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EFFECTIVENESS OF COMPLEX AGILITY TRAINING PROGRAM FOR AMATEUR MALE SOCCER PLAYERS

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Abstract

Background. The ability to quickly change direction has been considered an important physical quality related to success in youth soccer.

The study purpose was to investigate the training effect of a complex agility training program on amateur male soccer players.

Materials and methods. The participants were 60 amateur male football players (aged 18-22) divided into two groups and selected by using purposive random sampling. Thirty athletes aged 19.7 ± 1.34, BMI 21.8 ± 1.75 performed a complex training program (CTG) combined with sprint, agility or CoD, and plyometric session. While 30 participants of the control group (CG) aged 19.3 ± 1.31, BMI of 21.2 ± 1.02 followed a general football training program. In both groups, each training session lasted 120 minutes, a 30-minute period, 3 times a week, a total of 6 weeks. The Arrowhead Agility Test was scheduled at the baseline, for the 4th and 6th weeks. The mean and standard deviation of the data was calculated. The inferential statistic was repeated measure ANOVA. A Newman-Keuls post hoc test was calculated if the group x time interactions were significant ($p < 0.05$).

Results. After training, agility was a statistical difference within the CTG, when comparing baseline and the 6th week ($p = 0.03$), there were no significant changes in agility when comparing between-group. Therefore, this shows that complex training programs can improve agility in amateur male soccer players.

Conclusions. This integrated training program can be applied to amateur male soccer players. The training program should be specific and varied. It can help soccer players improve their agility that is related to overall soccer performance.

Keywords: complex training, agility, amateur male soccer players.

Introduction

Soccer is characterized by an intermittent-activity profile with metabolic contributions from both the aerobic and anaerobic systems (Rampinini et al., 2007). Players cover distances of 10-13 km during matches and perform approximately 1,350 activities (every 4-6 seconds) (Mohr et al., 2005), such as acceleration and deceleration, change of direction (CoDs) and jump, all of which are interspersed with short recovery periods (Asadi et al., 2016). In modern soccer, the appropriate development of neuromuscular capabilities is an important fundamental for players' performance (Barnes et al., 2014; Jeffreys et al., 2018). The ability to quickly change directions is considered an important physical quality, related to success in youth soccer (Hachana et al., 2017; Altmann et al., 2019). In this context, coaches and fitness specialists have been facing a great challenge to progressively increase strength, speed, and power capacities in soccer athletes, from the early stages of development to professionalism (Hammami et al., 2017; Loturco et al., 2017). Optimal training techniques designed to maximize strength receive considerable interest among strength and conditioning specialists, strength coaches, and researchers (Duthie et al., 2002). It is accepted by most industry professionals that athletes should incorporate both resistance training (RT) and plyometric training (PT) into their regimens to increase the probability of developing higher muscular power (Ebben & Blackard, 1997; Fatouros et al., 2000).

Complex training has gained popularity as a training strategy combining weight training and plyometric training

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(Faigenbaum et al., 1999; Burger et al., 2000; William, 2002). A form of combination training can be described as training that alternates between traditional resistance (heavy resistance exercise) and plyometric exercises (light resistance exercise) within a single exercise session (Chu,1996). Previously, Ebben and Watts (1998) reviewed the complex training literature and described the effectiveness of combining weight training and plyometrics. These authors offered suggestions for designing complex training programs, and recommended further research to assess the potential effectiveness of complex training. Interestingly, recent research has examined complex training as well as the ergogenic warm-up benefits associated with weight training exercises performed prior to explosive movements such as jumping (Burger et al., 2000; Ebben et al., 2000; MacDonald et al., 2012). Complex training may be an optimal training strategy for developing sport-specific athletic strength, if it is true that this form of training is more effective than other training programs at enhancing strength (possibly strength-power) production because of enhanced neuromuscular activity (Docherty et al., 2004; Ebben, 2002).

