วารสารวิทยาศาสตร์และเทคโนโลยีการกีฬา ปีที่ 15 ฉบับที่ 2, ธันวาคม 2558
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นิพนธ์ต้นฉบับ (Original articles)
วิทยาศาสตร์การโค้ช (Sports Coaching Science)

THE EFFECTS OF THE 11+ ON AGILITY PERFORMANCE IN ADOLESCENT FUTSAL PLAYERS

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ABSTRACT

The major aims of this project were to investigate the effects of the 11+ training programme on agility performance in adolescent futsal players. There were sixteen subjects in training group (TG) and 14 subjects in control group (CG). Illinois agility test and nine-square test were measured in three times periods namely, baseline- (wk-0), during- (wk-5) and final-test (wk-10) of training period. The TG followed the 11+ training programme which trained between after wk-0 to wk-5 and after wk-5 to wk-10, 5 d/wk, for 10-weeks.

Agility performance were tested by Illinois agility test in TG. They were increased significantly after 10-weeks of training program ($p < 0.05$). Nine-square test in TG showed to tend to improvement significantly.

These results were concluded that the 11+ training programme could improve agility performance in adolescent futsal players after trained with the 11+ training programme longer than 10-weeks.

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Key words : The 11+ training programme, Futsal, Agility performance

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ผลของโปรแกรมอบอุ่นและเสริมสร้างสมรรถภาพต่อประสิทธิภาพความคล่องแคล่วในนักฟุตซอลวัยรุ่น

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บทคัดย่อ

จุดประสงค์หลักในการวิจัยครั้งนี้คือการค้นหาผลของโปรแกรมอบอุ่นร่างกายและเสริมสร้างสมรรถภาพ (the 11+) ต่อสมรรถภาพความแคลวคลองวองไวในนักกีฬาฟุตซอลวัยรุ่นกลุ่มทดลองจำนวน 16 คน และกลุ่มควบคุมจำนวน 14 คน การทดสอบประกอบไปด้วย การทดสอบความแคล่วคล่องว่องไวแบบอิลลินอยส์ (Illinois agility test) และ การทดสอบตารางเก้าช่องถูกทดสอบทั้งหมด 3 ครั้ง คือ การทดสอบก่อนเริ่มฝึก (wk-0) การทดสอบระหว่างฝึก (wk-5) และการทดสอบหลังฝึก (wk-10) หลังจากการทดสอบก่อนเริ่มฝึก (wk-0) มีเพียงกลุ่มทดลองที่ฝึกโปรแกรมอบอุ่นร่างกายและเสริมสร้างสมรรถภาพ (the 11+) เป็นระยะเวลา 10 สัปดาห์ ๆ ละ 5 วัน โดยแบ่งเป็นสองช่วง คือ ฝึกระหว่างการทดสอบก่อนเริ่มฝึก (wk-0) ถึงการทดสอบระหว่างฝึก (wk-5) เป็นเวลา 5 สัปดาห์ และ การทดสอบระหว่างฝึก (wk-5) ถึงการทดสอบหลังฝึก (wk-10) เป็นเวลา 5 สัปดาห์

ความความแคลวคลองวองไวโดยการทดสอบความแคล่วคล่องว่องไวแบบอิลลินอยส์ (Illinois agility test) ในกลุ่มทดลองสามารถเพิ่มสมรรถภาพอย่างมีนัยสำคัญภายในกลุ่มหลังจากฝึกตามโปรแกรมเป็นเวลา 10 สัปดาห์ ส่วนของผลการทดสอบตารางเก้าช่อง กลุ่มทดลองมีแนวโน้มที่เพิ่มสมรรถภาพอย่างมีนัยสำคัญในการทดสอบหลังฝึก

ผลของการศึกษานี้สรุปได้ว่าโปรแกรมอบอุ่นร่างกายและเสริมสร้างสมรรถภาพ (the 11+) สามารถพัฒนาสมรรถภาพความแคลวคลองวองไวในนักกีฬาฟุตซอลวัยรุ่นหลังจากฝึกนานกว่า 10 สัปดาห์

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คำสำคัญ : โปรแกรมอบอุ่นร่างกายและเสริมสร้างสมรรถภาพ ฟุตซอล ความคล่องแคล่ว

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INTRODUCTION

Futsal is smaller pitch and usually indoors like a football but played five-a-side. Futsal started in South America. Futsal world cup was managed by the Fédération Internationale de Football Association (FIFA)[27].

