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Integrated Power Training Mode in Soccer: Merging Complex Training with Cluster Set

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Abstract

Power is one of the most important physical components to excel in modern soccer. Hence, finding the most efficient mode of power training is vital. This article aim is therefore, to propose an idea about a power training mode that might resulted with better power performance in soccer. Traditionally, resistance training and plyometrics will be the choice to be used by the trainers to improve power qualities. However, recent studies on power training had proven that complex training; a combination of resistance training and plyometrics, is a beneficial power training mode. In this article, discussion on power training modes is ultimately resumed by an unexplored research gap; cluster set (CS) application during a complex training. By utilizing the cluster set (CS) during a complex training, a better results of power training might occur.

Keywords: Complex Training, Cluster Set, Conditioning, Soccer, Power

Complex Training as a Power Training Mode in Soccer

According to Fédération Internationale de Football Association (Fédération Internationale de Football Association, 2016), power (strength-speed) and speed are the most important physical capacities and even decisive in modern soccer. The relationship between maximal strength and power has also been recognized as a key contributor to soccer performance (Manson, 2013). This relationship had been revealed by an earlier study findings on a strong correlation, between maximal strength in half squats with sprint performance and jumping height, among elite Norwegian club soccer players (Wisløff, Castagna, Helgerud, Jones, & Hoff, 2004).

Being mentioned as one of the most important factors in soccer, power performance can be developed via a lot of training form. Resistance, plyometrics (Thomas et al., 2009), combined strength and power training (Faude, Roth, Giovine, Zahner, & Donath, 2013) and the soccer match itself (Morgans, Di Michele, & Drust, 2018) have been accredited as a modes of power training.

Lately a hybrid method where resistance and plyometrics training are completed in one session; namely complex training, has become a norm in power training for all sports including soccer. This intervention has produced positive effects on vertical jump in team-sport athletes and concluded as a suitable option to include in the season planning (Freitas et al., 2017; Argus et al., 2012). In another study, de Villarreal et al. (2013) has proven that combining resistance and plyometrics training in a session has improved strength and speed; both are determinants of power, although it is questionable since volume for all training groups are not equal.

Chen, Lo, Wang, Yu, and Peng (2017) has not recommended complex training in a team setting because some athletes decreased their performance, while others showed improvement. However the statement is still due to further confirmation as this is the first study concerning on the issue and only 10 subjects involved, thus inadequate to be a strong generalization base. Complex training also has been hailed for its time saving nature (Tredrea, 2017). Even more, mobility and/or stability drills during the interphases interval of complex training, has been suggested as an option (Lim & Barley, 2016). It is important though to bear in mind that all those complex training advantages are dependent on the training status of the individuals, exercise selection and the recovery intervals (Scott, Ditroilo, & Marshall, 2017). These in fact has added to the rationales for soccer conditioning practitioners to manipulate the rest interval while controlling the training status and exercise selection factors.

Complex training has also been found superior than traditional training in power enhancement (Talpey, Young, & Saunders, 2016). Enhanced muscle explosiveness after being provoked by heavy resistance, is the logic behind the complex training idea. Resistance training with maximum or near maximum resistance may increase synchronization of motor unit recruitment; believed to provide less contact time and achieve greater maximum height, and ultimately magnifying the effect of the stretch-shortening cycle (SSC) during the subsequent plyometric phase (Ebben, et al., 2000). It has also been found that repeated exposure is needed to gain benefit from complex training (Comyns, Harrison, & Hennessy, 2010). Agreeing with all the above mentioned benefit whether in soccer or other sports as well, this paper is written with the main purpose to share and discuss the writer's opinion on how can we improve complex training to a further extent.

Cluster sets to optimize the training effects

In order to optimize the performance outcome of any training including the complex training, variables such as number of repetition, training load, type of exercise, number of set and rest period can be manipulated (Tufano et al., 2016; Bompa & Haff, 2009). Among those stated variables, rest period within a set is one of the most critical part to ensure that athletes can perform at the maximum level (Tufano et al., 2017). One method to utilize the rest period within a set is the cluster set (CS) configuration. CS training set is completed with IRR, meanwhile traditional set (TS) is performed in sequence without it (Tufano et al., 2016; Boullosa et al., 2013; Haff et al., 2003).