Research has also examined the effect of complex training while combining total body or lower body strength, power exercises and some form of jumping. Training studies have also been conducted to examine the effectiveness of complex training. For example, the effects of a three-week complex training program with seven division I college female basketball players. Pre and post test results revealed improvement in the 300 m shuttle, 1 mile run, VO_2max, 20 yd dash, pro agility run and the T-test, reverse leg press and back squat. The data showed that the complex training program was effective in eliciting statistically significant improvement in the 300-meter shuttle (Zepeda & Gonzalez, 2000). And there was other research showing that improving significantly in the change of direction (CoD) or agility and soccer shooting precision was supported (Fiorilli et al., 2017). In many team sports (e.g., ice hockey, soccer, handball, basketball, etc.), the ability to quickly change direction while running, also known as a cutting move or CoD, is a significant performance determinant (Paul et al., 2016). It was previously proved that faster athletes had greater strength in the leg responsible for the push-off movement during CoD activities to one side (Young et al., 2002). The support leg (i.e., the non-dominant leg) was found to have better static balance and reactive strength. There is evidence that soccer players kick the ball with their dominant leg faster and more accurately (Carey et al., 2001).

Currently, the evidences about short-term (8 weeks) training effects are very limited in the scientific literature in both plyometric and directional training using elite young players during the competitive season (Taylor et al., 2016). Moreover, the effect of a single plyometric session a week when combined with CoD training is not well known. Therefore, *the aim of this study was* to assess the effects of a CoD and a complex CoD and jumps protocol within a 6-week duration in amateur male soccer players.

Materials and methods

Study participants

The subjects were 60 amateur male soccer players of Surindra Rajabhat University, aged 18-22 years with an average height, body weight and body mas index of 174.13 ± 4.47 cm, 68.27 ± 6.86 and 21.8 ± 1.75 respectively. obtained from andom of the best time of Arrowhead Agility Test, and volunteered to experiment and had no severe injuries. Each participant signed a written informed consent form before the study began. The study was approved by the Surindra Rajabhat University's Ethical Committee on Human Research according to the current edition of the Declaration of Helsinki (HE 642011).

Study organization

All of them tested their agility by using the standardized Arrowhead agility test, and the best time statistics were recorded. Then, the results were ranked 1-60 in order from those with the lowest running time statistics to the highest,

Table 1. The protocol of training

Day	Training session	Unit of training	Reps/Set	Duration of training
CTG	General warm up	Basic drills movement		5 minutes
Monday Wednesday Friday	Sprint & accelerations 30 meter	30% Sprint 50% Sprint 70% Sprint 90% Sprint 100% Sprint	1/5	5 minutes
	Agility or change of direction (CoD) 3 patterns	Forward zigzag direction (FZD) 10 meter Backward zigzag direction (BZD) 10 meter Lateral zigzag direction (LZD) 10 meter	2/3 2/3 2/3	10 minutes
	Lower body plyometric workout 3 patterns	Forward double legs jump + 100% Sprint 5 m + FZD 5 meter Lateral double legs jump + 100% Sprint 5 m + LZD 5 meter Combine 4 direction double legs jump + 100% Sprint 10 meter	6/3 6/3 6/3	15 minutes
CG	General warm up	Basic drills movement		5 minutes
Monday Wednesday Friday	Keeping up their regular training schedule	Running and dribbling drills, passes, and goal-scoring drills		90 minutes

respectively. Using the ability to sort from least to most used time statistics (seconds) after matching individual (matched subjects) was arranged for people with similar speed to match and then separated into each group until the number was reached. The groups were divided into 2 groups of 30 of the complex training group (CTG) and 30 of the control group (CG) using the matching group method, each group comprised of 9 defenders, 12 midfielders, and 9 strikers. The protocol of training was held 48 hours before testing to allow for adequate recovery. The testing sessions were held within 2 hours to reduce the effects of diurnal variation. For all sessions, players were required to wear the same footwear. Eyedness, handedness, and footedness were determined prior to the start of the study to evaluate the soccer player's laterality profile (Azémar et al., 2008). CTG and CG were instructed by professional coaches and sport scientists during the intervention period. Only CTG underwent the complex training program30 minuite alongside a regular football training program.

