Actions with the Ball that Determine the Effectiveness of Play in Women’s Football

by

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Various actions with the ball performed by players during football matches encourage continuous research on game observation to be carried out. It is of special significance in providing information about players and their contribution to the effort of the whole team. Both quantitative and qualitative records enable transformation of the information obtained into data supporting training tasks. In the opinion of the authors, the determination of a winning team is affected to the greatest extent by qualitative factors in the form of coefficients of accuracy and efficiency of particular actions with the ball. A hypothesis was advanced in the study that in women’s football there are ball actions whose quality of execution affects winning a match, and that there exists a specific ranking of their significance. Analyses were conducted for nearly 18,000 actions performed with the ball by 130 players, competitors in the European Women’s Football Championship in 2005. Statistical tests applied in the study enabled differences between teams of winners and losers to be defined, whereas the analysis of a discriminant function indicated which qualitative factors were the most significant and had the greatest impact on winning a match. A specific hierarchy of the significance of those activities was also elaborated in the study. The most significant activities that affected the victory were: 1x1 play in defense, 1x1 play in offense, accuracy of passes and effective execution of dead-ball situations.

Key words: Women’s Football, Championship, analyses

Introduction

Football is amongst the most popular sports disciplines recently chosen by women. A decisive moment in development for football was its adoption to the program of Olympics Games that took place in Atlanta in 1996. However, worth noticing is the fact that, taking Iran as an example, that women’s football meet in many countries considerable difficulties. Its inclusion in the program of the Olympic Games in Atlanta in 1996 should be regarded as the turning point in the development of women’s football, although it is worth mentioning that, as exemplified in Iran, it still faces great difficulties (Fozooni, 2008). The participation of women in football has encouraged researchers to investigate the behavior of their organisms as affected by playing the game. Studies were undertaken to explore such issues linked with the specificity of a woman’s organism as the menstruation cycle (Bonekat et al., 1987), body adiposity (Davis and Brewer, 1993), energy expenditure (Krustrup et al., 2008; Miles, 1993), maximum oxygen uptake (Davis and Brewer, 1992; Krustrup et al., 2005; Rhodes and Mosher, 1992), morphological components of the body (McKay and Shephard, 1988; Wells and Reilly, 2002), and recently also an extremely significant problem, namely injuries (Faude et al., 2005; Junge et al., 2006; Tscholl et al., 2007; Junge et al. 2007).

In order to study specific actions performed during the football game, the method of observation is very useful because defining the players’ actions de-

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livers information about the contribution of each of them to collective effort of team, as a whole (Barros et al., 2007, Di Salvo et al., 2007). Through the observation, the structure and functional characteristic of football players form the world elite is described (Reilly et al., 2000, Helgerud et al., 2001). Research has also been carried out on the specificity of women’s play in terms of their actions with the ball (Bergier, 1997; Bergier and Buraczewski, 2005, Bergier, Soroka and Buraczewski, 2008; Konstadimidou and Tsigilis, 2005; Tumilty and Derby, 1992) and distance covered during a match (Hewitt et al., 2007; Mohr et al., 2007; Scott and Drust, 2007).

The range of issues linked with the specificity of women’s football elucidated so far encourages further research into more accurate recognition of their contribution to the game. Special significance seems to be the issue of identifying those actions with the ball that determine winning a match to the greatest extent. Their identification may contribute to further rationalization of training aimed at achieving success in women’s football.

Particularly interesting research issues refer to the most important premises for trainers, i.e. factors that determine victory in a match. Most authors analyzed shots at goal presenting sample data exemplified in the best national teams. The research on the symmetry of shots at goal in the 1978 World Championship (Starosta, 1988) showed that right leg was dominant among footballers – 69.8%. The opposite tendency, however, was characteristic of the world champions – Argentinean footballers who showed the preference for shots with their left leg – 56.2%. The issue of shots was continued by Wrzos (1991) who analyzed the1990 World Championship and pointed out that the winner (German national team) had the highest index of accuracy of passes - 60.7%, and the index of effectiveness came to 12.8%. The research on the1988 European Championship and 1990 Junior European Under- 16 Championship (Bergier, 1998) demonstrated that winning teams had statistically much higher indices in dribbling.

The analysis of the1994 World Championship (Loy, 1995) indicated that champion and vice champion teams had the best indices in 1x1 play in defense: the index of Brazilian team was 69.5%, and of Italian team – 67.7%. These results were confirmed by Bergier (1998) who stated that in the play of seniors the action with the ball that determines winning a match is the effectiveness of 1x1 play. Its indices in top teams come to 70%.

