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Research Article

WERE DIFFERENCES IN TACTICAL EFFICACY BETWEEN THE WINNERS AND LOSERS TEAMS AND THE FINAL CLASSIFICATION IN THE 2003 WATER POLO WORLD CHAMPIONSHIP?

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ABSTRACT

This study has pursued to find the efficacy values in the playing micro-situations with or without ball possession present in Water polo and to analyze the relation between these and the condition of winner or loser, among winning teams, among losing teams and for the position that dealt in the final classification of the X World Championship. Were recorded in video all the female and male matches of the X Water polo World Championship, out agreed by consensus between two trained specialists, continuing the directors of the observational methodology. A specific software was designed for the analysis of the images and the management of the information. Has evaluated by means of coefficients the playing micro-situations in numerical equality, counterattack, defensive adjustment, simple temporary numerical inequality and penalty; obtaining efficacy values. For the statistically data analysis was carried out an ANOVA of a single factor followed by the Tukey test, taking as reference a value of $p \leq .05$. To conclude with, say that significant differences have been revealed in thirty six efficacy values in female category and forty six in male between winning and losing teams, eight between winning teams, the same ones between losing teams and seventeen between the positions that dealt in the final classification on having finished the above mentioned championship.

Key words: *Water polo, efficacy, winner, loser*

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INTRODUCTION

When a water polo match ends, what marks the victory or defeat? Taking into account the results obtained by the quantification of the playing actions, we can value their efficacy from some coefficients (Argudo, 2002). The efficacy, according to Gayoso (1983), can be considered as a result of the correctly executed actions within a number of attempts or trials. This same author thinks that the measurements and evaluations of the behaviours both alive and in vitro are very important.

Particularly in water polo, we refer to studies of conceptualization, elaboration of evaluation instruments, and earlier studies of the efficacy values (Argudo, 2000; Argudo & Lloret, 1998a, b; 1999; 2007; Canossa, Garganta & Lloret, 2002; Carreiro, 2002; Kioumertzoglou, Kourtessis, Michalopoulou & Derri, 1997; Lloret, 1994, 1995, 1999; Platanou, 2004a, b; Sarmiento, 1991, 1994; Sarmiento & Magalhaes, 1991; Takagi, Nishijima, Enomoto & Stewart, 2005) that show some formulae to clarify and to justify the level of offensive and defensive work in the matches of this water sport. Thus, an efficacy coefficient is a mathematical formula that determines a numerical value resulting from the relation among the actions, individual tactics, or the tactical procedures, group tactics, or the tactical playing systems, collective tactics executed and the amount of attempts carried out in the different playing micro-situations. Consequently, we would have a value of efficacy, which is about a performance indicator, numerical, which reveals to us the necessary information to continue or to modify the planning or programme of the tactical content in the training or in the competition (Argudo, 2005).

If we were to assess the tactics of water polo teams in training or in a competition, it would be a very complicated process to deal with as a whole. Therefore, it is necessary to divide the playing situation into micro-situations, which maintain the structure of the sports modality. Thus, we would face several differentiated units that would make their quantification, valuation and action much easier; these are the phases of the sports tactical evaluation. The context in which each micro-situation develops is called situational framework, defined as the set of present motor behaviours in the playing dynamics in team sports and determined by the following factors: symmetry of the teams, organization of the tactical playing systems and ball possession. In the specific case of water polo we can distinguish the following four factors: a) numerical equality, b) transitional, c) numerical inequality and d) penalty (Argudo, 2005).

The goals of this study were: a) to find out the efficacy values in the playing micro-situations in female and male water polo in numerical equality, counterattack, defensive adjustment, simple temporary numerical inequality and penalty with or without ball possession, b) to analyze the relation between these efficacy values and the winner or loser condition at the end of the match, c) to analyze the relation between these efficacy values and the winner condition at the end of the match, d) to analyze the relation between these efficacy values and the loser condition at the end of the match and e) to analyze the relation between these efficacy values and the final classification at the end of the championship. The hypotheses of this study were: the winning teams obtain higher efficacy values than the losing ones, b) there are significant differences between the winners teams, c) there are significant differences between the losers teams and d) the best classified teams obtain higher efficacy values.