A futsal studies have been published on other knowledge in the international literature[1, 2, 4, 24, 27]. Such as changes activities[6] catalogue and distance of running[4], aerobic fitness[1,5] , Futsal player injuries[27] , tactic[7] and technical[18]. Castagna et al. showed futsal players had to sprint and high-intensity running about 5% (speed > 18.3 kmh) and 12% (speed > 15.5 kmh) of total playing time, respectively[4]. The average distance of total playing time of sprint, high-intensity running and medium-intensity running was 349, 571 and 1,232 meter, respectively[4]. However, study that relate skill of futsal players and functional abilities not yet many.

Futsal and football are sameness as aerobic system, strength, speed, agility and power for maintain performance while competition[17, 21]. Functional ability or sports specific skill effect to make players succeed[9, 13]. However, some of evidence that relate with sports specific skill and effect of training in futsal is still less[1, 27].

Specific soccer program can improve performance of physical and functional capability. Hagiwara et al. and Manolopoulos et al. studied Specific soccer program that effected to improve knee extension strength and hip flexion strength of the support leg that increases a stable for maintain body balance and improve maximum leg press strength[9, 13]. A complete warm-up program (the 11+ training programme) was developed from the preventive training programme (the 11) and Prevention Enhance Performance (PEP)[12] that include jogging, stretch, strength, balance and speed blend with change directions rapidly[22]. Main purpose of the 11+ training programme improved awareness and neuromuscular control during standing, running, planting, cutting, jumping, and landing[22]. Soligrad et al. (2008) showed training group (the 11+ training programme) reduced severe injuries rate 50% and reduced injury in training 37% and match 29% when compare control group within 8 months[22]. The 11 was studied that involve to improve functional ability such as leg power (Triple jump for distance test) and speed (20 meter sprint)[10]. The 11+ training programme included a new set of structured running exercises that made it better suited for training and matches[22, 23]. However, scientific studies so far was few to use the 11+ training programme to improve agility performance in adolescent futsal player but other programmes were applied to increased performance[13].

METHODS

Thirty adolescent futsal players were involved in the study (TG: mean age, 16.62 ± 1.02 years, CG: mean age, 16.36 ± 0.93 years; TG: mean height, 166.78 ± 7.6 cm, CG: mean height, 169.14 ± 5.4 cm; TG: mean weight, 59.18 ± 10.84 kg, CG: mean weight, 61.27 ± 9.81 kg). Written informed consent was obtained after verbal and written explanations of the experimental procedures.

A parallel 2-group, randomized, controlled, longitudinal (baseline, pre-test (wk-0), during-test (wk-5) and post-test (wk-10)) design was used. Before wk-0, subjects were allocated randomly to CG and TG. Two players in CG dropped out. Therefore, the final analysis consisted of 16 players in TG and 14 in CG. Then all groups were wk-0. After that TG had to participate in 5 day per week of the 11+ but both groups (TG and CG) remianed to participate in at least 5 day per week. Wk-5 was tested when ended a 5 weeks of the 11+, while wk-10 was tested when ended of the 11+.

The 11+ was applied in this study. The 11+ include warm up, strength, plyometrics, balance, speed and agility training. The 11+ used 20 minutes before futsal training[22].

Nine-squre test have the purpose of test for assesses agility by nine-square. Size 150x150 centimeter[8].

Illinois agility test have The purpose of test for assesses speed, agility and body control in directions[19].

Data are reported as means ± standard errors of mean (SEM). Before using parametric tests, the assumption of normality was verified with the Kolmogorov-Smirnov test. Age, weight, height, BMI, %fat, VO2max, futsal trained and the 11+ trained were tested by unpaired t tests. Two-way ANOVA, mixed model (groups and times) was used to assess differences between-groups and within group in Illinois agility test and Nine-squre test. The level of statistical significance was set at $p < 0.05$.