The aim of the study was to identify actions with the ball, and their qualitative dimensions in particular, which have the greatest impact on winning a match, and the resultant differences and dependences.

In terms of the research problem, the type of research was stipulated as empirical, which enables formulating conclusions that will be practically applied in women’s football training in order to improve the effectiveness of play.

The identification of factors that may determine success does not seem easy. However, such attempts should be undertaken even in the case of the immeasurable of a sports discipline such as football. This will promote the intended improvement of the training process.

**Research hypothesis:**

1. In football game there are certain qualitative factors whose performance conditions the victory. There is also their specific rank.
2. The players of victorious teams undertake 1x1 play more often than the players of losing teams and they perform it more effectively.

**Material and Methods**

The material for the study comprised observations of all 130 women players who participated in the VI European Senior Women’s Football Championship held in England in 2005.

Observations were made for 15 (all) matches, and the total observation time reached 1380 minutes, in which analyses were carried out for nearly 18,000 actions with the ball performed during the game.

The research was empirical in character, and in its scope the most useful element turned out to be the method of observation, understood as intended, planned and systematic perception as well as gathering and analysis of facts, events and phenomena.

From the applicatory perspective, the observation was indirect in character owing to the use of DVD records. The observation was conducted while playing back the football matches recorded previously on DVDs from the TV broadcast. Analyses were carried out for: the accuracy of passes, effectiveness of shots, effectiveness of one-on-one play in general but also in offensive and defensive actions, and for the effectiveness of offensive actions that were classified as fast attack, positional attack and attack after a dead-ball situation, with a division into teams of winners and losers in each match.
A statistical analysis of the study results was done using the Statistica software. Use was made of the Student t-test for independent variables, and of the Mann-Whitney U test for a lack of normal distribution of the variables. The tests were applied to determine differences in the qualitative factors occurring between teams of the groups analyzed. Actions with the ball with the greatest significance for winning were identified by means of the analysis of a discriminant function.

**Results**

An argument for the advisability of the study undertaken was the fact that the authors have focused on the basic actions performed with the ball in order to avoid the multiplicity of information that could hinder the proper conclusion. An additional advantage was that analyses were conducted as a whole (i.e. for all matches), for all players that participated in the Championship, and for all basic actions performed with the ball. The level of significance was adopted at $p<0.05$ for analyses of differences in the qualitative factors between teams of winners and losers.

All the analyzed actions were observed to be performed with a greater frequency by the winning teams, which may indicate a considerably higher game activity in that group of teams (Table 1).

A comparative analysis of the qualitative activities of technical elements allowed the selection of those whose effectiveness of performance, in statistical terms, significantly differentiated the teams of the winners and the losers. Such elements included: accuracy of passes, accuracy of shots, total effectiveness of 1x1 play in defense, and effectiveness of the form of an offensive action (i.e. execution of dead-ball situations) (Table 2 and 3).

Based on the analysis of a discriminant function, a search was made amongst the earlier selected variables for those which contribute to group discrimination, namely factors that affect significantly the winning of a match.

### Table 1

| Analyzed activity | Winning teams | Coefficient of effectiveness* | Losing teams | Coefficient of effectiveness |
|-------------------|---------------|-------------------------------|-------------|------------------------------|
| Accuracy of passes| 5435          | 76.1                          | 5091        | 67.4                         |
| Total effectiveness of 1x1 play in offense | 2351 | 56.9 | 2351 | 43.5 |
| Effectiveness of 1x1 play in defense | 1175 | 49.5 | 1175 | 35.7 |
| Effectiveness of shots | 34 | 20.6 | 12 | 9.2 |
| Effectiveness of fast attack | 15 | 17.2 | 6 | 8.8 |
| Effectiveness of positional attack | 9 | 27.2 | 2 | 16.7 |
| Effectiveness of executing dead-ball | 14 | 27.7 | 4 | 6.8 |

*Determined by accurate and effective actions

### Table 2

| Technical actions | Winning teams | Losing teams | Student's t-test |
|-------------------|---------------|-------------|------------------|
|                   | Mean value of effectiveness coefficients | Standard Deviation | Mean value of effectiveness coefficients | Standard Deviation | Value of Student's t-test | Level of significance p |
| Effectiveness of 1x1 play in defense | 64.8 | 6.9 | 51.1 | 5.7 | 5.258 | 0.001* |
| Effectiveness of 1x1 play in offense | 48.8 | 5.7 | 35.2 | 6.9 | 5.258 | 0.001* |
| Effectiveness of shots | 20.6 | 6.8 | 9.2 | 10.1 | 3.234 | 0.003* |

