วารสารวิทยาศาสตร์และเทคโนโลยีการกีฬา ปีที่ 15 ฉบับที่ 1, กรกฎาคม 2558
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นิพนธ์ต้นฉบับ (Original article)
วิทยาศาสตร์การโค้ช (Coaching Science)

THE EFFECTS OF THE 11+ TRAINING PROGRAMME ON CORE STABILITY PERFORMANCE IN ADOLESCENT 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 core body stability in adolescent futsal players. There were sixteen subjects in training group (TRG) and 14 subjects in control group (COG). Prone hold test (PRH) and One-minute sit-up test (sit-up) were measured in three times periods namely, first test or baseline test (wk-0), second test (wk-5) and third test (wk-10) of the 11+ training programme period. The TRG 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.

Core stability by PRH in TRG was significantly increased when trained with the 11+ training programme more than 5-weeks. Sit-up in TRG showed to trend of improvement significantly.

These results were concluded that the 11+ training programme could improve core stability performance in adolescent futsal players after trained with the 11+ training programme longer than 5-weeks up to 10-weeks.

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KEYWORDS: the 11+ training programme, Futsal, Core stability

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ผลของการฝึกนักฟุตซอลวัยรุ่นด้วยโปรแกรมอบอุ่นร่างกายและเสริมสร้างสมรรถภาพ (the 11+ training programme) ต่อความมั่นคงแกนกลางลำตัว

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บทคัดย่อ

จุดประสงค์หลักในการวิจัยครั้งนี้คือการค้นหาผลของโปรแกรมอบอุ่นร่างกายและเสริมสร้างสมรรถภาพ (the 11+ training programme) ต่อความมั่นคงแกนกลางลำตัวในนักกีฬาฟุตซอลวัยรุ่นกลุ่มทดลองจำนวน 16 คน และกลุ่มควบคุมจำนวน 14 คน การทดสอบประกอบไปด้วยการทดสอบโพรนโฮล์ด (Prone hold test, PRH) และ การทดสอบซิทอัพหนึ่งนาที (One-minute sit-up test, sit-up) ที่ถูกทดสอบทั้งหมด 3 ครั้ง คือ การทดสอบก่อนเริ่มฝึก (wk-0) การทดสอบระหว่างฝึก (wk-5) และการทดสอบหลังฝึก (wk-10) หลังจากการทดสอบก่อนเริ่มฝึก (wk-0) มีเพียงกลุ่มทดลองที่ฝึกโปรแกรมอบอุ่นร่างกายและเสริมสร้างสมรรถภาพ (the 11+ training programme) ที่ฝึกระหว่างการทดสอบก่อนเริ่มฝึก (wk-0) ถึงการทดสอบระหว่างฝึก (wk-5) และ การทดสอบระหว่างฝึก (wk-5) ถึงการทดสอบหลังฝึก (wk-10) เป็นเวลา 5 วันต่อสัปดาห์ จำนวน 10 สัปดาห์

ความมั่นคงแกนกลางลำตัวถูกทดสอบโดยโพรนโฮล์ดในกลุ่มทดลองที่สามารถเพิ่มประสิทธิภาพเมื่อฝึกโปรแกรมอบอุ่นร่างกายและเสริมสร้างสมรรถภาพ (the 11+ training programme) มากกว่า 5 สัปดาห์ ด้านการทดสอบการทดสอบซิทอัพหนึ่งนาทีมีแนวโน้มพัฒนาความสามารถอย่างมีนัยสำคัญทางสถิติ

ผลของการศึกษานี้สรุปได้ว่าโปรแกรมอบอุ่นร่างกายและเสริมสร้างสมรรถภาพสามารถพัฒนาความมั่นคงแกนกลางลำตัวในนักกีฬาฟุตซอลวัยรุ่นหลังจากฝึกโปรแกรมอบอุ่นร่างกายและเสริมสร้างสมรรถภาพนานกว่า 5 สัปดาห์ จนถึง 10 สัปดาห์

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คำสำคัญ : โปรแกรมการอบอุ่นร่างกายและเสริมสร้างสมรรถภาพ ฟุตซอล ความมั่นคงแกนกลางลำตัว

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INTRODUCTION

Futsal was managed by the Fédération Internationale de Football Association (FIFA) that specify the five-a-side version of football played on a smaller pitch[1, 2].