Table 1 Physical characteristics (* Significant difference in between groups, $p < 0.05$)

RESULTS

Both groups showed no significant difference in age, height, weight, BMI, %fat, VO2max and there was significant difference in the 11+ trained frequency ($p < 0.05$).

Illinois agility test performance in TG was 17.39 ± 0.84s at wk-0, 17.02 ± 0.88s at wk-5, and 16.81 ± 0.82s at wk-10, respectively. There was significant ($p < 0.05$) improvement at wk-10 when compared with wk-

	Training group (TG)	Control group (CG)
	n=16	n=14
Age (years)	16.62 ± 1.02	16.36 ± 0.93
Height (cm.)	166.78 ± 7.6	169.14 ± 5.4
Weight (kg.)	59.18 ± 10.84	61.27 ± 9.81
BMI (kg/m^2)	21.23 ± 3.44	21.42 ± 3.36
Body fat (%)	7.32 ± 0.11	7.35 ± 0.17
Rating heart rate (bpm)	66.19 ± 3.71	66.21 ± 3.29
Systolic blood pressure (mmHg)	117.62 ± 5.38	115.57 ± 3.82
Diastolic blood pressure (mmHg)	67.69 ± 3.32	66.43 ± 1.65
VO_{2max}(mL/min/kg)	49.92 ± .38	50.0 ± .34
Futsal trained frequency (days/wk)	5.45 ± 0.19	5.35 ± 0.22
the 11+ trained frequency (times/wk)	3.67 ± 0.31*	0

0 of Illinois agility test in TG. While that in CG was 17.45 ± 1.35s at wk-0, 17.66 ± 1.43s at wk-5, and 17.44 ± 1.25s at wk-10, respectively. There was no improvement in Illinois agility test in CG.

Nine-square test (9-square test) performance in TG was 32.94 ± 4.49 times at wk-0, 36.37 ± 6.22 times at wk-5, and 37.94 ± 6.37 times at wk-10, respectively. There was no significant different in TG. While that in CG was 35.43 ± 5.54 times at wk-0, 36.07 ± 5.06 times at wk-5, and 36.14 ± 4.22 times at wk-10, respectively. There was no improvement in 9-square test in CG.

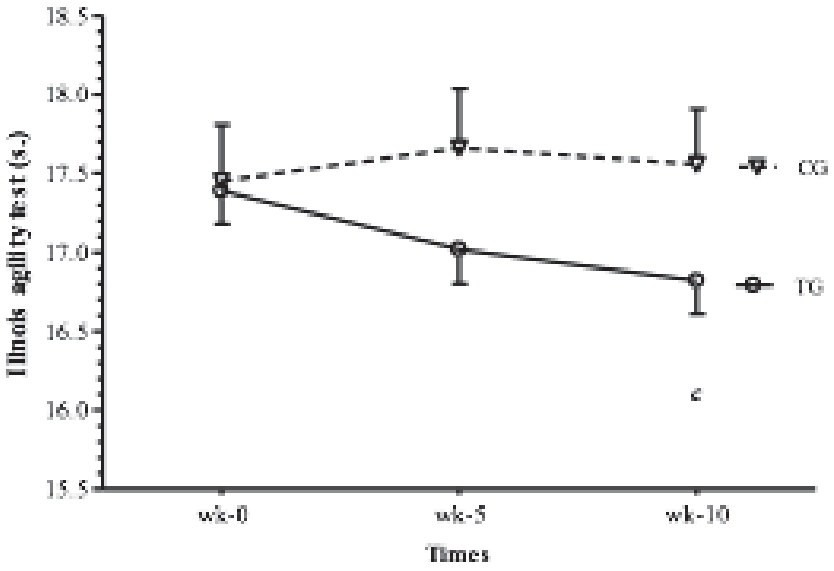

Figure 1 Illinois agility test. ^{c} $p < 0.05$ significant difference by within-group (wk-0 vs wk-10). The data were mean ± SEM.

