ENERGETIC COST IN THE DIFFERENT RUNNING CONDITIONS IN TEAM SPORT FOR THE EDUCATIONAL TEACHING METHOD

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Abstract

This case study aims to assess the energetic cost at different running conditions (RC) with/without a ball on: Linear running and shuttle running with changes of direction (180°). Experimental approach to the problem requires the following tests/devices: Squat Jump/Counter Movement Jump (Op to jump) to assess the strength's decrease of the lower limbs before/after each test and Ratings of Perceived Exertion after each RC to assess the training load. ANOVA with repeated measures will be used to assess the significant differences for each variable between each RC. The results of this study could be useful to optimize the basketball training load related to the RC in different seasonal periods.

Key words: *basketball, specific tests, training, motor learning.*

Introduction

The running typical in team sports, have biomechanical characteristics and different energetic costs with respect to the linear running. Moreover, the running types change according to physical characteristics (Altavilla & Raiola, 2019) and of the physiological effort. Therefore, they must be able to perform effectively specific tasks under conditions of physical fatigue that occur during different training and game-play intensities (Kamandulis et al., 2013). Team sports such as basketball present multiple and different dynamics during the game as a result of variability in offensive and defensive plays (Bourbousson et al, 2010).

These several requests justify a specific training method, such as team sports (basketball, soccer, handball, rugby), where the typical running is characterized by acceleration and deceleration phases, which entail a greater energy expenditure.
The varied running, typical of team sports, have biomechanical characteristics (D'isanto et al., 2018) and bioenergetic different with respect at the linear running. The several types running vary according to physical characteristics and sports activity (Pisapia & D'Isanto, 2018). Basketball as a multi-task's sport was defined on the basis of several active/passive phases very hard to replicate the basketball match during the training (Altavilla & Raiola, 2015). Indeed, in the basketball game situations change quickly and frequently (Altavilla & Raiola, 2014) as a function of the following factors:

- the position of the opponents on the field and their tactical behavior, making defensive and offensive choices (Oliveira et al, 2018);
- the players position in the pitch area and their movements, making defensive and offensive choices (Nikolaidis et al, 2015);
- in relation to the position of the ball related to active phases, making defensive and offensive choices games (Altavilla & Raiola, 2014).

In addition to matters of bioenergetic (commitment cardiovascular and type of mainly energy system), in basketball the bioenergetic was considered crucial because the metabolic demand under stress can negatively alter the player's performance (Bompa & Haff, 2009). Besides, the basketball is characterized by a multiple high-intensity actions performed on changes of direction over short distances (10<20m), determining considerable physiologic and metabolic demands (Ben Abdelkrim et al, 2010; McInnes et al, 1995).

Therefore, to investigate the running gait can contribute:
a) to improve the learn mechanism process about to the different running conditions;
b) to knowledge of the energy expenditure of the different running conditions with and without the ball.

Finally, to study the several types of running with different tasks is useful to understand how the energetic cost change due to the complexity of the task performed (with and without ball).This allows us to set up specific paths of training to improve the motor learning (Gaetano, Rago, 2014, Gaetano, 2012; Raiola, 2017,2014,2013), making this more economic and efficient; and it suggest us possible investigations on other aspects of the performance(D'Elia et al., 2019; D'Isanto et al., 2019), of motor learning, of the teaching methodology and assessment of periodization training (Raiola, &D'Isanto, 2016).

Aim

The aim of this case study is to assess the energetic cost of running in different conditions: linear running and shuttle running shuttle running with changes of direction (180°). My hypothesis could be confirmed showing a different metabolic expenditure in the different running conditions.

Methods and material

The approach is argumentative theoretical for the part relating at the training theory. Firstly, summarizing and deducting the scientific idea of research and of apply it in the practices of the sport performance.

Subjects
15 young males, aged between 16 and 18, took part in this case study. The tests were performed over five days and then repeated after one week. All the subjects participate voluntarily in this investigation. The method of detection and analysis of data will require the use of the followings test and devices:
- Yo-Yo endurance test/Basketball court (Bangsbo et al., 2006);
- Shuttle running and linear running (Zamparo et al, 2014),
- Lower limb muscle strength (Bosco et al, 1983) assessed with Optojump;

Statistical analysis
All data are presented as mean and standard deviation (SD). The normality of data distribution will be checked with Kolmogorov-Smirnov test. Repeated measures analysis of variance is used to show the significant differences for each running condition (n=4).

The 95% confidence intervals (95% CI) and Cohen d effect size will be calculated between each running conditions. Intra-class correlation coefficient is calculated to assess the reliability of the measures. The significance level has been set at $p<0.05$. Statistical analysis is carried out with the software IBM SPSS Statistics 23.