Match demand, fitness parameter, tactic, technical and injuries in futsal were studied and published[2, 4, 5, 6, 7, 9] but there are few studies have been published in the international literatures[1, 4]. Futsal is an intermittent sports because changing activities average every 3.28 second[2, 3]. Futsal running study 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. The average distance of total playing time of sprint, high-intensity running and medium-intensity running was 349, 571 and 1,232 meter, respectively[5]. Fitness parameter of futsal was studied about aerobic fitness showed professional players have maximal oxygen uptake (VO_{2max}) was 61.6±4.6 - 62±5.3 ml/kg/min and amateur players was 55.2±5.7 ml/kg/min and both groups studied from match and the Futsal intermittent endurance test[4, 8]. Futsal world cups 2000-2008 showed injuries occurred 165 times and 70% of total injuries occurred at lower extremity and 7% occurred at core body from tournament 127 matches[1]. However, studies that relate functional abilities not yet many.

Futsal require aerobic system, strength, speed, agility and power for maintaining performance while competition as football[10, 11, 19, 21, 22]. Likewise, functional ability is important in futsal players like sports specific skill effect to make players succeed[19, 20] such as agility is important for using during start, stop and turn[12] conform to Dogramaci and Watsford[3]. But numerous futsal publications currently showed endurance study more than motor performance or skill research[17]. Therefore, some of evidence that relate with sports specific skill or effects of training in futsal were still less[1, 4].

Specific soccer program can improve performance of physical capability. Manolopoulos *et al.* showed soccer training that emphasizes strength and technique could improve knee extension strength and hip flexion strength that would be effective to improve player potential[19, 20]. A complete warm-up program (the 11+ training programme) was developed from the preventive training programme (the 11) and Prevention Enhance Performance (PEP)[18]. The 11+ training programme included jogging, stretch, strength, balance and speed blend with changing directions rapidly[13]. Main purpose of the 11+ training programme was to improve awareness and neuromuscular control during standing, running, planting, cutting, jumping, and landing[13]. Soligrad et al. showed that training group (the 11+ training programme) reduced severe injuries rate 50% and reduced injury in training 37% and match 29% when compare to the control group within 8 months[13]. Junge et al. used the 11 for training in training group could reduce injuries 11.5% and 25.3% for matches and training, respectively[14]. However, the 11 had to be developed to be the 11+ training programme because incidence of injuries was not significant between training group (the 11) and control group the compliance with the program was low[15]. Kilding *et al.* who studied the effects of the 11 (part of the 11+ training programme) that showed to tend to improvement of core stability significantly in young football players for 6 weeks[16] but this present study add to 10 weeks of the 11+ training that according with Soligard *et al.* who suggested that the

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11+ training programme included a new set of structured running exercises that made it better suited for training and matches[13]. Therefore, scientific studies so far was few to use the 11+ training programme to improve core stability performance in adolescent futsal player but other programmes were applied to increased performance[19].

MATERIALS AND METHOD

Thirty adolescent male futsal players (mean ± SD: age 16.5 ± 0.18 years; height 168.88 ± 0.12 cm; weight 60.16 ± 1.87 kg; 5.45 ± 1.87 days of futsal training per week) participated in the study. Players were randomized to a training group (TRG, n = 16) and control group (COG, n = 14). Two adolescent male futsal players were excluded. Subjects were tested 3 times to be first test or baseline test (wk-0), second test (wk-5) and third test (wk-10). After wk-0, Subjects (TRG & COG) had to participate in at least 5 days per week of futsal training. Specifically, TRG had to participate in at least 5 days per week of the 11+ training programme for 10 weeks. Wk-5 was tested when trained a 5 weeks of the 11+ training programme, while wk-10 was tested when ended of the 11+ training programme.

