

The Effect of Physical Condition Training Forms In Soccer Team Performance For The Entire Season



Physical Education

KEYWORDS : competition performance, general physical condition, specific physical condition, training loads, precompetitive period, competitive season

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ABSTRACT

One of the main directions of coaching is to investigate, evaluate and determine correlations between competitive performance and training loads. The aim of this study was to group training loads during the training process of a professional football team first division and classification of information for some key players throughout the season. This recording was made in order to study the effect of training on the development of athletic form during the annual planning. As a kind of burden was defined as general physical condition and specific physical condition. Data charges total quantity and total intensity of training were recorded and calculated using a formula, while the effect of training on the performance was evaluated by the "game performance index" (SWI). The data recorded by the same investigator using a specific protocol in training during 10 weeks precompetitive period and 36 weeks competitive season. The winning performance was evaluated by a special process observation official match (league, cup, and friendly) and involved the recording technical-tactical elements through video analysis by two observers. To determine the performance was taken into account the parameters, the two observers had a high degree of agreement. The value of these parameters determined by qualified coaches. Multivariate analysis of variance for dependent samples was used to analyze the data in order to assess whether the training time was dedicated to any kind of training was statistically significant between period of high performance competition and those with poor competition performance. For the types of training, significant differences were found between the different period. In particular, we found that increasing the time of general fitness during the season accompanied with reduced competition performance while reducing the time of general fitness go together with high performance. The same profile presented in the special fitness growth was accompanied with low competition performance while reducing caused an increase in performance during the season.

INTRODUCTION

The managing of the physical and physiological condition of elite soccer players relies on complete knowledge regarding the demands of performance. Time-motion analysis is a useful method to compute the physical demands of individual players during match-play (Rienzi et al., 2000). A main advantage of the non-intrusive method is the making of data concerning durations, frequencies and percentages of various modes of motion and, if 1field measurements are known, distances covered by the players may also be calculated (Reilly, 1997). In turn, this provides crude measurements of energy expenditure through determining exercise-to-rest ratios and intensities of play as well as direct match involvement (e.g. dribbling).

There is a lot of studies involving the investigation of a variety of players, positions, levels and competitions have produced a wide range of time-motion analysis reports (e.g. Di Salvo and Pigozzi, 1998; Reilly and Thomas, 1976; Rienzi et al., 2000). Also, significant differences in age, stature, body mass and body mass index have been recently identified between elite players of different positions suggesting that players of particular size and shape may be suitable for the demands of the various playing positions (Bloomfield et al., 2005). In this respect, positional role appears to have an influence on total energy expenditure in a match, suggesting different physical, physiological and bioenergetic requirements are experienced by players of different positions (Di Salvo and Pigozzi, 1998; Reilly and Thomas, 1976; Reilly, 1997).

Soccer has been described as stochastic, acyclical and intermittent with uniqueness through its variability and irregularity (Nicholas et al., 2000; Wragg et al., 2000). It has been estimated that approximately 80-90% of performance is spent in low to

moderate intensity activity whereas the remaining 10-20% are high intensity activities (Bangsbo, 1994a, 1997; O'Donoghue, 1998; Reilly and Thomas, 1976; Rienzi et al., 2000). However, the repeated random bouts of high intensity anaerobic and aerobic activity producing elevations in blood lactate concentration are mainly responsible for fatigue in match-play (Reilly, 1997). In this respect, the frequent alterations of activities, numerous accelerations and decelerations, changes of direction, unorthodox movement patterns and the execution of various technical skills significantly contribute to energy expenditure (Bangsbo, 1997; Reilly, 1997).