MATERIAL AND METHODS

Participants

In the X Water polo World Championship, in Barcelona in 2003, 32 national teams, 16 male and 16 female, which show a great level of homogeneity, participated. The sample has been extracted from this championship; 47 female and 46 male matches were selected, whose final result was not a draw.

Tools

All the matches selected have been analyzed with the Polo analysis v 1.0 direct software (Argudo, Alonso and Fuentes, 2005), a tool developed for the quantitative tactical evaluation in water polo in real time (see figure 1).

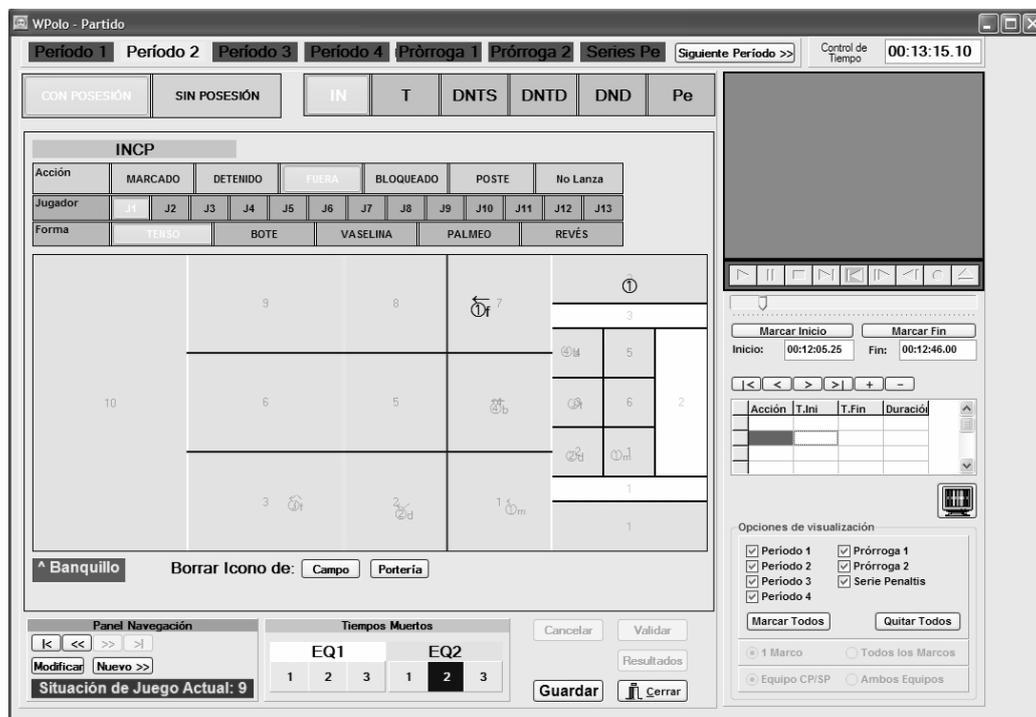


Figure 1. Principal screen.

The variables studied were the condition of winner or loser at the end of the match and the efficacy values obtained from the coefficients proposed and validated by an analysis of varimax rotation to evaluate this playing micro-situation Argudo (2005).

Procedure

The method of recording started from the initial approach to the midfield, so that once any of the two teams had the ball, it would carry out a sweeping technique centring the image in the midfield where the playing action developed. The observation of the matches was carried out based on consensus between two trained specialists, [Anguera et al. \(2000\)](#) and [Anguera \(2003\)](#).

Statistical analysis

We calculated the variance homogeneity tests through Levene's statistical tool. Later on, an ANOVA of a single factor was carried out, followed by the Tukey test for the analysis of the statistically significant differences among the efficacy values and the condition of winner or loser at the end of the match. All the statistical analyses mentioned were carried out with the SPSS 12.0 statistical package, accepting a level of confidence of 95% and an error probability of 5% (meaning level of .05).

RESULTS

The comparison between the efficacy values achieved for female teams in playing micro-situations in numerical equality (NE), counterattack (C), defensive adjustment (AD), simple temporary numerical inequality (STNI) and penalty (P) with and without possession, after statistical analysis, has provided the following results, as presented in [table 1](#).