The 11+ training programme was applied in this study. The 11+ training programme included warm up, strength, plyometrics, balance, speed and agility training. The 11+ training programme used 20 minutes before futsal training[13].

One minute sit-up test (sit-up) was assessment strength and endurance of abdominal. The detailed protocol of the test has been presented elsewhere[16].

Prone hold test (PRH) was an assessment of static endurance of abdominal and control body. The detailed protocol of the test has been presented elsewhere[16].

Data are reported as means ± SD. 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+ training programme 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 PRH and sit-up. The level of statistical significance was set at $p < 0.05$.

RUSULTS

There were no changes significantly to body mass or stature during the study in either the TRG or COG. Comparison of the data between TRG and COG showed no significant difference in age, height, weight, BMI, %fat, VO2max and there was significant difference in the 11+ trained frequency ($p < 0.05$).

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	Training group (TRG)	Control group (COG)
	n=16	n=14
Age (years)	16.62 ± 1.02	16.36 ± 0.93
Height (cm.)	166.78 ±7.65	169.14 ± 5.49
Weight (kg.)	59.18 ± 10.84	61.27 ± 9.81
BMI	21.23 ± 3.44	21.42 ± 3.36
%fat	7.32 ± 0.31	7.35 ± 0.27
VO_{2max} (ml/min/kg)	49.38 ± 5.36	50.03 ± 4.91
Futsal training frequency (days/week)	5.45 ± 0.19	5.35 ± 0.22
The 11+ training frequency (times/week)	3.67 ± 0.31*	0

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

PRH performance scores in TRG was 55.46 ± 7.14s at wk-0, 68.7 ± 17.13s at wk-5, and 84.8 ± 18.44s at wk-10, respectively. There was significant ($p < 0.05$) improvement in PRH in TRG. While that in COG was 54.06 ± 10.94s at wk-0, 54.09 ± 15.13s at wk-5, and 57.98 ± 14.54s at wk-10, respectively. There was no improvement in PRH in COG. Prone hold test performance in TRG was significantly ($p < 0.05$) when compared with COG in wk-5 and wk-10.

Sit-up performance in TRG was 34.19 ± 7.59 times at wk-0, 36.75 ± 7.27 times at wk-5, and 38.87 ± 9.57 times at wk-10, respectively. There was no improvement significantly but there was trend to increase performance in TRG. While that in COG was 33.86 ± 6.19 times at wk-0, 35.36 ± 8.72 time at wk-5 and 35.21 ± 7.45 times at wk-10, respectively. There was no improvement in sit-up in COG.

DISCUSSION

This study found significant increase in core stability which proved through PRH. The TRG was able to improve their core stability at wk-5 and wk-10 in this study. This is consistent with Durall *et al.*[23] those found that core stabilization exercise (CSEP) for 12-weeks caused improvement of trunk static test. They found that subjects with CSEP could improve trunk static test performance at post-test between 34-80 seconds when compare with baseline. They reported that CSEP was at least twice per week during a 12-week period was an effective stimulus

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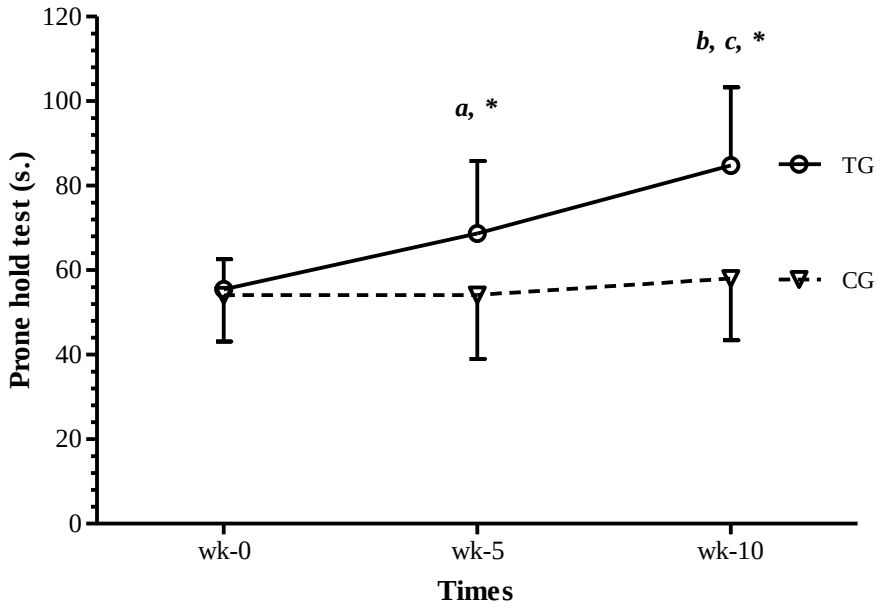