It is estimated that between 1000 and 1500 discrete movement changes occur within each match at a rate of every 5-6s, having a pause of 3s every 2min (Reilly, 2003; Strudwick et al., 2002). To report this, studies have investigated a range of movement activities such as walking, jogging, cruising, sprinting, backwards and lateral movements (e.g. Bangsbo, 1997; Mohr et al., 2003; Reilly and Thomas, 1976). The most recently cited values are in top-class level Danish soccer with observations made in standing 19.5%, walking 41.8%, jogging 16.7%, running 16.8%, sprinting 1.4%, and other 3.7% (Mohr et al., 2003). Previously in FA Premier League soccer, Drust et al. (2000) discovered a mean number of 19 sprints within match-play which occurred every 4-5min and Strudwick and Reilly (2002) observed an average change in activity every 3.5s, a bout of high-intensity activity every 60s, and a maximal effort every 4 minutes. Midfield players appear to engage in low to moderate intensity activity more frequently, and for longer durations (Bangsbo, 1994a) and also being stationary for significantly less time than the other outfield players (O'Donoghue, 1998) corresponding to the further distances covered than defenders and strikers. However, strikers have been found to perform the most maximal sprints and for longer durations, followed by midfielders and defenders

(O'Donoghue, 1998). Rienzi et al. (2000) also identified that defenders perform more backward movement than strikers with high intensity backwards and lateral movement requiring an elevated energy expenditure of 20-40% in comparison to forward running (Reilly, 2003; Williford et al., 1998).

Finally, different soccer related activities such as slide tackling, powerful heading, and long passing provide an extra physiological stress to the player (Bangsbo, 1994b) with different playing positions having to perform specific activities for different proportions of match time. For example, strikers and centre backs are significantly more engaged in situations where they have to jump or are required to head the ball whereas defenders tend to make more tackles (Reilly, 2003; Bangsbo, 1994a). Furthermore, an added exertional cost from dribbling a soccer ball has been reported at 5.2 kJ•min⁻¹ (Reilly, 2003).

METHODS

Experimental design

The present study examined the effect of training contents over the complex competitive performance. For this reason, the data was collected from the daily training process through methods involving the recording and evaluation. Data concerning the performance was recorded weekly by means of systematic observation (Video analysis) of the game. By analyzing the impact of training contents on the performance takes the effort to identify the weekly training periods during which there was high (or low) competitive performance and therefore would qualify that contributed positively (or negatively) on team performance.

Data collection - analysis

Data collection took place in the time of an annual training process of a Greek professional football team of the First National Division. This period consists of precompetitive period of 10 weeks (05/July - 11/September) and the entire competitive season (12/September - 22/May). In this study followed the next ways of recording data: training data grouping in relation to the training protocol and systematic evaluation of the players' performance using video analysis. The training protocol applied according to literature (Fergert et al., 1998), and the training data grouping was made, using the ranking system of coaching structure for team sports (Hohmann et al., 1994). The effect of training on the performance was evaluated by the "game performance index" (SWI). Finally to control the degree of agreement of the observers used the index Kappa (Kappa measure of agreement). The value of these parameters determined by qualified coaches.

Procedure

General physical condition (Gpc)

Recorded the time spent on general physical condition which lays the foundation for a further performance increase, using non specific exercise and non specific modulation of the training load.

General physical condition	
1	General aerobic training
2	General speed training
3	General strength training
4	General speed resistance training
5	General strength training
6	General strength resistance training

Table 1: General physical condition training content

Specific physical condition (Spc)

Recorded the time spent on specific physical condition, which develops the skills of physical condition which are essential for achieving high competition performance, and for this reason apply specific exercises and formed a special charge.

Specific physical condition	
1	Specific aerobic training
2	Specific speed training
3	Specific explosive strength training
4	Specific speed resistance training
5	Specific strength training
6	Specific strength resistance training

Table 2: Specific physical condition training content

Statistical analysis

For the analysis of results used the multivariate analysis of variance for dependent samples. Before application, was tested for homogeneity of variance and the regular price for all variables. Normality of distribution of data and gender variations, tested to detect any differences that affect the survey results. According to the results of the sample on the physiological parameters showed a normal distribution and fluctuations were equal. For the analysis of the results was set as the significance level of $p = 0.05$. Specifically, all variables were tested by the Kolmogorov-Smirnov test and showed regular distribution with values greater than the level of significance $p > 0.05$. Also the differences in sample tested through the Bartlett-Box test.