The IRR implementation within a CS is based on the understanding of the recovery – adaptation principles. Recovery is a process of regaining the lost or bouncing an athlete's performance back to where it was. Adaptation deals with the long-term alterations caused by a specific training program. Hence, it has been suggested to the coaches and physical trainers to use the recovery-adaptation term (Sands, Apostolopoulos, Kavanaugh, & Stone, 2016). Via the cluster set (CS) recovery-adaptation

can actually being promoted not only after the training, but also during the training itself. CS can be done by altering the structure of individual sets in the training (Tufano, Brown, et al., 2016).

Cluster Set on Resistance Training

The first indication of a cluster set (CS) usage in a resistance training has been recognized in a documents on American football off season training (Roll & Omer, 1987). Then it started to receive attention among the practitioners. Haff et al. (2003) have examined 3 types of clean pull structures including the CS for two of them and has concluded that CS structure is a better choice for the resistance training.

By using the same relative intensity across the various set structures for the duration of the training program, it is possible that implementing CS structures using the same load as TS may have resulted in a decrease in perceived effort during the CS training sessions, as seen in previous studies (Hardee et al., 2012; Iglesias-Soler et al., 2016; Mayo, Iglesias-Soler, & Del-Olmo, 2014). Theoretically, increased resistance load use might be possible, allowed by the decreased perceived effort thus resulting higher stimulus for the physiological adaptations that underpin the development of muscular strength (Tufano et al., 2016). Yet, the author of this study did not use the advantage. Since no data were reported on the rate of perceived effort (RPE), and training loads were constant in this study (Hardee et al., 2012), further research is warranted to determine if CS can allow for an increased training load while producing a similar RPE as in TS (Tufano et al., 2016).

Another findings has suggested that CS protocols may not be ideal compared to TS when both groups use the same training loads, volume and total rest time (Hardee et al., 2012; Iglesias-Soler et al., 2016; Mayo et al., 2014). It is possible if the CS group experienced less fatigue, subjects may have been able to tolerate greater training loads, leading to greater strength increase when compared with TS. Meanwhile, Oliver et al., (2013) investigated the effect of CS and TS during a hypertrophy oriented training program. Both group trained with equal total rest time. After 12 weeks, both groups improved bench press, back squat and vertical jump power output, but contradicted with the previous findings, the CS group experienced greater increases in bench press and vertical jump power output compared with TS. Indeed, these contradictions in literature provide gaps in the discipline, and eventually might prompt future researchers to propose a study with an advantage to support any parties, regardless of the findings to be made.

Iglesias-Soler et al. (2016) investigated the effects of a TS and CS protocol over a 5 week period using unilateral knee extensions. Result had shown that TS produced slower mean propulsive velocities (0.48 vs 0.54m/s) and greater RPE (8.3 vs 6.6) than CS, respectively after five weeks of training. However subjects in both the CS and TS group experienced an equal increase in isometric strength, dynamic 1RM, mean propulsive power, and total work. These evidence indicate that in university students of both genders, unilateral knee extension protocol after 5 weeks of CS intervention felt easier but resulted in similar increases in strength and power output compared with TS within the equal training period.

To date, some scholars have reported that strength gains in CS set structure are lower than TS (Hansen, Cronin, Pickering, & Newton, 2011; Lawton et al., 2004) with only one study providing evidence that CS structures produce superior strength gains (Oliver et al., 2013) and one study showing similar increases in strength for both CS and TS set structure (Iglesias-Soler et al., 2016). At

first glance, CS structures seems to have a limited application to develop strength. However, it is important to determine why TS resulted in greater strength development compared with CS training in these instances. Within studies that investigate CS, there are two common characteristic, the equalization of the total rest time for both set structure and the lack of training load variation and systematic progression between the CS and TS set structures (Hansen et al., 2011; Lawton et al., 2004). The equalization of training loads between groups is a sound specific method but with the same intensities it is likely that the TS group will experience greater acute fatigue, a greater compensatory response, and possibly greater increase in strength. Therefore, reforming the training strategy where the rest is not going to be equal between CS and TS, and the load will be adjusted to a percentage of a new 100% 1RM, after 3 weeks of training.

