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## **DIVERSIFICATION OF THE EFFECTIVENESS OF PERFORMANCE OF SELECTED TECHNICAL ELEMENTS IN FEMALE AND MALE FOOTBALL GAME**

**Key words:** football, comparative analysis of play, women, men

### **Introduction**

Throughout the 20th century as well as in the new 21st century numerous tournaments were and are organized for high stakes, such as world championships, Olympic Games or the European Cup in men's football. This fact has allowed making a good recognition of the male play. The analyses contain motor activity profile, body response to training load, as well as the factors influencing the effectiveness of technical activities in the game. Changes are being investigated and the trends regarding both individual and group activity in the foreign (Carey 2001, Hewitt et al. 2008, Jin 2002, Krustup et al. 2008, Konstadinidou, Tsigilis 2005, Kunh 2005, Loy 1994, Reilly 1994) and in the Polish research (Bergier 2000, Panfil 1989, Szwarc 2004, Śledziwski 1989, Wrzos 2006).

The female football can be described as expanding worldwide, including Europe. This young sports discipline requires recognition and continuous observation. With growing boldness the scientific research in our country deals with the subject of female football analysis (Bergier 2005, Bergier, Buraczewski 2005, Bergier, Soroka 2005 a, b, Bergier et al. 2008, Soroka 2007, Soroka, Bergier 2006).

In contemporary sport, the results of objective research make the ground for effective training work and are the proper way to success. Recognition of the values from the viewpoint of match analyses gives much support for the training practice. It helps trainers and competitors in their better recognition and understanding, which eventually allows rational assignment of the training duties. Therefore, the criteria have been continuously searched for concerning the assessment of individual and group activities and the methods of their record and game analysis (Naglak 1996).

## Study goal

Taking into account the more and more frequent research concerning female football focusing on the match activities analysis with regard to the quantitative structure and effectiveness, the need has emerged to compare the female and the male play. It seems that the comparative analysis of the basic technical elements, like passes and shots, should allow determination of the differences and uniqueness of male and female play. Eventually, it should bring new values in the training process, as the present sports training theory has been worked out for men and to a large extent may not be employed in the female sports training process (Socha 2005).

The goal of this work is to recognize the effectiveness of passes and their technical elements in association with direction, distance and performance mode, and of shots with the technique and mode of their performance.

The following research hypotheses have been formulated:

1. In female and male play there are differences in the structure of performing the basic technical elements, like passes and shots.
2. Differences occur (to the male teams' advantage) in the effectiveness of passes and shots performance.

## Material and methods

The material for the study comprised the observation of 15 (all) matches played in the 6th European Championship in female football, England 2005, and 27 matches played during the world championship in male football, Korea and Japan 2002. In the statistical analyses only the winning matches were included: 12 played by women and 19 by man. Passes of ball were analysed with regard to direction, distance and mode. Their qualitative and quantitative parameters were determined as well. In shots analysis, the same parameters were considered as in case of passes, and additionally the shooting technique.

As a study method the systematic external observation was applied, categorised through a standardized research tool in the form of own observation forms. The observation was done while playing back the football matches recorded previously on DVD records from the TV broadcast.

A statistical analysis of the study results was done using the *Statistica* software. Applied was the assessment of differences between the mean values of the coefficients of passes and shots accuracy and of their technical elements.

Normal distribution and *variance* homogeneity of the correlated variables were tested. With the conditions met, the Student's T-test was conducted for the independent groups. In the case the parametric conditions could not be met, the non-parametric Mann-Whitney U-test was applied, as relevant for two independent samples.

## Study results

### Characteristics of passes diversification in female and male play

Ball passing is the main tool in football playing. It helps construct actions which should allow a successful shot at goal.

The characteristics of passes (Tab. 1) shows that on the average the women passed the ball more often than the men but the latter performed with higher accuracy. The evidence for making more mistakes by women while passing the ball is the statistically significant variation in pass accuracy at  $p < 0.001$  to the male teams' advantage (Tab. 6).

Tab. 1. Overall characteristics of passes.

Effectiveness of passes		Women	Men
1	Number of passes in total	6140	20318
2	Mean per match in total (quantity)	409	376
3	Number of accurate passes	4388	16074
4	Mean per match accurate passes (quantity)	292	298
5	Accuracy coefficient	71.5%	79.1%

Tab. 2. Characteristics of passes diversification with regard to direction.

Direction	Women		Men	
	Per cent share (%)	Accuracy coefficient (%)	Per cent share (%)	Accuracy coefficient (%)
Perpendicular	51.3	66.3	40.9	74.0
Oblique	21.4	66.8	31.5	88.8
Transverse	27.3	82.6	27.6	86.9

Analysis of the ball passing results with regard to direction allows concluding that for both groups only small differences can be found, concerning the transverse passes (women 27.3%, men 27.6%) (Tab. 2). The same conclusion regards the accuracy, making no difference for women and men (Tab. 5).