RESULTS

Team performance results

Analysis of variance for dependent samples applied to examine the variables whether the average performance of the team was different among the eight periods of the pre-match day and season. It was found that among the eight period no statistically significant differences in the average performance of the group $F(7,70) = 7.522, p < 0.01$

Period	Weeks	Mean	Std
1	1-6	175.54	40.22
2	7-10	118.36	34.45
3	11-17	126	67.11
4	18-21	192.72	73.54
5	22-25	102.09	56.05
6	26-39	197.36	65.44
7	40-43	132.90	39.05
8	44-46	214.81	53.31

Table 3: Mean and Std of the average performance of the team among the eight periods

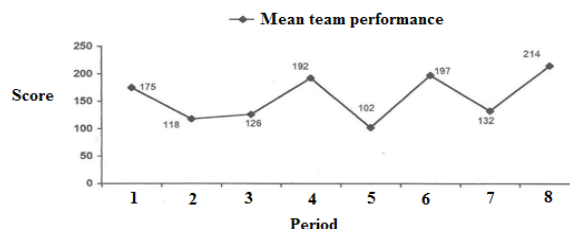


Fig 1: Differentiation of the average performance of the team among the eight periods

Multiple comparison test (LSD) conducted to examine between which periods were no statistically significant differences in the average performance of the group.

	1 Period	2 Period	3 Period	4 Period	5 Period	6 Period	7 Period	8 Period
1 Period	—	*	—	—	*	—	*	—
2 Period	*	—	—	*	—	*	—	*
3 Period	—	—	—	*	—	*	—	*
4 Period	—	*	*	—	*	—	*	—
5 Period	*	—	—	*	—	*	—	*
6 Period	—	*	*	—	*	—	*	—
7 Period	*	—	—	*	—	*	—	*
8 Period	—	*	*	—	*	—	*	—

* $\rho < .05$ ** $\rho < .01$ *** $\rho < .001$

Table 4: Multiple comparison test (LSD) of the average performance of the team among the eight periods

Training forms results.

General physical condition

An analysis of variance for dependent samples applied to determine if the training time of general physical condition was different among the eight periods of the pre-competitive and competitive season. It was found that among the eight periods is statistically significant variation of time training of general physical condition $F(7.70)=304.11$, $\rho < .001$

Period	Weeks	Mean	Std	Performance
1	1-6	238.54	6.28	175
2	7-10	87.36	16.78	118
3	11-17	73.18	5.43	126
4	18-21	54.72	12.79	192
5	22-25	118.27	20.09	102
6	26-39	109.27	11.17	197
7	40-43	75.72	12.49	132
8	44-46	33.63	5.46	214

Table 5: Mean and Std of the training duration (min) of the General physical condition, among the eight periods.

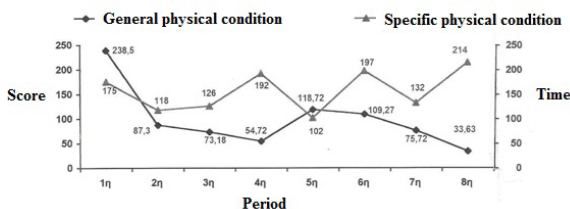


Fig 2: Differentiation of the training duration (min) of the General physical condition compared to the average performance of the team among the eight periods.