The implementation of different CS configurations has also been found to be effective in reducing the mechanical (velocity loss) and metabolic (blood lactate concentration) measures of fatigue compared to TS while using a 10RM load (García-Ramos et al., 2017). Furthermore, different types of CS protocols can result in pro-anabolic physiological responses to resistance training, and shorter but more frequent sets may allow kinetics and kinematics to remain more constant (Tufano, et al., 2017). Referring to these evidences, the writers had come out with a postulate that the plyometrics phase of the complex training will benefit from the increased preparedness in the resistance phase.

Through the ability to alleviate fatigue, CS has also been proven to acutely decrease cardiovascular stress (Tufano et al., 2016) beside maintaining velocity and power (Tufano et al., 2016) during resistance training. An IRR as short as 6 seconds has been reported to be sufficient enough to induce partial recovery, and could therefore improve muscle power output (García-Ramos et al., 2016). However Tufano et al., (2017) has resolved that the ability to maintain the velocity and power is not due to the CS application, instead more to the type of CS structure. Arguments on this matter once again has warranted a further investigations to clarify the unsettled issue.

Cluster set on plyometrics training

Another form of power training is the plyometrics training. Effort by the previous researchers to gain extra benefit this training has also included the cluster set (CS) implementation. In a study done by Aminaei et al., (2017), the results indicated both CS and TS plyometric training program seems to improve physical fitness elements at the same levels.

Asadi and Ramirez-Campillo (2016) have earlier investigated the effects of TS and CS plyometric training in college aged students for 6 weeks. After completing the training, increased countermovement jump height, standing long jump distance, and decreased t test and 20 and 40m sprint times were present for both TS and CS group. Although there were no significant interactions between groups, the effect size were greater in the CS group for countermovement jump height, long jump distance, and t test time, whereas the effect size were greater for the TS group for 20 and 40 m sprint times. Therefore, this useful evidence is one of the reason for the writers to support the implementation of CS and plyometrics as a phase of a complex training. In another study result has demonstrated that CS, allow for a greater maintenance of power, take off velocity, and jump height compared to a TS when performing repeated body weight plyometric squat jumps (Moreno, Brown, Coburn, & Judelson, 2014). Lack of training data precludes definitive recommendations; however,

based on this data, coaches should have their athletes perform 2-5 jumps with 27-45 seconds rest, respectively. To date, extensive literature search has only found these three CS studies involved plyometrics. This incompleteness has indeed providing a gap to be fulfilled.

Cluster set on complex training

After an extensive search on previous literature no evidence has been found regarding to the usage of a complete cluster set (CS) in a complex training. In a study conducted by Boullosa et al., (2013), protocol of countermovement jump height was measured before and 1,3,6,9 and 12 minutes after squats with 5RM load for both TS and CS group had been used. The result had shown that vertical jump post activation potential occurred after 1 minute using the partial CS compared with 9 minutes using TS. However, in this study, the IRR has been applied only during the resistance phase, not in both resistance and plyometrics phases.

Three years later, Treeraj, Kamutsri, Lawsirirat, and Intiraporn, (2016) have also added the IRR of the resistance phase for one of the training groups, while trying to determine the most relevant form of complex training that can provide similar to a soccer game's stimulation. It has been resulted with the partial CS group has been identified to be the most relevant group. Earlier occurrence of post activation potential after the resistance phase with IRR in these stated researches means earlier preparedness to perform subsequent plyometrics drills. Theoretically the effect may be enhanced if the IRR is to be included during plyometrics phase of a complex training. This premise abides to the fitness-fatigue theory, thus resulted to suggestions of a long term positive accumulated increase in performance, if the training is continued for a longer term. Then only the supercompensation theory will make sense. Accordingly, we suggested for future study that the IRR can implemented on both of the resistance and plyometrics phases of a complex training.

Conclusion

CS has been tried to several training methods, including the resistance training , plyometrics training and resistance phase of a complex training. However it has not been tried on both of the complex training phases. Moreover, scant research on CS application using complex training to develop power for soccer players led to incompleteness in literature. Fulfilling this significant gap will contribute to the knowledge expanding and be beneficial for the soccer practitioners as well as in other sports. Without adequate studies on this matter, using of CS in a complex training to improve power related abilities among soccer practitioners is just an intuitive guess work, not a scientifically proven method as it should be. Accordingly, given all the limitations in the literature, attempt to investigate the effects of CS compared to the TS within a complex training regime to improve power related components in soccer is clearly warranted.