The difference was found regarding perpendicular passes executed more often by the female teams – 51.3% than by the male teams – 40.9%, and regarding the oblique passes, more frequent in male play – 31.5% than in

female games – 21.4%. Statistically significant differences were also found with regard to the pass accuracy, both perpendicular and oblique. In both cases, the statistical significance equaled  $p < 0.001$  with a higher performance accuracy of the male teams (tab. 5 and 6).

**Tab. 3.** Characteristics of passes diversification with regard to distance.

Distance	Women		Men	
	Per cent share (%)	Accuracy coefficient (%)	Per cent share (%)	Accuracy coefficient (%)
Short – to 10 m	19.4	76.4	46.5	77.7
Medium – from 10 to 25 m	57.6	74.0	40.7	70.2
Long – above 25 m	23.0	52.7	12.8	70.2

Short-distance passes were performed more often by men – 46.5% than by women – 19.4%. Their accuracy was 77.7% and it was very close to that of women – 76.4%. The female teams more often passed the ball over a medium or long distance: 57.6% and 23.0%, respectively.

Women were more accurate at performing oblique passes, which was shown by the statistical significance of  $p < 0.05$ . Men executed with more precision the passes over long distances, exceeding 25 m; the statistical significance was  $p < 0.001$  (Tab. 6).

The female teams applied passes without ball reception more often than the male teams, 54.7% and 41.4%, respectively. However, men more frequently passed the ball after reception – 33.1%, especially after dribble – 22.5%. Respectively, the female teams executed the passes: after reception – 28.9% and after dribble – 15.8% (Tab. 4).

In all modes of play men were considerably more accurate. The significance level for passes without reception and after the ball reception was  $p < 0.001$  while in the case of passes after dribble the level was  $p < 0.01$  (Tab. 5).

**Tab. 4.** Characteristics of the diversification of passes with regard to the mode of play.

Mode of play	Women		Men	
	Per cent share (%)	Accuracy coefficient (%)	Per cent share (%)	Accuracy coefficient (%)
Without ball reception	54.7	63.8	41.4	73.7
After ball reception	28.9	78.2	33.1	84.0
After dribble	15.8	74.5	22.5	81.5

**Tab. 5.** Diversification of the mean values of the accuracy coefficients regarding technical elements of female and male passes (Mann-Whitney U-test).

Technical elements of passes	Rank sum of male teams	Rank sum of female teams	Mann-Whitney U-test value	Precise <i>p</i>
Direction – perpendicular passes	1848.0	498.0	33.0	0.001***
Direction – transverse passes	1181.0	1165.0	440.0	0.108
Technique – without ball reception	1700.0	646.0	181.0	0.001***
Technique – after reception	1649.0	697.0	232.0	0.001***
Technique – after dribble	1547.0	799.0	334.4	0.003**

\*\* refers to the level of significance  $p < 0.01$ , \*\*\* refers to the level of significance  $p < 0.001$

**Tab. 6.** Diversification of the mean values of the accuracy coefficients regarding technical elements of female and male passes (Student's T-test).

Technical elements of passes	Male teams		Female teams		Student's T-test	
	Mean value of the accuracy coefficient	Standard deviation value	Mean value of the accuracy coefficient	Standard deviation value	<i>t</i> – Student's value	Significance level <i>p</i>
Accuracy of passes in total	79.1	4.4	71.5	6.4	6.144	0.001***
Direction – oblique passes	88.8	9.4	66.8	8.5	9.905	0.001***
Distance – short passes	77.5	6.5	76.4	7.3	0.694	0.489
Distance – medium passes	70.2	7.9	74.0	5.9	-2.163	0.034*
Distance – long passes	70.2	7.9	52.7	12.4	6.439	0.001**

\* refers to the level of significance  $p < 0.05$ , \*\* refers to the level of significance  $p < 0.01$ , \*\*\* refers to the level of significance  $p < 0.001$

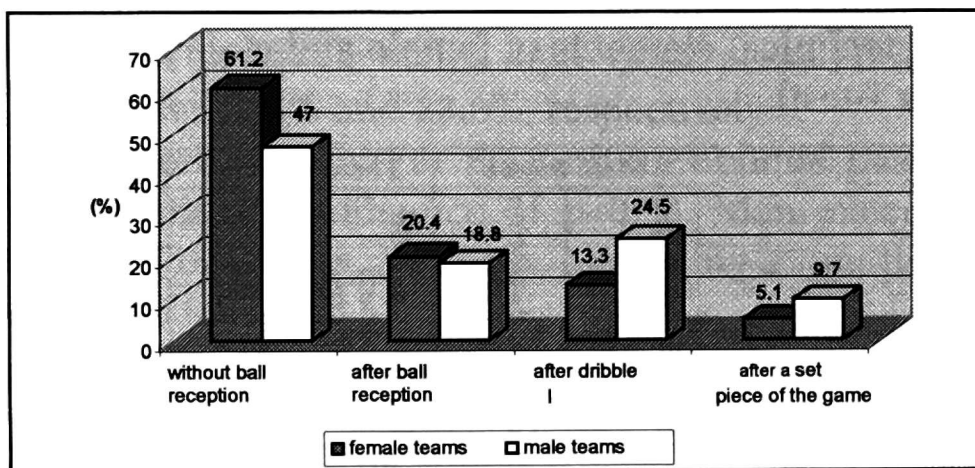
### Characteristics of the shooting technique of the female and male teams