DISCUSSIONS

An important finding from this research was that the 11+ training programme to enhance agility performance in Illinois agility test by progressive load, agility, speed and plyometric training. In this study, agility performance could improve significantly at wk-10 in TG. This is consistent with Reis *et al*. (2013)[20] who found that the 11+ training programme for 12-weeks in young futsal players could enhance agility test performance (T-Test) at post-test. They suggested that the 11+ training programme could improve agility performance and developed physical capacities in young futsal players by progressive load. Progressive load in the 11+ training programme is the increase of intensity or difficulty of training which is divided to three level and according with the present study which used the 11+ training programme including progreesive load could improve agility performance in 10-weeks[20]. Plant and cut is agility training which composd in the 11+ training programme and focus on agility especially to be slow down the body rapidly and accelerate the body as fast as possible in as little time possible. This might be the component of improvement to Illinois agility test performance in this study. This is in agreement with Young *et al.* (2001) who studied agility training for 6-weeks on agility test. The results showed that subjects trained with agility training could improve

significantly in agility tests[26]. They suggested that agility training induced a more positive agility performance. Therefore, there was synopsis that specific-tasks agility training affected to specific testing. The development of Illinois agility test performance was consistency with the development of cognitive function performance because accuracy and rapidity of movement was important aspect[11] but 9-square test in this study was not shown to improvement significantly but created the tendency of improvement ($p < 0.071$) at wk-10 in TG which might involve with the improvement of cognitive functions by agility training. Possibility, the 11+ training programme might affect positively to influence on cognitive functions by increasing the potential in motor cortex and cerebellum in the brain. Lennemann *et al.* (2013) investigated agility training that increased after the traditional military physical training for 6-weeks on Illinois agility test and cognitive portion tests[11]. Agility performance in the agility training group could improve within-group and improved cognitive test (Continuous memory test and Visual vigilance test). They suggested that agility training provided greater benefit to agility and cognitive performance since 6-weeks training program. Therefore, agility training (Plant and cut exercise is in part 3 of the 11+ training programme) in this study did not transfer to Illinois agility test which trained within 5-weeks training program or in short time training but affected obviously after 6-weeks of agility training period. Some research supported that sprint training could have positive effect to development of agility performance[11]. Markovic *et al.* (2007) was assertion that sprint training could improve agility performance[14]. They studied sprint training for 10-weeks consisted in a maximal sprints over distances of 10-50m on agility test[14]. The result showed that sprint training could improve agility test performance within 10-weeks[14]. They suggested that sprint training could improve leg extensor strength and power as well as for development in agility performance[14]. It was similar to this study which used the 11+ training programme consisting sprint training over 30m (Across the pitch) that could improve agility performance within 10-week. This is consistent with Mero *et al.* (1992) who advised that agility performance required a great concentric force/power and generates high velocity during acceleration at the beginning and acceleration phases[16]. Thomas *et al.* (2009) suggested that agility performance was not only dependent on agility training, sprint training and progressive load, but also plyometric training that was shown improvement performance and other study showed that leg muscle power was correlated moderately with agility performance[15, 25]. Plyometric training is a SSC exercise of muscle unit that improve muscle force and power produce which is consistent with agility performance and requires rapid force development and high power output for the great agility performance. Thomas *et al.* (2009) studied plyometric training for 6-weeks on agility test in young soccer players[25]. They reported that players trained with plyometric training could improve agility time performance[25]. They suggested that players trained with plyometric training improved the ability of deceleration and acceleration within 6-weeks of

training period[25]. This is consistent with this study which showed that plyometric training (Jumping with vertical, lateral & box jumps and bounding exercise) in part 2 and 3 of the 11+ training programme could have little effect to agility performance within 5-weeks and affected obviously at wk-10. Movements rapidly and forcefully which related components of futsal or soccer thought to be necessary for success[25] and familiarize players with unanticipated changes in direction[3]. Agility performance in the present study could be improved by the 11+ training programme including progressive load, sprint training, plyometric training and agility training within 10-weeks.

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