Multiple comparison test (LSD) applied to examine between which periods were not statistically significant differences in the training duration (min) of the General physical condition, among the eight periods

	1 Period	2 Period	3 Period	4 Period	5 Period	6 Period	7 Period	8 Period
1 Period	-	*	*	*	*	*	*	*
2 Period	*	-	*	*	*	*	-	*
3 Period	*	*	-	*	*	*	-	*
4 Period	*	*	*	-	*	*	*	*
5 Period	*	*	*	*	-	*	*	*
6 Period	*	*	*	*	-	-	*	*
7 Period	*	-	-	*	*	*	-	*
8 Period	*	*	*	*	*	*	*	-

* $\rho < .05$ ** $\rho < .01$ *** $\rho < .001$

Table 6: Multiple comparison test (LSD) of the training duration (min) of the General physical condition, among the eight periods

Specific physical condition

An analysis of variance for dependent samples applied to test if time training of specific physical condition was different among the eight periods of the pre-match day and season. It was found that among the eight periods are statistically significant differences in time training of specific physical condition $F(7.70)=34.89$, $\rho < .001$

Period	Weeks	Mean	Std	Performance
1	1-6	12.72	0.64	175
2	7-10	16.36	5.85	118
3	11-17	10.81	2.96	126
4	18-21	5.18	2.08	192
5	22-25	10.45	2.84	102
6	26-39	5.00	1.26	197
7	40-43	2.72	1.10	132
8	44-46	2.00	2.49	214

Table 7: Mean and std of the training duration (min) of the Specific physical condition among the eight periods

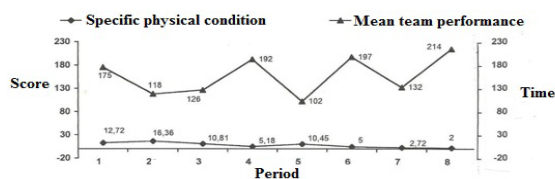


Fig 3: Differentiation of the training duration (min) of the Specific physical condition compared to the average performance of the team among the eight periods.

Multiple comparison test (LSD) conducted to examine between which periods were statistically significant differences in training time.

	1 Period	2 Period	3 Period	4 Period	5 Period	6 Period	7 Period	8 Period
1 Period	—	—	*	ic	*	*	*	*
2 Period	-	-	*	*	*	*	*	*
3 Period	*	*	-	*	-	*	*	*
4 Period	*	*	*	-	*	-	*	*
5 Period	••	••	-	*	-	*	*	*
6 Period	*	*	*	-	*	-	*	*
7 Period	*	*	*	*	*	*	-	-
8 Period	*	*	*	*	*	*	-	-

*p05 *χ p<.01 ***p001

Table 8: Multiple comparison test (LSD) of the training duration (min) of the Specific physical condition, among the eight periods

DISCUSSION

General physical condition

Training duration (min) for general physical condition is different in each period. Concrete is much greater the time devoted to general physical condition to 1 period compared to other period. According to Dokas and Michaelides (1988) in the first period of the precompetitive season seeks to improve the kinetic properties of the player mainly endurance and strength as well as improve individual regular behavior and behavior in groups 2-3 players. The purpose of the first period of 'precompetitive season is to create the player sports bases or a general background on which to build the whole competitive performance (Cannavacciuolo, 1993; Faraglia, 2003).

As observed in the present study we find that in the first period (phase of 6 weeks) general fitness to hold great time and accompanied by a good team competitive performance. This fact is explained by the direct effect of training over the body (either during exercise or withdrawal period), and for functional, metabolic and morphological changes (Cannavacciuolo, 1993).

According to Leisen (1983a) to become biological adaptations to footballers National A required 5-7 weeks for aerobic capacity, strength for 3-4 weeks, for 3-4 weeks and speed for speed endurance 2 weeks, while according to Kellis et al., (1997) operational adjustments related to resistance (Vo2max) take practice two to three weeks depending time required for specific operational adjustments (specific resistance), while for neuromuscular adaptations and particular explosive strength for intramuscular and coordinating the time required ranges from 3 to 5 weeks.

The second period of preparation which follows the first period aims to improve specific physical skills such as speed, explosive strength and specific strength (Kellis et al., 1997). At this stage the general physical condition decreases and increases the time of the Special physical condition. In the present investigation in the second period (7 to 10 weeks) observed that the decrease in overall fitness at this stage is accompanied with a drop in performance.

