m^{-2}$)	21,84±1,12	20,89±1,99	NS
FI(%)	11,80±1,64	11,40±1,14	NS
FFM (kg)	46,66±1,35	49,49±4,67*	<0,05
FM (kg)	8,03±1,27	10,30±1,41***	<0,001
IWI($cm.kg^{-1/3}$)	42,83±0,42	43,71±1,15*	<0,05
NS: not significant difference. *** : Highly significant difference(P<0,001)			

Table I shows that the meso-endomorphs juniors soccer players of both devices showed statistically identical values for age, height, weight, BMI, the FI. In contrast, the FFM, FM, and IPI of meso-endomorphs juniors soccer players in device 4.3.3 were significantly higher compared to their counterparts in the same device 4.4.2 somatotype (p<0.05, p<0.001 and p<0.05, respectively).

The resting heart rate (RHo), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean blood pressure (MBP), mean aerobic velocity (VMA) and the maximum oxygen consumption ($\dot{V}O_2$ max) of meso-endomorphic junior footballers of two devices 4.4.2. and 4.3.3 were reported in Table II as mean plus or minus standard deviation ($\bar{x} \pm \delta$).

Table II: FCo, SBP, DBP, MBP, VMA and $\dot{V}O_2$max of meso-endomorphic junior footballers of two devices 4.4.2. and 3.3.4 as mean plus or minus standard deviation ($\bar{x} \pm \delta$)

	Training					
	Before		p	After		p
	Device 4.4.2 (n=19)	Device 4.3.3 (n=11)		Device 4.4.2 (n=19)	Device 4.3.3 (n=11)	
FCo (bpm)	73,50±3,53	72,98±3,96	NS	73,00±3,60	65,33±1,52***	<0,001
SBP (mmHg)	133,50±3,77	130,89±2,91	NS	130,63±3,20	127,66±2,11**	<0,01
DBP (mmHg)	77,00±3,53	76,50±3,53	NS	76,63±5,50	76,48±3,21	NS
MBP (mmHg)	95,16±2,59	93,56±4,48	NS	93,83±1,38	92,10±1,01***	<0,001
VMA ($km.h^{-1}$)	11,44±1,19	15,28±2,00	NS	16,11±1,36	19,21±1,07***	<0,001
$VO_2max(ml.kg^{-1}.min^{-1})$	52,56±3,02	54,56±3,00	NS	56,36±2,58	67,26±3,75***	<0,001
NS. : Not significant difference						
** :very significant difference (P<0,01)						
*** : highly significant difference (P<0,001)						

Table II analysis indicates that prior to training, the meso-endomorphs juniors soccer players in devices 4.4.2 and 3.3.4 displayed statistically similar HRo, SBP, DBP, MBP, VMA and $\dot{V}O_2$max. After training, the meso-endomorphs juniors teams in Device 4.3.3 showed significantly lower FCo and SBP compared to their counterparts in Device 4.4.2 ($p < 0.001$ and $p < 0.01$, respectively) . However, the DBP post-training values of the 4.4.2 and 4.3.3 junior footballers were similar from a statistical point of view. However, MBP, VMA and $\dot{V}O_2$maxof meso-endomorphs juniors soccer players were significantly greater than those of their counterparts of the same device 4.4.2 somatotype ($p < 0.001$).

4. Discussion

This study was conducted for the purpose of to examine the somatotype-related influence of the device on cardiovascular adjustments during training in juniors soccer players. The initial hypothesis was that cardiovascular adjustments to training depend on the system. For this purpose, a cross-sectional study was conducted to avoid the loss of subjects depending on 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 meso-endomorphs juniors soccer players of both devices have statistically identical values for age, height, weight, BMI, FI. However, the FFM, FM, and IWI of the meso-endomorphs younger players in device 3.3.4 are significantly higher compared to their counterparts in the same device somatotype 4.4.2 (49.49 ± 4.67kg Vs 46 , 66 ± 1.35kg, $p < 0.05$, 10.30 ± 1.41kg Vs 8.03 ± 1.27kg, $p < 0.001$ and 43.71 ± 1.15cm.kg-1/3, p <0 , 05, respectively) (Table I). These larger values of FFM on the one hand and FM and IWI on the other hand are dependent on the two components of the somatotype, namely mesomorphism and endomorphism. Mesomorphism characterized by musculoskeletal dominance attests a preliminary gain in lean mass through physical effort **(Wilmore and Costill, 1998)**, while endomorphism translates to a large proportion of lipid **(Verson, 2004)**. adapted feeding. The highest FM and IWI can also be attributed to the socio-economic conditions that are likely to modify the body shape of the individual through a nutritional pathway **(Layden, 2002)**.