Statistical analysis

Data processing was conducted using SPSS Version 17 software. The normal distribution of variables was tested using the Shapiro wilk test. Descriptive statistics were mean and standard deviation to express demographic characteristic. Inferential statistic was repeated measure ANOVA used to compare differences within and between groups at 95% confidence interval. A Newman-Keuls post hoc test was calculated if the group x time interactions were significant.

Results

The participant group was no baseline differences in demographic characteristics findings between the experimental and control groups.

Table 2. Demographic characteristics at base line

Group	Age		Weight		Height		BMI		P
	X	SD	X	SD	X	SD	X	SD	
CTG (n=30)	19.7	1.34	68.27	6.86	174.13	4.47	21.8	1.75	.184
CG (n=30)	19.3	1.31	67.67	6.70	171.67	4.75	21.2	1.02	.471

The ability test of agility by arrowhead agility test in the complex training group showed a significant difference when comparing within group from baseline after training in 4th week and 6th week ($p = 0.03$). Meanwhile, there was no significant difference ($p = 0.82$) in the control group.

Table 3. Comparison of the ability test of agility by arrowhead agility test variable of the subjects

Variance	SS	df	MS	F	Sig.
Within group : Complex training group					
Time	1.11	2	0.56	4.18	0.03*
Error	3.59	27	0.13		
Within group : Control group					
Time	0.13	2	0.07	0.21	0.82
Error	8.77	27	0.33		

* $p < 0.05$ statistically significant difference when compared within group, mean scores at point comparisons from baseline.

A Newman-Keuls post hoc test was utilized if the group x time interactions were significant. The agility variable of the complex training group was a significant difference ($p = 0.02$) when comparing between baseline and after the 6th week.

Table 4. The agility variable of the complex training group.

Time	Mean Difference	Sig.
Baseline X 4th week	0.18	0.52
4th week X 6th week	0.29	0.20
Baseline X 6th week	0.47	0.02*

* $p < 0.05$ statistically significant difference when compared within group, mean scores at point comparisons from baseline.

Discussion

Soccer is a sport that requires a variety of skills and abilities. The integrity of the gongs inevitably affects the performance of excellent physical fitness during competition. Having good physical mechanics can be advantageous for movement required in a sport. Change of direction ability (CoD) is an essential physical component for soccer. More specifically, change of direction ability seems to have an essential role in determining the success of soccer players (Brughelli et al., 2008; Goral, 2015). Agility is a key performance indicator in professional soccer and it's also utilized to discover young, talented players (Goral et al., 2012; Kaplan et al., 2009). According to this study research, it was found that a 6-week complex training program with integrated skill sessions considerably increased agility performance in amateur soccer players in Surindra Rajabhat University from baseline after training in 4th week and 6th week ($p = 0.03$). From the integration of complex training programs, training steps were sequenced to have the quality of training volume. The intensity of the training is related to the recovery between sets. The coaches were supervised and controlled by focusing on athletes to show their skills with accuracy including details of the rhythm of movement relative to each other while in motion. The correct factors in training will have a positive effect on the CoD tasks in the athlete. There are various muscle responses and mechanisms involved in controlling movement. There is a planned movement.

These findings show that the complex training program was helpful in improving agility performance. Linear speed and lower limb strength and power qualities are associated with agility performance (Little & Williams, 2005; Asadi et al., 2016). Therefore, Training to develop agility in the soccer must be a training that has similar movement mobility to that skill, thus it directly affects the force caused by the muscles action of hips, knees and ankle action. When muscle fibre works and responds quickly, it affects the effectiveness of movements agility.

The data in this study were consistent with Markovic and Mikulic (2010) that after a 6-week training program consisting of workouts with one or more CoD, professional football players increased their agility. The reaction force of the lower limbs, on the other hand, can be improved by training. While, Miller et al. (Miller et al., 2006) found that after six weeks of plyometric training, adult athletes performed much better on the Illinois test. In addition, Attene et al. (2015) re-

vealed that jump performance increased after 4 weeks of repeated sprint ability with one CoD in male basketball players. There are suggestions for the development of CoD training performed with a horizontal application of force enhances agility performance, whereas CoD training performed with a vertical application of force does not (Young & Farrow, 2006). It can be concluded that both ability to respond to a stimulus and ability to alter direction are important in agility. It is vital to exercise these physical aspects while taking into account the athlete's laterality (e.g., slower and quicker direction) in order to increase agility performance.