During the season our goal is to keep the form of the players for the greatest possible time. During this time the 70-80% in the time devoted to training specific exercises tau football and only 20-30% devoted to the general physical condition of players (Liapis, 1985). In the present investigation the 3rd stage (the 11th to 17th week) the reduction of general physical condition accompanied with a decrease of team competitive performance. In the fourth period (18th-21th week) observed that a statistically significant reduction in the training time of general physical condition (compared with all other period) to be statistically

significant with a high performance racing. In Period 5 (for the next 5 weeks ie from 22 to 25 weeks) we find that an increase in general physical condition accompanied with decline in performance and then to period 6 (26th to 39th week) observed that reducing the time of general physical condition to be accompanied for a long time with a very high competitive performance of the team. Then to period 7 and period 8 there is the same trend as in period 2, 3 and 4. Ie in period 7 (40th to 43rd week) reduce overall physical condition accompanied with low winning performance while then (period 8) a statistically significant decrease in time of general physical condition than the other period accompanied with high team competitive achievement.

Summarizing the above we conclude that: 1) Increase general physical condition during precompetitive season accompanied with good team competitive performance for 6 weeks. 2) Reducing the time of general physical condition during the season accompanied with high competitive performance. The Hohmann (1986) in the research demonstrated the existence of a positive correlation between the militant group performance group the water polo and general physical condition preceding 6 weeks. The Ferger (1998) in women's professional football team found that the increase general physical condition during the season negatively influenced by delay of one week on the team competitive performance. But word of a small number of data (analyzed a total of only 18 weeks of the year planning) could not record and analyze such changes in research.

Specific physical condition

The timing of the training of qualified physical condition varied significantly during different period of team performance. More specifically and in period 1 (1st to week 6) and Period 2 (7th – 10th week) did not change significantly the time of the special physical state between these two period only observe that in stage 1 appears good competitive Group performance while in Period 2 noticeably reduced team performance. During the season it is observed that in Period 3 (11 to 17 weeks) and in Period 5 (22 to 25 weeks) where the time of the specific physical condition is statistically significantly greater than the other period of the season, to prevail one drop team performance, while in period 4 (18 to 21 weeks) and period 6 (26th to 39th week) where there is a decrease in time of special physical condition to be accompanied with high performance racing.

Exactly the same profile as the specific physical condition in Research Ferger (1998) where in women's professional football team found that increasing the time of the specific physical condition during the season (from the 9th to 15th week) to be negatively correlated with team performance while reducing the time of specific physical condition (the 16th and the 18th week) was associated with a dramatic increase in team performance. The Hohmann (1986) in his research involving players ro1o water group reported a positive correlation between performance and the special physical condition for a period of 4 weeks in accordance therefore with what has been reported, we can assume that the specific physical situation temporarily Positive influences go to shape the players, and then by using a drastic reduction of the specific physical condition, we can help to achieve high performance. Therefore, the correct ratio of training time between general physical condition and special physical condition in the different period the annual planning can help to improve the form of the players of a football team.

CONCLUSION

This study showed a positive correlation between the time of the general physical condition and team performance during periods precompetitive, and also showed a positive correlation between the time of the special physical condition and team performance during periods precompetitive

In addition showed a negative correlation between the time of the general physical condition and team performance during the season and finally showed a negative correlation between the time of the special physical condition and team during the season.