In the structure of shots the female teams performed 11.8 shots on the average per match while the male teams 11.4. The differences to the women's advantage regarded the effectiveness which was 14.2% for women and 9.6% for men. The differences were also revealed regarding the accuracy of shots with the same pattern of dominance: women – 49.3%, men 44.9% (Tab. 7).

**Tab. 7.** Overall characteristics of shots.

Effectiveness of shots	Women	Men
Number of shots in total	353	617
Number of accurate shots	174	277
Number of effective shots	50	59
Accuracy coefficient%	49.3	44.9
Effectiveness coefficient%	14.2	9.6
Shots per match on average (quantity)	11.8	11.4

The evidence for a faster play with the ball of the female teams is the more frequent shooting without the ball reception – 61.2% with only 47.0% for men. However, the male players executed shots more frequently after dribble – 24.5%, compared to 13.3% for the female players. Moreover, men shot nearly two times more often after a set piece of the game – 9.7% while women only 5.1% (Fig. 1, Tab. 8).

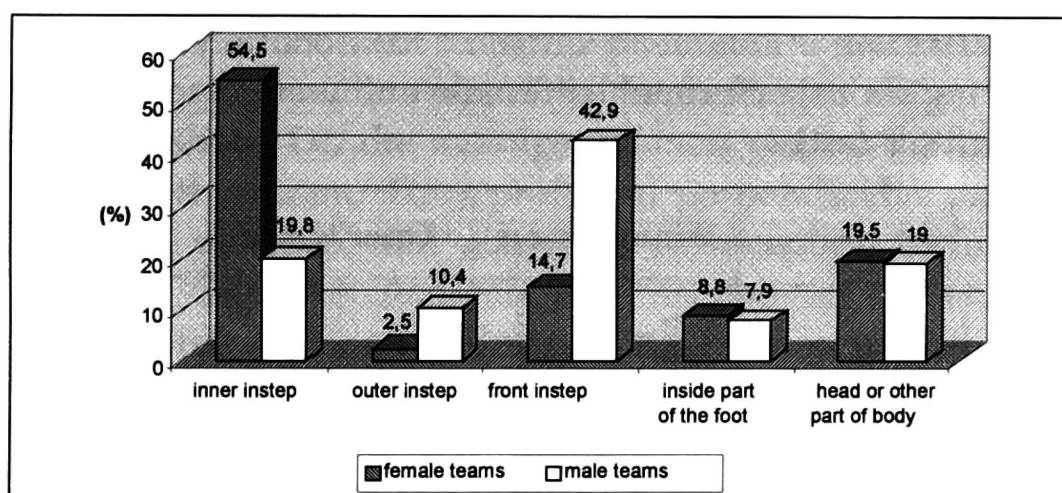


**Fig. 1.** Diversification of the structure of shooting at goal modes by the female and male teams.

The effectiveness of shots for most performance ways had higher efficiency coefficients in case of women (without ball reception – 17.1%, after reception 8.3% and after a set piece of the game – 22.2%) than of men (without ball reception – 12.4%, after reception 6.9%, after a set piece of the game – 10.2%). Minimally higher was the effectiveness of shots performed by men after dribble – 7.3%, women – 6.0%. Despite the higher effectiveness coefficients for the female shots, the differences were statistically insignificant (Tab. 8).

**Tab. 8.** Characteristics of the diversification of the female and male teams shots, depending on the performance mode.

Qualitative and quantitative structure of a shot		Mode of shooting			
		Without ball reception	After ball reception	After dribble	After a set piece of the game
Women	Number of shots	216	72	47	18
	Share in the shots structure (%)	61.2	20.4	13.3	5.1
	Number of effective shots	37	6	3	4
	Share in the effective shots structure	74.0	12.0	6.0	8.0
	Effectiveness coefficient (%)	17.1	8.3	6.4	22.2
Men	Number of shots	290	116	151	66
	Share in the shots structure (%)	47.0	18.8	24.5	9.7
	Number of effective shots	36	8	9	6.0
	Share in the effective shots structure	61.0	13.5	15.5	6.0
	Effectiveness coefficient (%)	12.4	6.9	7.3	10.0



**Fig. 2.** Diversification of the structure of shooting technique in female and male teams.

In the structure of the shooting technique observable are the considerable differences particularly regarding the shots executed with inner instep (women 54.5%, men 19.8%) and with front instep (women 14.7%, men 42.9%). The shots executed with outer instep were more frequent in male play – 10.4% than in female – 2.5%. As for the shots executed with inside of the foot or with head and other body parts no significant differences were found between the sexes (fig. 2 and tab. 9).