Table 1. Values of significance of the efficacy values with or without possession between female team winners and losers.

winners – losers				
	NE	C-DA	STNI	P
Coefficient of shot possibility with possession	.005*	.000*	.020*	.535
Coefficient of shot concretion with possession	.000*	.000*	.000*	.181
Coefficient of shot definition with possession	.000*	.000*	.000*	.181
Coefficient of shot resolution with possession	.001*	.000*	.002*	.235
Coefficient of shot precision with possession	.000*	.000*	.000*	.280
Coefficient of shot accuracy with possession	.017*	.001*	.000*	.280
Coefficient of blocked shots received	.564	.738	.058	-
Coefficient of shot possibility without possession	.005*	.000*	.020*	.535
Coefficient of shot concretion without possession	.000*	.000*	.000*	.181
Coefficient of shot definition without possession	.000*	.000*	.000*	.181
Coefficient of shot resolution without possession	.001*	.000*	.003*	.235
Coefficient of shot precision without possession	.000*	.000*	.000*	.280
Coefficient of shot accuracy without possession	.017*	.001*	.000*	.280
Coefficient of shots blocked made	.564	.738	.058	-

* Denote significant differences ($p \leq .05$) between winners and losers.

The comparison between the efficacy values achieved for male teams in playing micro-situations, after statistical analysis, has provided the following results, as presented in [table 2](#).

Table 2. Values of significance of the efficacy values with or without possession between male team winners and losers.

winners – losers				
	NE	C-DA	STNI	P
Coefficient of shot possibility with possession	.200	.025*	.025*	.033*
Coefficient of shot concretion with possession	.000*	.006*	.000*	.006*
Coefficient of shot definition with possession	.000*	.029*	.000*	.006*
Coefficient of shot resolution with possession	.000*	.131	.009*	.005*
Coefficient of shot precision with possession	.001*	.047*	.006*	.012*
Coefficient of shot accuracy with possession	.000*	.152	.032*	.012*
Coefficient of blocked shots received	.000*	.332	.014*	-
Coefficient of shot possibility without possession	.201	.025*	.025*	.033*
Coefficient of shot concretion without possession	.000*	.006*	.000*	.006*
Coefficient of shot definition without possession	.000*	.029*	.000*	.006*
Coefficient of shot resolution without possession	.000*	.131	.009*	.005*
Coefficient of shot precision without possession	.001*	.047*	.006*	.012*
Coefficient of shot accuracy without possession	.000*	.152	.032*	.012*
Coefficient of shots blocked made	.000*	.332	.014*	-

* Denote significant differences ($p \leq .05$) between winners and losers.

The comparison between the efficacy values achieved for winner teams in playing micro-situations, after statistical analysis, has provided the following results, as presented in [table 3](#).

Table 3. Values of significance of the efficacy values with or without possession between winner teams.

winners				
	NE	C-DA	STNI	P
Coefficient of shot possibility with possession	.693	.238	.677	.612
Coefficient of shot concretion with possession	.542	.487	.930	.408
Coefficient of shot definition with possession	.485	.113	.829	.408
Coefficient of shot resolution with possession	.283	.130	.208	.413
Coefficient of shot precision with possession	.700	.643	.073	.537
Coefficient of shot accuracy with possession	.877	.608	.008*	.537
Coefficient of blocked shots received	.000*	.084	.056	-
Coefficient of shot possibility without possession	.012*	.013*	.289	.310
Coefficient of shot concretion without possession	.349	.495	.303	.535
Coefficient of shot definition without possession	.015*	.703	.263	.535
Coefficient of shot resolution without possession	.021*	.272	.102	.401
Coefficient of shot precision without possession	.263	.012*	.835	.389
Coefficient of shot accuracy without possession	.229	.147	.802	.389
Coefficient of shots blocked made	.004*	.356	.100	-

* Denote significant differences ($p \leq .05$) between winners.

The comparison between the efficacy values achieved for loser teams in playing micro-situations, after statistical analysis, has provided the following results, as presented in [table 4](#).