Figure 4.1 Prone hold test (PRH). [a] $p < 0.05$ significant difference by within-group (wk-0 vs wk-5). [b] $p < 0.05$ significant difference by within-group (wk-5 vs wk-10). [c] $p < 0.05$ significant difference by within-group (wk-0 vs wk-10). * $p < 0.05$ significant difference by between-groups. The data were mean ± SD.

to improve trunk static that elevated fatigue threshold to increase active pelvic and spinal stability. The findings of Durall *et al.*[23] assert this study result which showed the development of core stability performance at wk-10. Childs *et al.*[25] found that CSEP which includes the horizontal side support (like Sideway bench in the 11+ training programme) for 12-weeks on abdominal and trunk muscles endurance in soldier of US army could improve abdominal and trunk muscles endurance performance in within-group. Those results are compatible with this study which showed that 1minute sit-up test (sit-up) improved continually in TRG but it was not significant. The cause of improvement but non-significant was the difference of intervention time for trained group as the present study. Whereas, Durall *et al.*[23] used CSEP for 12-weeks and they also suggested that CSEP was considered to cause small positive improvement for sit-up performance. In this study, core stability performance improved at wk-5 because core stability training increased intensity from level 1 to level 2 in part 2 when through 3-weeks of the 11+ training programme period. Consistency with Parkhouse and Ball[24] which studied CSEP for short term on three core stability test performance that consisting Plank (likely PRH), double leg lowering and back extensions. The training group with CSEP could improve significantly in pre- to post-test of all tests. They indicated that short term training might only improve core strength by reducing fatigue in the core musculature. There affect to ability to control the position and motion of the trunk and the pelvis that allowing optimum production transfer and control of force to the athlete is more neuromuscular control during core stability. Oliver and Brezzo[26] suggested that core stability performance

was not only dependent on CSEP, but also balance training which could improve core and pelvic stability. Moreover, Olivmoer and Brezzo[26] studied balance training for long term on core stability/strength and endurance in collegiate volleyball and soccer woman. They reported that core endurance, core strength/stability and pelvic stability improved significant in post-test. Their finding is consistent with the present study which showed that there were improvements in core stability performance at wk-10 of the 11+ training programmes period. The finding of Oliver and Brezzo[26] supported that balance training could improve rectus abdominis, transverse abdominis and the multifidus were the muscles of the core that fire instantaneously prior to improve core stability/strength. Oliver and Brezzo[26] also sustained that balance training could affect to pelvic stability which was the primary to improve PRH performance through balance training (Single-leg stance with ball or partner) in part 2 of the 11+ training programme when through 5-weeks of training period because the intensity was developed from level 1 to level 2 when through 3-weeks of training period in this investigation. In summary, CSEP and balance training was composition in the 11+ training programme could improve core strength/stability performance since 5-weeks training programme. Core endurance performance did not show significant improvement but the 11+ training programme created the tendency of performance developing within 10-weeks.

CONCLUSIONS

The 11+ training programme can improve core stability performance distinctly after 5-weeks of the 11+ training programme in adolescent futsal players by The bench (static, alternate legs and one leg lift &hold) and Sideways bench (static, raise & lower hip and with leg lift) in part 2.

This also correlated with the lower incidence of injury in soccer players trained by long term the 11+ training programme reported by many investigators[1].

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