REFERENCE

1. Bangsbo, J. (1994a) Energy demands in competitive soccer. *Journal of Sports Sciences* 12, S5-S12. | 2. Bangsbo, J. (1994b) The physiology of soccer with special reference to intense intermittent exercise. *Acta Physiologica Scandinavica*. 151(619), 1-156. | 3. Bangsbo, J. (1997) The physiology of intermittent activity in football. In: *Science and Football III*. Eds: Reilly, T., Bangsbo, J. and Hughes, M. London, E & FN Spon. 43-53. | 4. Bloomfield, J., Polman, R.C.J., Butterly, R. and O'Donoghue, P.G. (2005) An analysis of quality and body composition of four European soccer leagues. *Journal of Sports Medicine and Physical Physical condition* 45, 58-67. | 5. Cannavacciollo F.F. (1993) Preparazione fisica del calciatore second I piu moderni orientament. *Societa Stampa Sportiva*, Roma, 52, 75. | 6. Di Salvo, V. and Pigozzi, F. (1998). Physical training of football players based on their positional roles in the team. *Journal of Sports Medicine and Physical Physical condition* 38, 294-297. | 7. Dokas & Michailidis (1988) Training and tactics of football edition b, Bousnali, Thessaloniki, 76. | 8. Faraglia P. (2003) Preparazione atletica: Una stagione complete esercizio per esercizio. Edizioni Nuova Prhomos, Citta Dicastello, 11-12 | 9. Ferger, K. (1998). Trainingseffekte im Fußball. Eine trainingswissenschaftliche Analyse individueller Leistungsentwicklungen und Anpassungsreaktionen auf Trainingsbelastungen. Hamburg: Czwalina, 56, 66-88, 55 | 10. Hohmann, A. (1985). Zur Struktur der komplexen Sportspielleistung. Trainingswissenschaftliche Leistungsdiagnostik im Wasserball. Ahrensburg: Czwalina, 169-177, 112-121. | 11. Kellis S (1997) Programming of the team training preparation. Salto edition, Thessaloniki, 18, 206. | 12. Liesen H (1983) Training konditioneller Fähigkeiten in der Vorbereitungsperiode. Fußballtraining H 3:11-14 | 13. Liapis D (1985) football training, theory and practice A Olympiou vimatou, Katerini, 65. | 14. Mohr, M., Krusturup, P. and Bangsbo, J. (2003) Match performance of high-standard soccer players with special reference to development of fatigue. *Journal of Sports Sciences* 21, 519-528. | 15. Nicholas, C.W., Nuttal, F.E. and Williams, C. (2000) The Loughborough Intermittent Shuttle Test: A field test that simulates the activity pattern of soccer. *Journal of Sports Sciences* 18, 97-104. | 16. O'Donoghue, P.G. (1998) Time-motion analysis of work-rate in elite soccer. *World Congress of Notational Analysis of Sport IV*, Porto, Portugal. Porto, University of Porto Press. 65-71. | 17. Reilly, T. (1997) Energetics of high-intensity exercise (soccer) with particular reference to fatigue. *Journal of Sports Sciences* 15, 257-263. | 18. Reilly, T. (2003) Motion analysis and physiological demands. In: *Science and Soccer*. Eds: Williams, A.M. and Reilly, T. 2nd Edition. London, E & FN Spon. 59-72. | 19. Reilly, T. and Thomas, V. (1976) A motion analysis of work-rate in different positional roles in professional football match-play. *Journal of Human Movement Studies* 2, 87-89. | 20. Rienzi, E., Drust, B., Reilly, T., Carter, J.E.L. and Martin, A. (2000) Investigation of anthropometric and work-rate profiles of elite South American international soccer players. *Journal of Sports Medicine and Physical Physical condition* 40, 162-169. | 21. Strudwick, A., Reilly, T. and Doran, D. (2002) Anthropometric and physical condition profiles of elite players in two football codes. *Journal of Sports Medicine and Physical Physical condition* 42, 239-242. | 22. Williford, H., Scharif, N., Olsen, M., Gauger, S., Duey, W.J. and Blessing, D.L. (1998) Cardiovascular and metabolic costs of forward, backward, and lateral motion. *Medicine and Science in Sport and Exercise* 30, 1419-1423. | 23. Wragg, C.B., Maxwell, N.S. and Doust, J.H. (2000) Evaluation of the reliability and validity of a soccer-specific field test of repeated sprint ability. *European Journal of Applied Physiology* 83, 77-83. |