**Tab. 9.** Characteristics of the diversification of shots performed by female and male teams, depending on the execution technique.

Qualitative and quantitative structures of shots		Shooting technique				
		Inner instep	Outer instep	Front instep	Inside of the foot	Head and other body parts
Women	Number of shots	192	9	52	31	69
	Share in the shots structure (%)	54.5	2.5	14.7	8.8	19.5
	Number of effective shots	19	4	3	13	11
	Share in the effective shots structure	38.0	8.0	6.0	26.0	22.0
	Effectiveness coefficient (%)	9.9	44.4	5.0	40.4	16.0
Men	Number of shots	122	64	265	49	117
	Share in the shots structure (%)	19.8	10.4	42.9	7.9	19.0
	Number of effective shots	7	2	16	17	17
	Share in the effective shots structure	11.9	3.4	27.1	28.8	29.2
	Effectiveness coefficient (%)	5.7	3.1	6	34.7	14.5

**Tab. 10.** Diversification of the mean values of the accuracy coefficients regarding shots performed by female and male teams (Student's T-test).

Technical elements of a shot	Winner teams		Loser teams		Student's T-test	
	Mean value of the accuracy coefficient	Standard deviation value	Mean value of the accuracy coefficient	Standard deviation value	t - Student's value	Significance level p
Shots accuracy in total %	45,1	16,7	48,0	13,4	-0,784	0,437
Technique - front instep %	42,3	27,2	33,3	39,7	1,033	0,305

The highest effectiveness in both groups was associated with the shots executed using the inside of the foot (women 40.4%, men 34.7%). Women shot the ball with the inner instep nearly two times more effectively than men (women 9.9%, men 5.7%) (Tab. 9). The largest variation, statistically significant ( $p < 0.05$ ), occurred when the shots were performed with the outer instep (women - 44.4%, men - 3.1%) (Tab. 10 and 11).



**Tab. 11.** Diversification of the mean values of the accuracy coefficients regarding technical shooting elements of female and male teams (Mann-Whitney U-test).

Technical elements of a shot	Rank sum of male teams	Rank sum of female teams	Mann-Whitney U-test value	Precise $p$
Shot effectiveness in total	1176.5	1169.5	435.5	0.096
Technique - inner instep	1241.5	969.5	504.5	0.647
Technique - outer instep	416.0	179.0	38.8	0.016*
Technique - inside of the foot	459.0	402.0	206.0	0.937
Mode - without reception	1285.5	1060.5	544.5	0.752
Mode - after reception	948.5	1004.5	353.5	0.083
Mode - after dribble	824.5	660.5	296.5	0.328
Mode - after a set piece of the game gry	675.0	271.0	166.0	0.337

\* refers to the level of significance  $p < 0.05$

### Conclusions

1. The hypothesis has been confirmed about the diversification of the structure of game with respect to the basic technical elements, like passes and shots. On the average, women passed the ball in a match more times than men. They preferred perpendicular passes, medium and long in distance, and using the no-reception technique. On the other hand, men executed more of the oblique passes, short in distance, and after dribble. While shooting, women used the inner instep more and did not receive the ball whereas the male teams used the front instep after reception or dribble.
2. Significant diversifications occurred regarding the passes accuracy with respect to most of the technical elements. In every examined case the diversification was to the male teams' benefit. No significant diversifications have been observed regarding shots aimed at goal (except the effectiveness of shots performed with the outer instep) between the female and male teams.

### Abstract

In contemporary sport the results of objective studies make the ground for effective training and are the proper way to success. Since the study results have been appearing of the women's play, concerning analysis of the structure and effectiveness of the match activities, there is a need for comparisons between the female and male play. The material for the study compri-

sed all 15 matches played in the 6th Women European Championship, England 2005, and 27 matches played during the men world championship, Korea and Japan 2002. The study method was the systematic external and categorized observation conducted with the help of own study tool – the observation forms. Statistical analysis of the study results was done using the *Statistica* software. The assessment was used of the differences between the mean values of the passes and shots accuracy coefficients, and of their technical elements. In the analysis, the diversification has been found regarding the structure of game at the main technical elements like passes and shots, between the female and male teams. Significant diversifications concerned the passes accuracy in association with most of the analysed technical elements.

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