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Original Article

Experimental approach via three different protocols on the speed agility in basketball: a case study

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Abstract:
In modern team sports, agility has become more important than in the past, because the game has evolved and has turned faster than before. This is due to the increasingly presence of strength and condition training and the highest care of teams on the athletes. The agility in sport is a multifactorial parameter; it is correlated with body stability, rapidity and speed. In order to understand which parameters have more prominence in output performance, we decided to follow a PRE-POST case study, based on three different training protocols and a control group. The study was made following an Italian amateur team of 20 basketball athletes (age 23 ± 4) divided in 4 groups and using the Lane Drill Test (Sigmon, 2005) to obtain objective data.
Key words: basketball, agility, lane drill test, stability, rapidity

Introduction

Nowadays agility has become a crucial factor in team sport, the agility index of athletes, is an indicator of the level of the players. The performance level of many sports disciplines depends on the ability to react promptly to stimulus perceptions of various nature and to complete the kinetic responses as soon as possible and perform the correct execution with the optimal range of motion. Normally the strategies actuated during the sports training are focused on the development of agility in specific movements and to execute specific sport technique in a faster way. In various sports, agility is manifested in various forms: initiating the kinetic response with the least latency time after the stimulus (reaction); completing the single gesture in the shortest possible time (rapidity of action); performing cyclic movements with high frequency (speed); applying power to the movement (acceleration) and maintaining high execution speed even in muscle fatigue condition (prolonged speed movement). Agility is a complex ability because it depends on many factors: nervous system, individual anthropometric characteristics; muscular coordination; muscle quality and characteristics of the gesture (strength, range of motion, precision, complexity and duration). Agility is strongly influenced by body and motor control; to achieve rapid movements, the athletes must acquire a high level of specific technical gestures, so as to, enable them to maintain optimum performance, without significant slowdown, even in problematic situations of instability, adjustment and imbalance. Therefore, coordination, understood as organizing, controlling, regulating, modulating, and adapting the movements, is the basic prerequisite for a quick expression of movement. Team sports, are made up of many phases with high uncertainty (Raiola & D'Isanto 2016ab, Altavilla, & Raiola, 2015), so agility is crucial to performance. Delaying a move means giving the opponent the opportunity to take on an important advantage (Raiola, 2017, Altavilla & Raiola, 2014). In basketball, athletes are forced to make change of direction with very narrow and fast passes in limited spaces to achieve effective play actions, then is easy to understand how much is important to reach and training a high level of specific and not specific agility for a basketball player (D'Isanto et al, 2017, Gaetano et al,2016, Izzo, 1996).

Method

In order to understand which parameters have more prominence in output performance, we decided to follow a PRE-POST case study, based on three different training protocols and a control group. The study was made following an Italian amateur team of 20 basketball athletes (age 23 ± 4, height 1,86 ± 0,07 mt and weight 86 ± 9 kg) during the regular season period for a 8 weeks of aspecific and specific training program. The team was divided randomly in 4 homogeneous groups, each formed by 5 athletes. The four groups performed different athletic workout programs during their regular weekly basketball tactical and technical training. The groups were: Control Group (CG), Stability Group (SG), Rapidity Group (RG) and Stability and Rapidity Group (SRG). The CG performed normal training without the add of a specific athletic program, the SG performed an aspecific and specific stability athletic program based on the control of the core, on balance/imbalance exercise and on correlated specific basketball basic technique, the RG performed an aspecific and specific rapidity athletic

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program based on feet quickness, on legs muscles stiffness and on specific basketball correlated specific basketball basic technique at least the SRG performed a training program which include rapidity and stability.