*Determined by accurate and effective actions
In this way, variables were selected that formed a “model” to be used in further analyses: effectiveness of 1x1 play in defense, effectiveness of 1x1 play in attack, accuracy of passes and effectiveness of the execution of dead-ball situations. The value of the general statistics of the “model” in the Wilks lambda test reached – 0.091, at F – 35.748. The lowest value of partial Wilks lambda was determined for the variable describing the effectiveness of 1x1 play in defense and the variable describing the effectiveness of 1x1 play in offense. Both variables had high F values of elimination. The variable describing the accuracy of passes also appeared to show significant statistical differentiation. Despite a lack of significant differences in the variable describing the effectiveness of executing dead-ball situations, it was also included in the formed “model” of a discriminant function. The significance of those variables is additionally indicated by the values of explained variables presented as 1 minus R square (1-R2) a given variable at the inclusion of all other variables to the current “model” (Table 4).

Another step of the study involved carrying out a canonical analysis that formulated a discriminant function. Owing to two groups of variables (i.e.: teams of winners and teams of losers), one discriminant function was established following a rule that the number of discriminant functions cannot exceed the number of groups minus one. A low value of the Wilks lambda coefficient indicates a high discriminating power of that root. Nearly total canonical correlation that occurred between the groups analyzed and the discriminant function, as well as a high value of the hi-square test, confirmed the significance and the power of the discriminant function formulated (Table 5).

The formulated function explained 100% of the total discriminant power. Crude results of coefficients after standardization explained and determined the contribution of the variables in the canonical function. The study showed that the greatest contribution to the formulated function was made by discriminant variables describing the effectiveness of 1x1 play in both defense and offense. In turn, the

| Differences between the winning and losing teams analyzed by means of the Mann-Whitney U test |
|-----------------------------------------------|
| Technical activities | Sum of ranks of the winners | Sum of ranks of the losers | Value of U Mann-Whitney test | Accurate p |
| Accuracy of passes | 208.0 | 92.0 | 14.0 | 0.001* |
| Total effectiveness of 1x1 play | 222.0 | 78.0 | 22.0 | 0.001* |
| Effectiveness of fast attack | 181.0 | 119.0 | 41.0 | 0.078 |
| Effectiveness of positional attack | 120.0 | 70.0 | 34.0 | 0.442 |
| Effectiveness of executing dead-ball | 187.5 | 112.5 | 34.5 | 0.028* |

*determined by accurate and effective actions

| Results of the selection of discriminant variables constituting the “model” of variables to be used for further analyses |
|---------------------------------------------------------------|
| “Model” variables | Wilks lambda | Partial Wilks lambda | F of elimination (2.30) | Level of significance p | Tolerance value | 1-Tolerance value (R-square) |
| Effectiveness of 1x1 play in defense | 0.264 | 0.346 | 33.98 | 0.001 | 0.542 | 0.457 |
| Effectiveness of 1x1 in offense | 0.198 | 0.461 | 21.03 | 0.001 | 0.595 | 0.404 |
| Accuracy of passes | 0.123 | 0.739 | 6.350 | 0.021 | 0.794 | 0.205 |
| Effectiveness of executing dead-ball | 0.108 | 0.841 | 3.398 | 0.081 | 0.892 | 0.107 |

| Chi – square test of subsequent roots (discrimination functions) |
|---------------------------------------------------------------|
| Eliminated root | Own value | Canonical R | Wilks lambda | Chi-square | p level |
| 0 | 9.930 | 0.953 | 0.091 | 46.634 | 0.001 |
discriminant variables describing the accuracy of passes and execution of dead-ball situations had a considerably smaller contribution to the function (Table 6).

The significance of the effectiveness of 1x1 play in defense, the effectiveness of 1x1 play in offense, the accuracy of passes and the effectiveness of executing dead-ball situations was also indicated by the values of intra-group correlations between the primary variables and the discriminant function (Table 7).

