

Effects of Different Training Program Packages On Agility and Straight Sprinting Performance of 13-15 Years School Boys

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Abstract : The aim of this study was to evaluate the effect of a different degree of contextual interference (CI) training program on the change of direction ability (CODA) itself and on the straight sprinting (SSP) performance (5 m and 15 m) in students in the 13 to 15 years of school boys. It also evaluated which CI training program was more effective. Eighty eight students (6.42 ± 0.38 yr) volunteered as participants for the present study. Participants were randomized into 5 different CI training programs (LCI: low contextual interference, MCI: moderate contextual interference, HCI: high contextual interference, VCI: variable contextual interference, and CG: control group) during a 3 week period. Significant CODA improvements ($p < 0.05$) in pre-posttest were found in MCI (4.39%, ES 0.41) and VCI (9.37%, ES 1.12) groups. Furthermore, LCI, MCI and HCI groups ameliorated their SSP performance, both in 5 m (5.92%, ES 0.81; 6.67%, ES 0.90; 8.05%, ES 1.33 respectively) and 15 m SSP (5.86%, ES 0.76; 6.47%, ES 0.80; 2.47% ES 0.41 respectively). These results suggest that training through games of tag (VCI) was the most effective in improving the CODA and training with moderate contextual interference (MCI) was the only type which induced improvements in both capacities (SSP and CODA).

Key words: CI, CODA, SSP, LCI, MCI, HCI, VCI.

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I. INTRODUCTION

Physical fitness is considered a key health marker in boys and adolescents (Ortega et al., 2008; Ruiz et al., 2009). Furthermore, adequate physical activity levels have been reported to be necessary and decisive for the development and functioning of many physical, physiological, psychomotor and psychosocial processes in young people (Gallotta et al., 2009; Gutin et al., 2005; Ruiz et al., 2006; Strong et al., 2005; Zivcic et al., 2008). Physical activity levels have severely changed over the last few decades (Stalsber and Pedersen, 2010) and their consequences for boys' overall development and health have attracted much attention from the media, scientific researchers, and policy makers (Fjortoft et al., 2011). In this sense, several practical guidelines for appropriate physical activity habits during childhood have been published (Gallotta et al., 2009; Twisk, 2001).

Physical education is an indispensable instrument to encourage young people to establish a long-lasting healthy lifestyle (Fairclough et al., 2002; Kirk, 2005). Specifically, straight sprinting (SSP) performance and change of direction ability (CODA) are considered primordial qualities in many activities (Sporis et al., 2010b; Young et al., 2001) and important physical components related to youth health status (Vicente-Rodriguez et al., 2011). CODA is defined as the ability to change the direction of the body in an efficient and effective manner (Young and Willey, 2010), whilst SSP is a relatively closed skill involving predictable and planned movements (Young et al., 2001). A proper attainment of these two fundamental and independent motor skills (Jovanovic et al., 2011; Salaj and Markovic, 2011) is considered important for an appropriate development of health processes in young people (Ortega et al., 2008; Vicente-Rodriguez et al., 2011).

II. METHODS AND PROCEDURE

The sample consisted of 88 students (43 boys and 45 girls) in the 13 to 15 years of school boys from Ligaba High School, Wolaita Sodo Town. Participants were randomized into 5 different CI groups: i) low contextual interference (LCI) group, ii) moderate contextual interference (MCI) group, iii) high contextual interference (HCI) group, iv) variable contextual interference (VCI) group and v) control group (CG). Each participant performed a pre-test and a post-test session separated by a 3 week period, where the participants were randomly assigned to five different CI training programs. At both test sessions the participants performed a SSP test and CODA test. Prior to the pre-test, the researchers gave all participants graphic and field instructions about how to successfully perform the test. Two test sessions were performed to practice the tests and to ensure

that the participants performed both tests correctly. Before the tests, the participants completed a 10 min warm-up, including jogging, bilateral movements, dynamic stretching, skipping and jumping. Participants were given verbal encouragement to run as fast as possible during the tests. All tests were performed outdoor ground which is available in the school arena. All test sessions were conducted in the before and after school hours. The training sessions were conducted during the physical education class times. The SSP test consisted of 3 maximum acceleration drills of 15 m with a 180 s rest between them. Running time was recorded using stop watch and Split times were recorded at 5 m and 15 m. Similar distances have been used previously in other studies in both adults (Gorostiaga et al., 2009; Sporis et al., 2010a) and boys (Condello et al., 2013; Oxyzoglou et al., 2009; Yanci et al., 2012). The CODA test was performed 48 hours after the SSP test. Based on a previous protocol for the T-design test (Sporis et al., 2010b), the Modified Agility Test (MAT) proposed by Sassi et al., 2009 and Paulele et al., 2000 was chosen for CODA assessment. This is considered a short duration test where linear movement in the antero-posterior and medio-lateral directions are required (Sassi et al., 2009). Previous studies (Yanci et al., 2012) conducted with primary school students showed excellent MAT test reproducibility values (ICC = 0.91, CV = 2.30%).

Statistical Analysis

One way ANOVA and Tukey's ad hoc analysis were conducted to find initial and final differences between groups, and Bonferroni correction has been applied for p values. A repeated measure ANOVA was conducted to analyze the differences among pre- and post-test results, and a related measures Student's t-test was carried out to analyze each group independently. Data analysis was performed using the Statistical Package for Social Sciences (version 19.0 for Windows, SPSS Inc, Chicago, IL, USA).