Figures and tables

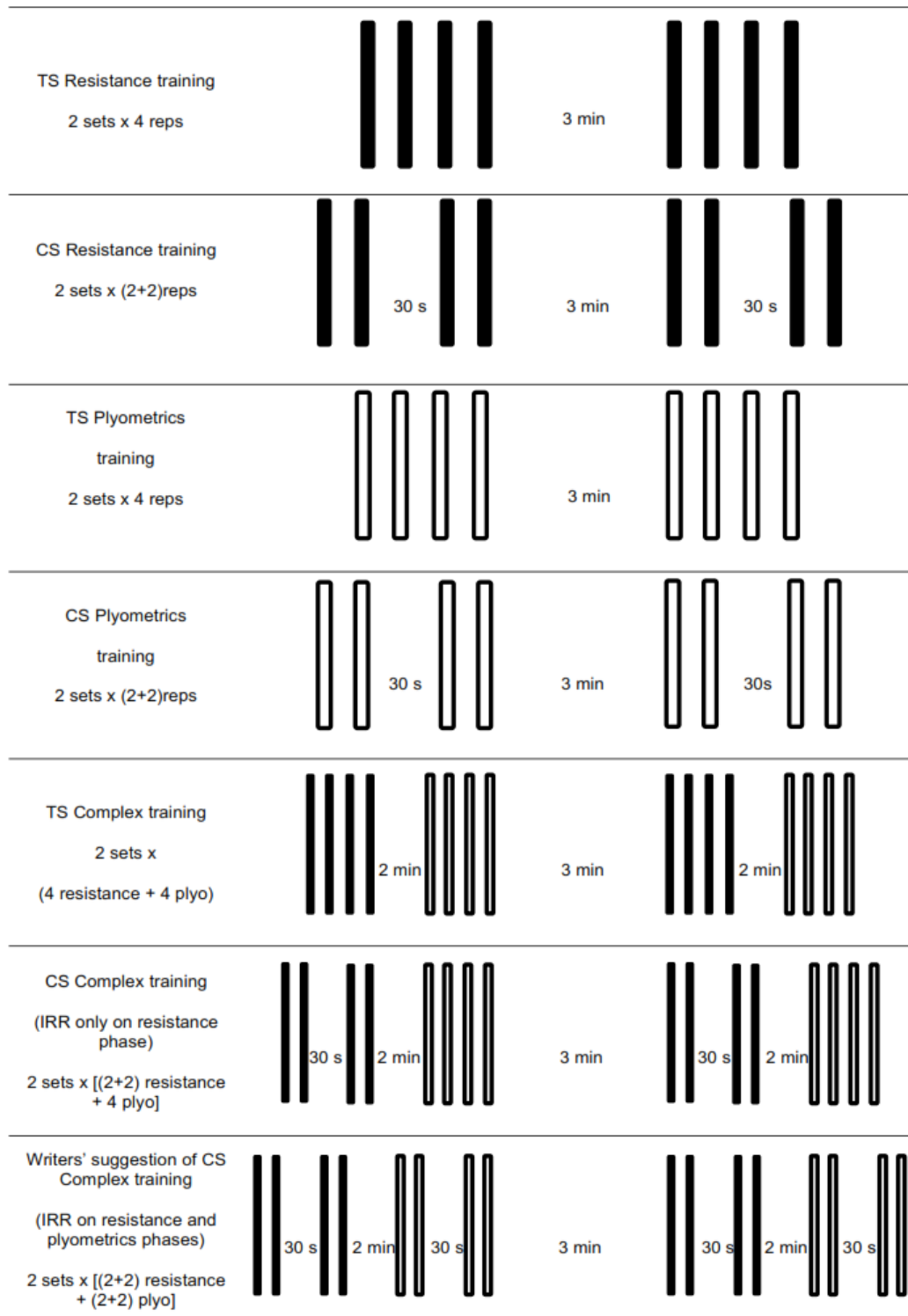


Figure 1. Schematic differences between CS and TS set structures (Tufano et al., 2017)

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