Results of standardized discrimination coefficients and those of structural coefficients enabled the establishment of a rank of significance of those actions with the ball, during a game, which most greatly influenced the effectiveness of play during the European Women’s Football Championship in 2005. The most significant actions resulted from effective 1x1 play in defense and offense, accurate passes and effective execution of dead-ball situations.

**Discussion and Conclusions**

In research carried out on the effectiveness of men’s play in top football competitions an attempt was made to characterize the effectiveness of play actions with the ball performed by winning teams. The research concerned shots mainly (Starosta and Bergier 1992; Luhtanen, Korhonen and Ilkki 1997). Based on this research, sample characteristics of shot effectiveness were presented on the example of the best teams. Over the years, greater attention has been paid to the search of actions with the ball that differentiate winning and losing teams by analyzing various game elements. Other studies indicated that in order to win, the effectiveness of 1x1 play is indispensable and particularly 1x1 play in defense (Loy 1995; Luhtanen, Hayrinen and Vantinen 1999).

The role of defense actions seems to have been noticed first by Brazilian coaches whose team despite of playing impressively, stopped achieving successes in World Championships in 1980. As practitioners and theoreticians stated then, one of the main reasons for the weaker play of Brazilian team was their worse preparation to play in defense. The improvement of players’ defense skills let the team in 1999 become the world’s best footballers again. High effectiveness of Brazilian team in 1x1 play in defense in the 1994 World Championship was indicated by Loy (1994) in his research. The significance of 1x1 play in defense was confirmed by the analyses of the 1998 World Championship carried out by Luhtanen, Hayrinen and Vantinen (1999).

The significance of the ability of 1x1 play results from the fact that it constitutes the complex of consecutive actions. In 1x1 play in offence these actions are as follows: the ability to dribble the ball, feints with the ball, body play; in 1x1 play in defense these actions are: overtaking an opponent, reaction or the lack of reaction to the feint movements, body play, the ability to perform sliding tackle. Moreover, it should be remembered that 1x1 duels are performed at high speed and quite often in direct closeness to

| Discrimination variable                  | Function 1 | Crude | Standardized |
|----------------------------------------|------------|-------|--------------|
| Constant                               | 27.708     | 0.181 | 1.151        |
| Effectiveness of 1x1 play in defense   | 0.159      | 0.123 | 0.998        |
| Effectiveness of 1x1 play in offense   | 0.020      | 0.001 | 0.442        |
| Accuracy of passes                     | 9.930      | 9.930 | 9.930        |
| Effectiveness of executing dead-ball   | 100%       | 100%  | 100%         |
| situations                             |            |       |              |

| Discrimination variable                  | Root |
|----------------------------------------|------|
| Effectiveness of 1x1 play in defense    | 0.300|
| Effectiveness of 1x1 play in offense    | 0.360|
| Accuracy of passes                      | 0.292|
| Effectiveness of executing dead-ball    | 0.173|
| situations                             |      |
the goal, thus good psychological preparation of the player is indispensable to carry out such action.

So far, the search for the effectiveness of play has concerned the research on male teams. The research carried out by the authors of the paper concerned the play of women in the 2005 European Championship and confirmed the importance of the effectiveness of 1x1 play, especially in defense, as a factor that determines the victory. The average number of 1x1 duels played by women in the tournament analyzed by the authors was comparable with the research on the footballers of the Champion League carried out by Gerisch and Reichelt (1993) as well as by Bauer (1996) who made observations of the 1996 European Men’s Championship. Diversity in frequency and effectiveness of 1x1 duels depending on the position on the field was found among women as well as men (Loy 1998).

The importance of the effective passes which was demonstrated in the research on the women’s play confirmed previous analyses of male teams (Dufour 1993, Grand et al. 1998). There exists suggested by Yamanaka, Hughes and Lott (1993) as well as by Milijkovic, Jerovic and Simenc (2002) diversity in the number of passes which are conditioned by the competence of individual teams as well as by their level of tactical-technical advancement. In addition, the study enabled the identification of ball actions whose quality of performance determined victory in matches and the determining of a specific ranking of their significance. The most significant actions that influenced victory were: effective 1x1 play in defense and offense, a higher index of the accuracy of passes and effective execution of dead-ball situations.

The data obtained in the study have important implications for the training process of women football players. They indicate that effective 1x1 play in both defensive and offensive actions. Worth remembering, however, is the fact that such skills are among the most difficult to master, for they test a player’s capabilities in direct contact with an opponent without the possibility of any support from a team partner. Therefore, practical activities undertaken in the training process should include the development of that capability.