Body composition in turn determines the physical form in its aspects. physiological. The results show that prior to training, the meso-endomorphs juniors soccer players in devices 4.4.2 and 3.3.4 show statistically similar HRo, SBP, DBP, MBP, VMA and $\dot{V}O_2$max. After training, the HRo presented by the meso-endomorphs juniors soccer players of device 4.3.3 is significantly lower compared to their initial value and that obtained with their counterparts of device 4.4.2 (65.33 ± 1.52 bpm Vs 72.98 ± 3.96 bpm and 73.00 ± 3.60 bpm, $p < 0.001$) (Table III.2). This can be explained by offensive type training which, by developing aerobic power **(Barneratand al., 2002)** acts on the parasympathetic system responsible for the reduction of HRo**(Ewamela, 2005)**.

In addition, the post-training SBP of meso-endomorphs juniors soccer players in device 4.3.3 is significantly reduced compared to that recorded at home before training and to those obtained at their colleagues in device 4.4.2 at the end of this training (127.66 ± 2.11mmHg VS 130.89 ± 2.91mmHg and 130.63 ± 3.20mmHg, $p < 0.01$, respectively) (Table III.2). This reduction in SBP is dependent on the very large aerobic training in device 3.3.4 which induces the proliferation of capillaries and improves blood redistribution **(Billat, 2009)**. However, the post-training values of the DBP of the junior players of the 4.4.2 and 4.3.3 devices are not significantly different (Table II). However, the MBP, 92.10 ± 1.01mmHg Vs 93.56 ± 4.48mmHg and 93.83 ± 1.38 mmHg; $p < 0.001$) (Table II). These results reinforce the hypothesis of the effects of much greater aerobic training in device 4.3.3 on the blood pressure of footballers having suffered. It has been reported to this effect that physical exertion provided in a weekly aerobic training program (50-70% of $\dot{V}0_2$max) involves 3 to 5 sessions of at least 30 minutes induces reduction of physical activityoccurs when the programs **(Bury,2003)**.

The VMA and $\dot{V}O_2$max of the meso-endomorphs juniors soccer players of device 4.3.3 are significantly larger than those of their counterparts of the same device somatotype 4.4.2 (19.21 ± 1.07 km.h^{-1} Vs 16.11 ± 1.36 km.h^{-1}) and (67.26 ± 3.75 ml.kg^{-1}.min^{-1}Vs 56.36 ± 2.58 ml.kg-1.min-1; $p < 0.001$) (Table II). These VMAs and $\dot{V}O_2$max of the meso-endomorphs juniors soccer players of device 4.3.3 are the reflection of the offensive and aerobic training. Indeed, in the offensive type device 4.3.3 characterized by displacements, high intensity diagonal strokes (15 to 20m), cross-races, permutations and individual breakthroughs, the one-two, the evolution more on the sides of the creative playmaker, the variety of fast combinations has resulted in increased chondrioma, aerobic metabolism, and oxygen consumption by the muscles. There is a greater improvement in the muscular capacity of O_2 consumption during training in relation to respiratory activity (pulmonary diffusion, ventilation), the combined transport of O_2 (blood transport capacity of O_2) increased by aerobic effort **(Dempsey and al., 1996 ;Ewamela, 2005).**

5. Conclusion

In sum, this study has shown that it induces a reduction in HRo, SBP and MBP parallel to an increase in the VMA and $\dot{V}$O2max much more in the device 4.3.3 offensive type than in the device 4.4.2 defensive type footballers of the category meso-endomorphic cadets. These results suggest the influence of the training device and the somatotype on the cardiovascular adjustments of the cadet category footballers.

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