III. RESULTS

Table I indicates that the results of the repeated measures ANOVA among pretest and post-test scores for each group (LCI, MCI, HCI, VCI and CG). For the MAT test, significant differences were only reported for the MCI and VCI groups, which improved their performance by 0.44 s and 0.99 s after the intervention respectively. There were no significant differences among groups after the program for the MAT test. No significant differences were obtained between groups after the training.

Table I - Repeated measures ANOVA for the modified agility test and the straight sprinting running test.

Test	Group	Pre-test	Post-test	F	df	p	Dif. pre-post.(%)	ES
MAT (s)	LCI	9.82	9.37	3.80	(14)	.071	4.58	.44
	MCI	10.03	9.59	4.48	(14)	.050*	4.39	.51
	HCI	9.87	9.66	1.89	(15)	.189	2.12	.25
	VCI	10.56	9.57	21.38	(19)	.001**	9.37	.99
	CG	10.46	10.20	1.59	(18)	.222	2.48	.22
SSPT at 5 m (s)	LCI	1.52	1.43	19.89	(14)	.001**	5.92	.98
	MCI	1.50	1.40	25.28	(14)	.001**	6.67	.99
	HCI	1.49	1.37	41.16	(15)	.001**	8.05	.00
	VCI	1.51	1.55	1.77	(19)	.198	-2.64	.24
	CG	1.46	1.50	4.38	(18)	.051	-2.74	.51
SSPT at 15 m (s)	LCI	3.75	3.53	31.27	(14)	.001**	5.86	.99
	MCI	3.71	3.47	35.22	(14)	.001**	6.47	1.00
	HCI	3.63	3.54	5.96	(15)	.028*	2.47	.63
	VCI	3.78	3.77	0.05	(19)	.836	.26	.05
	CG	3.59	3.80	34.78	(18)	.001**	-5.85	1.00

MAT: modified agility test; SSPT: straight sprinting running test; ES: effect size; LCI: low contextual interference; MCI: moderate contextual interference; HCI: high contextual interference, VCI: variable contextual interference; CG: control group. * p < 0.05, ** p < 0.01.

Regarding the 5 m SSP test, LCI, MCI and HCI groups improved their performance (0.09 s, 0.10 s and 0.12 s, respectively). Significant differences were found between groups in the post-test scores (F(4,80) = 12.86; p < 0.001; $\eta^2 = 0.391$), specifically VCI with regard to LCI (p < 0.01), MCI (p < 0.001) and HCI (p < 0.001) groups. Thus, the VCI group reported higher acceleration scores than the other three groups (+0.12 s, +0.15 s, and +0.18 s, respectively). Furthermore, MCI and HCI groups showed a shorter SSP running time at 5 m (0.10 s for p < 0.05 and 0.13 s for p < 0.001, respectively) in comparison to the CG.

Similarly to the previous results, in the 15 m SSP test, LCI, MCI and HCI improved their performance (0.22 s for $p < 0.01$, 0.24 s for $p < 0.01$ and 0.12 s for $p < 0.28$). On the contrary, the CG showed a longer SSP running time at this distance (0.21 s for $p < 0.01$). Significant differences were found between groups in the post-test scores ($F(4,80) = 6.02$; $p < 0.001$; $\eta^2 = 0.232$), once again VCI with regard to LCI ($p < 0.05$), MCI ($p < 0.05$) and HCI ($p < 0.05$) groups. This time, the VCI again reported higher SSP scores regarding the other three groups (+0.24 s, +0.3 s, and +0.23 s, respectively). There were also significant differences between the control group with regard to LCI ($p < 0.05$), MCI ($p < 0.01$) and HCI ($p < 0.05$) groups, with higher SSP scores of +0.27 s, +0.33 s and +0.26 s, respectively.

The results of the SSP tests in 5 m and 15 m, suggest a significant improvement of the LCI, MCI and HCI between the pre and post-tests. Nevertheless, no significant differences were observed in the VCI and CG groups in 5 m (ES = 0.24, -2.64%, ES = 0.51, -2.74%). Furthermore, a significant loss of acceleration capacity was observed in 15 m in the GC after a 3 week period (ES = 1.00, -5.85%). The LCI group improved the results obtained in 5 m (ES = 0.98, 5.92%) and in 15 m (ES = 0.99, 5.86%). Young et al., 2001 observed that agility training is barely related to acceleration performance and vice versa. The LCI group, which performed one way direction tasks, improved the SSP test significantly but not the COD test. This result coincides with the results obtained by Young et al., 2001 and is consistent with the concept of training specificity (Salaj and Markovic, 2011; Sassi et al., 2009; Sheppard and Young, 2006; Sporis et al., 2010a). The VCI group, which performed variable CI tasks, showed significant improvements (ES = 0.99, 9.37%) in the CODA after a 3 week training program.

IV. CONCLUSION

Significant differences were found in agility improvements in MCI and VCI groups after a 3 week agility training period with 13 to 15 years of school boys. By contrast, no significant difference was found in the LCI and HCI and CG groups. The most important improvement was found in the VCI group. Significant differences were found in 5 m and 15 m performance in LCI, MCI and HCI groups after a 3 weeks agility training period. No significant difference was found in the VCI group.

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