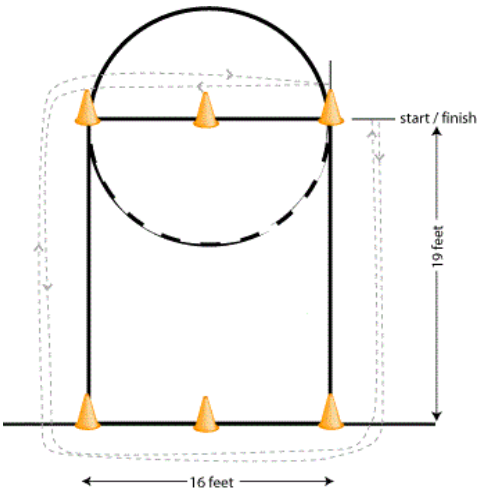

Fig. 1. Lane Drill Test (http://www.topendsports.com)

In order to detect better values less affected by errors, a week before the PRE Test survey, all the team got confident with the Lane Drill Test (Carvalho et al., 2017; Sekulic et al., 2016; Carvalho et al., 2011; Sigmon, 2005), performing it for the first time. In order to detect the travel time (expressed in seconds) with high accuracy the Lane Drill Test (LDT) was execute with the use of the Witty photocells (Microgate, Bolzano, Italy), for both tests PRE and POST, LDT was performed two times for each athlete, after a rest time of 60 seconds, and was selected the examination with lower time. The PRE survey was made a week after the first trial execution of the LDT, and the POST survey was made after 8 weeks of aspecific and specific athletic protocol program. The data collection was made with Excel (Microsoft, USA), and to understand which protocols was better to increase agility performance was used a t-student test ($p<0,05$) to verify if improvements were significant or not.

Results and discussions

The table below shows the results for PRE e POST LDT for both groups, results are expressed in seconds. Table contain even the calculated difference (Diff, second and Diff%, percentage of decrease or increase) from PRE to POST detection.

Table 1. Collected data from PRE-POST LDT

Athlete	Group	Pre	Post	Diff	Diff %
1	CG	9,11	8,98	0,13	-1,43
2	CG	9,27	9,20	0,07	-0,76
3	CG	9,33	9,30	0,03	-0,32
4	CG	9,28	9,07	0,21	-2,26
5	CG	8,55	8,44	0,11	-1,29
6	SG	9,43	9,33	0,10	-1,06
7	SG	9,23	9,07	0,16	-1,73
8	SG	8,98	8,75	0,23	-2,56
9	SG	9,48	8,66	0,82	-8,65
10	SG	9,05	8,93	0,12	-1,33
11	RG	10,03	10,13	-0,10	1,00
12	RG	9,84	9,20	0,64	-6,50
13	RG	9,55	9,25	0,30	-3,14
14	RG	9,65	9,30	0,35	-3,63
15	RG	9,28	9,05	0,23	-2,48
16	SRG	10,55	9,55	1,00	-9,48
17	SRG	9,88	8,76	1,12	-11,34
18	SRG	9,66	8,96	0,70	-7,25
19	SRG	9,73	9,33	0,40	-4,11
20	SRG	9,54	9,11	0,43	-4,51
Average		9,47	9,12	0,35	-3,64
D.S		0,43	0,36	0,34	3,34

The Tables below shows the collected data divided by training protocols.

Table 2. Collected data form Control Group

Control Group				
Athlete	**Pre**	**Post**	**Diff**	**Diff %**
1	9,11	8,98	0,13	-1,43
2	9,27	9,20	0,07	-0,76
3	9,33	9,30	0,03	-0,32
4	9,28	9,07	0,21	-2,26
5	8,55	8,44	0,11	-1,29
Average	9,11	9,00	0,11	-1,21
D.S	0,32	0,33	0,07	0,73

Table 3. Collected data from Stability Group

Stability Group				
Athlete	**Pre**	**Post**	**Diff**	**Diff %**
6	9,43	9,33	0,10	-1,06
7	9,23	9,07	0,16	-1,73
8	8,98	8,75	0,23	-2,56
9	9,48	8,66	0,82	-8,65
10	9,05	8,93	0,12	-1,33
Average	9,23	8,95	0,29	-3,07
D.S	0,22	0,27	0,30	3,17