Experimental approach
Before each test, participants will perform 10 minutes of warm-up, including 5 minutes of dynamic stretching. Four testing sessions will be included in the study over a five days period and after one week all tests will be repeated to assess the reliability of the measures.

The Yo-Yo endurance test will be performed by each player, as an incremental test according to di Prampero (2009) to detect the VO_2max. After the VO_2max test, for each running condition, the Squat Jump (SJ) and Counter Movement Jump (CMJ) will be performed to verify the muscle strength decrement according to the Bosco's (1983) procedures.

In the following days the subjects will be randomly evaluated on the four running conditions with and without the ball: linear running (LR) and shuttle running (SR) with change of direction (180°).

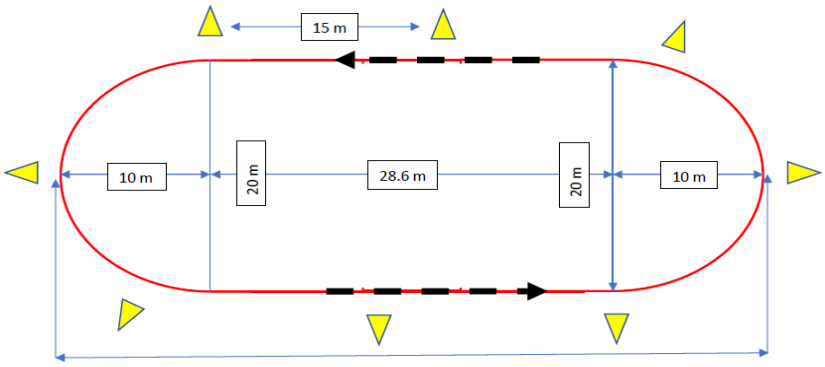

Figure 1. Path of linear running.

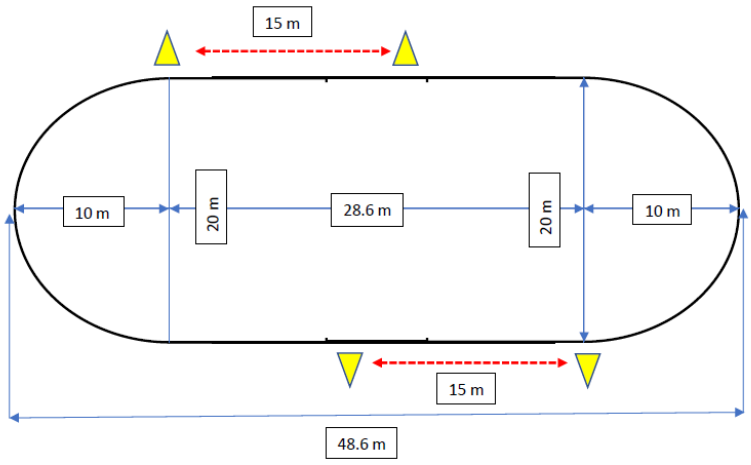

Figure 2. Shuttle running with change of direction (180°) on 15 m.

Discussion

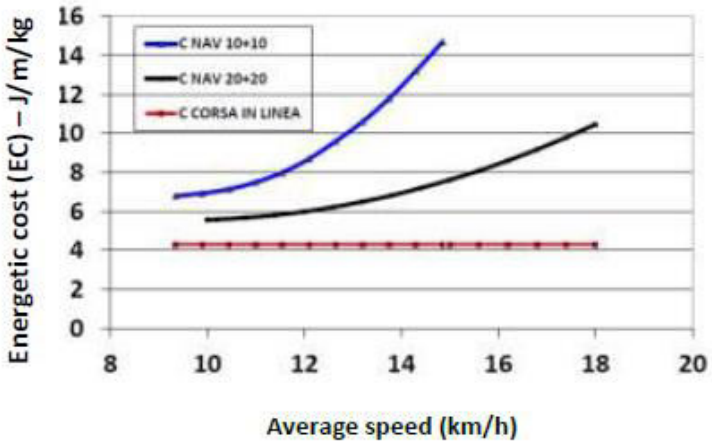

Figure 3. Comparison between energetic cost of linear running and shuttle running.

Referring to other researches (Colli et al., 2008), as seen in figure 3, the Energetic Cost (EC) of the shuttle running with respect to the linear running, follows a parabolic function related to the increase of the speed and distance of the shuttle running section. This occurs because, at the same speed, the continuous changes of direction and the consequent acceleration and deceleration actions in the shuttles running entail costs that are paid by the body with a greater demand for aerobic and anaerobic energy.

Conclusion

I expect that the energetic cost (EC) is dependent on the type of running and high in the running with ball. Conversely, the EC will be lower without the ball for each running conditions.

The results of this case study could be useful for to program specific training on the different running conditions (with and without ball) and to optimize the motor learning in young athletes.

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