Significant importance in this respect is also ascribed to the quality (accuracy) of passes – the basic action of play during the game, and to the effectiveness of executing dead-ball situations. Mastering both those skills by women football players determines their achievement of success to the greatest extent.

The lack of similar studies on the factors that determine success in women’s football does not allow to deepen the comparative analysis in terms of conducted research. Such situation encourages researchers to continue study which will enable to determine in a more precise way tactical-technical actions that condition the effectiveness in women’s play.

References

Barros RML, Minuta MS, Menezes RP, Figueroa PJ, Moura FA, Cunha SA, Ando R, Leite NJ. Analysis of the distances covered by First Division Brazilian soccer players obtained with an automatic tracking method. J Sport Sci Med, 2007; 6: 233-242.

Bauer G. Erkenntnisse der EM 1996 – Rückschlusse für Training und Spiel. Fussballtraining, 1996; 11/12: 57-61.

Berger J. The structure of the game in the final women’s football match during the Olympic Games - Atlanta’96 (In:) Woman and Sport: The Thirteenth International Congress of the International Association of Physical Education and Sport for Girls and Women, University School of Physical Education. (Ed.) Z. Wyznalczykiewicz - Kopp. AWFiS, Gdansk, 1997; 180-186.

Berger J. Searching for Determinants of Playing Effectiveness in Soccer. Physical Education an Sport. Academy of Physical Education in Warsaw. 1998.

Berger J, Buraczewski T. Symmetry of shots as an indication of coordinating abilities at the U-19 Women’s Football World Cup (In:) Coordination of motor abilities in scientific research. (Ed.) J. Sadowski. Faculty of Physical Education. Biala Podlaska, 2005; 150-156.

Berger J, Soroka A, Buraczewski T. Analysis of actions ending in shots at goal in the Women’s European Football Championship (England 2005). (In:) Science and Football VI. The Proceedings of the Sixth World Congress on Science and Football (Ed.) T. Reilly and F. Korkusuz, Taylor & Francis Group, London and New York, 2008; 152-154.
Bonekat HW, Dombowy ML, Staats BA. Progesterone - induced changes in exercise performance and ventilatory response. J Sport Sci, 1987; 12: 534-538.

Davis JA, and Brewer J. Physiological characteristics of an international female soccer squad. J Sport Sci, 1992; 10: 142-143.

Davis JA, Brewer J. Applied physiology of female soccer players. Sports Med., 1993; 16: 180 -189.

Di Salvo V, Baron R, Tschank H, Calderon Montero FJ, Bachl N, Pigozzi F. Performance characteristics according to playing position in elite soccer. Int J Sport Med, 2007; 228: 222-227.

Dufor W. Computer - assisted scouting in soccer. (In:) Science and Football II. (Ed.) T. Reilly, J. Clarys and A. Stribbe. EFN SPON, London, 1993; 160 - 168.

Faude O, Junge A, Kindermann W, Dvorak J. Injuries in female soccer players: A prospective study in the German National. Am J Sport Med, 2005; 33: 1694-1700.

Fozooni B. Iranian women and football. Cult Stud, 2008; 22: 114-133.

Gerisch G, Reichelt M. Erhebungstechniken und praktische Anwendung der computer - und videogestützten Spielaufnahme im Fussball, in Weber K., Kollath E., Schmidt G.J. (Ed.) Video und Computer im Leistungssport der Sportspiele. Sport und Buch Strauss, Cologne, 1993; 145 – 161.

Grant A, Reilly T, Williams M, Borrie A. Analysis of the goals scored in the 1998 World Cup. Insight, 1998; 2: 17-20.

Helgerud J, Engen LC, Wisløff U, Hof J. Aerobic endurance training improves soccer performance. Med Sci Sport Exer, 2001; 33: 1925-1931.

Hewitt A, Withers R, Lyons K. Match analyses of Australian international women soccer players using an athlete tracking device. (In:) Science and Football VI. The Proceedings of the Sixth World Congress on Science and Football (Ed.) T. Reilly and F. Korkusuz, Taylor& Francis Group, London and New York, 2007; 224 - 228.

Yamana K, Hughes M, Lott M. An analysis of playing patterns in the 1990 World Cup for association football. (Ir) Science and Football II (Ed.) T. Reilly, J. Clarys, A. Stribbe, EFN SPON, London, 1993; 206-214.