The results of the agility test, in terms of performance, are as follows: there were no significant changes in the agility in the current investigation at pre- and post-tests of CG ($p = 0.82$). Therefore, designing a training program in the form of complex training to have a variety of specific skills will affect the skill performance and individual abilities of each athlete. Coaches should have an understanding and systematic training plan and build a commitment to the athletes in the correct and safe cadence of movements that may cause injury while practicing. A longer training period, on the other hand, could reduce the agility during the agility test (Keiner et al., 2014). The cognitive determinants of agility are the perception-action coupling. The visual, auditory, or kinesthetic systems detected stimuli first, then the sensory information was processed by the central nervous system, and ultimately decision-making leads to an appropriate neuromuscular response (Sheppard et al., 2006). A limitation of this study is that the applied agility test has not yet been employed in correlational studies to see if there are any connections between agility test performance and important match-related key performance indicators in soccer that are related to overall soccer performance.

Conclusions

This study shows that the designation of a variety of training styles is defined, and the association of skills in complex training has a positive impact on the efficiency of mobility agility in football. Therefore, for further studies, to develop effective training styles for different sports, the trainer should apply the training style and test by applying dribbling techniques along with movement in the form of agility tests, which will reveal the ability to move while possession and other skills-related factors are more clearly available.

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Conflict of interest

The authors declared no potential conflicts of interest.

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ЕФЕКТИВНІСТЬ КОМПЛЕКСНОЇ ПРОГРАМИ ТРЕНУВАННЯ ДЛЯ РОЗВИТКУ СПРИТНОСТІ У ФУТБОЛІСТІВ-АМАТОРІВ ЧОЛОВІЧОЇ СТАТІ

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Авторський вклад: A – дизайн дослідження; B – збір даних; C – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 6 с., 4 табл., 39 джерел.

Базова проблематика. Для успішної гри у футбол здатність юних гравців швидко змінювати напрямок руху вважається важливою фізичною якістю.

Метою дослідження було вивчення ефективності тренування футболістів-аматорів чоловічої статі за комплексною програмою тренування для розвитку спритності.

Матеріали та методи. Учасниками були 60 футболістів-аматорів чоловічої статі (віком 18–22 роки), розподілені на дві групи та відібрані методом цільової випадкової вибірки. Тридцять спортсменів віком 19,7 ± 1,34, ІМТ 21,8 ± 1,75 виконували комплексну програму тренування (ГКТ) у комбінації зі спринтом, вправами на розвиток спритності або швидкості зміни напрямку руху, а також заняттями з пліометрики. Тоді як 30 учасників контрольної групи (КГ) віком 19,3 ± 1,31, ІМТ 21,2 ± 1,02 займалися за загальною програмою тренування з футболу. В обох групах кожне тренування тривало 120 хвилин, заняття по 30 хвилин, 3 рази на тиждень, загалом 6 тижнів. Тест на спритність «Вістря стріли» був передбачений графіком на момент початку дослідження, на 4-й тиждень і на 6-й тиждень. Було розраховано середнє та стандарте відхилення цих даних. Статистикою висновку був дисперсійний аналіз повторних вимірювань. У випадках, коли взаємодії факторів «група × час» були значущими ($p < 0,05$), за одержаними результатами було розраховано апостеріорний критерій Ньюмана-Кеулса.

Результати. Після завершення тренування показник спритності в ГКТ становив статистично значущу різницю, порівнюючи результати на момент початку дослідження та на 6-й тиждень ($p = 0,03$), а в міжгруповому порівнянні значних змін показника спритності не було. Таким чином, це показує, що комплексні програми тренувань можуть покращувати спритність футболістів-аматорів чоловічої статі.

Висновки. Цю комплексну програму тренування можна застосовувати до футболістів-аматорів чоловічої статі. Програма тренування має бути спеціальною та різноманітною. Вона може сприяти розвитку спритності футболістів, що відбивається на загальній результативності гри у футбол.

Ключові слова: комплексне тренування, спритність, футболісти-аматори чоловічої статі.

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