Table 4. Collected data from Rapidity Group

Rapidity Group				
Athlete	**Pre**	**Post**	**Diff**	**Diff %**
11	10,03	10,13	-0,10	1,00
12	9,84	9,20	0,64	-6,50
13	9,55	9,25	0,30	-3,14
14	9,65	9,30	0,35	-3,63
15	9,28	9,05	0,23	-2,48
Average	9,67	9,39	0,28	-2,95
D.S	0,29	0,43	0,27	2,69

Table 5. Collected data from Stability and Stability Group

Stability and Rapidity Group				
Athlete	**Pre**	**Post**	**Diff**	**Diff %**
16	10,55	9,55	1,00	-9,48
17	9,88	8,76	1,12	-11,34
18	9,66	8,96	0,70	-7,25
19	9,73	9,33	0,40	-4,11
20	9,54	9,11	0,43	-4,51
Average	9,87	9,14	0,73	-7,34
D.S	0,40	0,31	0,33	3,12

The last target was to calculate the statistical significance level of the data, using the T-Student method, in order to understand if the observed changes could be considered relevant.

Table 6. Final calculated data with p-value analysis

Group	Pre	Post	Diff	Diff %	T-Student
CG	9,11 ± 0,32	9,00 ± 0,33	0,11	-1,21	0,6113
SG	9,23 ± 0,22	8,95 ± 0,27	0,29	-3,07	0,1023
RG	9,67 ± 0,29	9,39 ± 0,43	0,28	-2,95	0,2508
SRG	9,87 ± 0,40	9,14 ± 0,31	0,73	-7,34	0,0119
Total	9,47 ± 0,43	9,12 ± 0,36	0,36	-3,34	0,0076

The data analysis (Table 1) shows that, on average, the whole team has achieved improvements with a value a PRE value of 9,47 ± 0,43 and a POST value of 9,12 ± 0,36, with a decreasing of -3,34 %. The CG (Table 2) has registered a PRE value of 9,11 ± 0,32 and a POST value of 9,00 ± 33 with a decreasing of -1,21 %. The SG (Table 3) has detected a PRE value of 9,23 ± 0,22 and a POST value of 8,95 ± 0,27 with a decreasing of -3,07 %. The RG has obtained a PRE value of 9,87 ± 0,40 and a POST value of 9,39 ± 0,43 with a decreasing of -2,95 %. At least the SRG has registered a PRE value of 9,87 ± 0,40 and a POST value of 9,14 ± 0,36 with a decreasing of -7,34 %. The average decreasing detected in the PRE-POST evaluation of SG and RG was similar

0,29 seconds for SG and 0,28 seconds for RG, that can suggest that there is no difference in the use of the two protocols in order to improving agility. The SRG group obtained the best percentage decreasing even with the highest average value in the PRE analysis, with an average time decreasing of 0,73 seconds. Applying the T-Student test, was calculated the p-value, to determinate if the observed change could be considered relevant or not (Table 6). The only group that receive a statistical significance level of p-value was the SRG with a $p = 0,0119$ ($p < 0,05$). Considering the all data form both group the observed change was more significant with a of $p = 0,0076$ ($p < 0,01$).

Conclusion

This study was made in order to understand if a multifactorial parameter of basketball agility performance is more important of another. The case study protocol divided a team of 20 amateur basketball men players in fourth groups; a CG, a SG, a RG and a SRG. The application of these three protocols shows that the use of stability and rapidity aspecific and specific exercise programme can influence positively the agility of a basketball player, evaluated by LDT. It is unclear if the improvements obtained in LDT can be transferred during matches' performance. In order to better define the question taken at the beginning of the study, in future application is possible to enlarge the group study with more number of athletes, divided athletes by category and age, prolong the time of training protocol, divided the groups (SG,RG and SRG) even in the application of a specific or aspecific training program and correlated the detected time of LDT with the body mass of the athletes to find out how the anthropometric indexes affect the performance.

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