Junge A, Langevoort G, Pipe A, Peytavin A, Fooy W, Mountjoy M, Beltrami G, Terrell R, Holzgraebe M, Charles R, Dvorak J. Injuries in Team Sport Tournaments During the 2004 Olympic Games. A. J Sports Med, 2006; 33: 565-576.

Junge A, Dvorak J. Injuries in female football players in top-level international tournaments. Brit J Sport Med, 2007; 41: 3-7.

Konstandinidou X, Tsigilis N. Offensive playing profiles of football teams from the 1999 Women's World Finals. Int J Per An Sport International Journal of Performance Analysis in Sport, 2005; 5/1: 61 -71.

Krustrup P, Mohr M, Ellingsgaard H, Bangsbo J. Physical demands during an elite female soccer game: importance of training status. Med Sci Sport Exer, 2005; 37: 1242- 1248.

Krustrup P, Andersen H, Mohr M, Breidgaard M, Jensen A, Zebis M, Kirkendal D, Bangsbo J. Match activities and fatigue development of elite female soccer players at different levels of competition. (In:) Science and Football VI. The Proceedings of the Sixth World Congress on Science and Football (Ed.) T. Reilly and F. Korkusuz, Taylor& Francis Group, London and New York, 2008; 205-211.

Loy R. Wohin steuert der Fußball? Fussballtraining, 1994; 10: 1 –24.

Loy R. Systematische Spielbeobachtung im Fussball. Leistungssport, 1995; 3: 15-20.

Loy R. Was fordert das Spiel von einem Mittelfeldspieler? Fussballtraining, 1998; 9: 4-9.

Luhtanen P, Korhonen V, Ilikki A. A new notational analysis system with special reference to the comparison of Basle and its opponents in the World Cup 1994. (In:) Science and Football III, (Ed.) T. Reilly, J. Bangsbo, M. Hughes, EFN SPON, London, 1997; 229-232.
Luhtanen P, Häyrinen M, Väntinen T. A computer-aided team analysis of the World Cup France `98 in soccer. Wychowanie Fizyczne i Sport (suppl.), 1999; 172-176.

McKay L, Shephard RJ. Standardized Tests for Canadian Soccer Players. Ottawa, ON: Canadian Soccer Association, 1988.

Miles A, MacLaren D, Reilly T, Yamanaka K. An analysis of physiological strain in four-a-side women’s soccer. (In:) Science and Football U (Ed.) T. Reilly, J. Clarys and A. Stibbe, E & F N Spon, London, 1993.

Milijkovic Z, Jerovic S, Simenc Z. Evaluation of a model of monitoring individual and team performance during attack in a competitive soccer game. Kinesiology, 2002; 1: 73-85.

Mohr M, Krustup P, Kirkendall D, Bangsbo J. Differences in physical match performance at two levels in female soccer. J Sport Sci Med. 2007; Suppl. 10: 108-109.

Reilly T, Bangsbo J, Franks A. Anthropometric and physiological predispositions for elite soccer. J Sport Sci, 2003; 18: 669-683.

Rhodes EC, Mosher RE. Aerobic and anaerobic characteristics of elite female university soccer players. J Sports Sci, 1992; 10: 143-144.

Scott D, Drust B. Work-rate analysis of elite female soccer players during match-play. J Sport Sci Med. 2007; Suppl. 10: 107-108.

Starosta W. Symmetry and asymmetry in shooting demonstrated by elite soccer players. (In:) Science and Football, I, (Ed.) T. Reilly London, New York, 1988; 346-355.

Starosta W, Bergier J. Pattern of a sport technique in football based on the symmetry of movement. (In:) Science and Football, II, (Ed.) T. Reilly London, Spon, 1992; 265-271.

Tscholl P, 0’Riordan D, Fuller CW, Dvorak J, Gutzwiller F, Junge A. Causation of injuries in female football players in top-level tournaments. Brit J Sport Med, 2007; 41: 8-14.

Tumilty DMcA, Darby S. Physiological characteristics of Australian female soccer players. J Sport Sci, 1992; 10: 145.

Wells C, Reilly T. Influence of playing position on fitness and performance measures in female soccer players. (In:) Science und Soccer IV. (Ed.) W. Spinks, T. Reilly, A. Murphy, Taylor & Francis Group London and New York, 2002; 369-373.

Wrzos J. Developmental Tendencies in Offensive Play Teaches in Worlds Top Teams. Soccer – The International Training Guide. 1991.

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