Table 4. Values of significance of the efficacy values with or without possession between loser teams.

	losers			
	NE	C-DA	STNI	P
Coefficient of shot possibility with possession	.008*	.013*	.289	.310
Coefficient of shot concretion with possession	.354	.495	.303	.535
Coefficient of shot definition with possession	.012*	.703	.263	.535
Coefficient of shot resolution with possession	.018*	.272	.074	.401
Coefficient of shot precision with possession	.229	.012*	.835	.389
Coefficient of shot accuracy with possession	.218	.147	.802	.389
Coefficient of blocked shots received	.004*	.356	.100	-
Coefficient of shot possibility without possession	.780	.238	.677	.612
Coefficient of shot concretion without possession	.538	.487	.930	.408
Coefficient of shot definition without possession	.510	.113	.829	.408
Coefficient of shot resolution without possession	.301	.130	.208	.413
Coefficient of shot precision without possession	.760	.643	.073	.537
Coefficient of shot accuracy without possession	.895	.608	.008*	.537
Coefficient of shots blocked made	.000*	.084	.056	-

* Denote significant differences ($p \leq .05$) between losers.

The comparison between the efficacy values achieved for teams in playing micro-situations and the position at the end of the championship has provided the following results which are presented below.

The [table 5](#) shows significant differences between the fifth and eighth and fifteenth in coefficients of shot blocked received in numerical equality, all of them in male category. There are significant differences in the coefficient of shot possibility in numerical equality without possession between the third, fifth and the eighth and twelfth, too. Besides, in the coefficient of shot precision in numerical equality without possession between the third and fifth with the twelfth.

Table 5. Values of significance of the efficacy values in numerical equality in water polo male teams.

Coefficient of blocked shots received in numerical equality	
5° - 8°	.048*
5° - 15°	.046*
Coefficient of shot possibility in numerical equality with possession	
3° - 12°	.000*
5° - 12°	.000*
8° - 12°	.027*
Coefficient of shot precision in numerical equality without possession	
3° - 12°	.008*
5° - 12°	.019*

* Denote significant differences ($p \leq .05$) in the final classification.

In the [table 6](#) appear the results of the next seven coefficients analyzed in female category. Significant differences were observed between the third and sixth and eleventh in the coefficient of shot possibility in numerical equality with possession. At the coefficient of shot accuracy in numerical equality with possession of the fifth to the eleventh. In the coefficient of shot possibility in numerical equality without possession between the eighth and eleventh and between the seventh, eighth and the fifteenth and sixteenth. At the coefficient of shot concretion in numerical equality without possession of the fourth to sixteenth. At the coefficient of shot definition in numerical equality without possession of the fourth to fifteenth. In the coefficient of shot resolution in numerical equality without possession of the fourth to the fourteenth. And finally, at the coefficient of shot accuracy in numerical equality without possession of first with the twelfth.

Table 6. Values of significance of the efficacy values in numerical equality in water polo female teams.

Coefficient of shot possibility in numerical equality with possession	
3° - 11°	.027*
6° - 11°	.031*
Coefficient of shot precision in numerical equality with possession	
5° - 11°	.021*
Coefficient of shot possibility in numerical equality without possession	
7° - 16°	.017*
8° - 11°	.022*
8° - 16°	.005*
15° - 16°	.025*
Coefficient of shot concretion in numerical equality without possession	
4° - 16°	.022*
Coefficient of shot definition in numerical equality without possession	
4° - 15°	.049*
Coefficient of shot resolution in numerical equality without possession	
4° - 14°	.028*
Coefficient of shot precision in numerical equality without possession	
1° - 12°	.040*

* Denote significant differences ($p \leq .05$) in the final classification.

An analysis of [table 7](#) is extracted that there are significant differences between the sixth and eighth and fifteenth classified male in the coefficient of shot concretion in defensive adjustment. In addition, the sixth to fifteenth in the coefficient of shot definition in defensive adjustment.

Table 7. Values of significance of the efficacy values in defensive adjustment in water polo male teams.

Coefficient of shot concretion in defensive adjustment	
6° - 8°	.015*
6° - 15°	.019*
Coefficient of shot definition in defensive adjustment	
6° - 15°	.033*

* Denote significant differences ($p \leq .05$) in the final classification.

At the coefficient of shot precision in simple temporary numerical inequality without possession exist significant differences between the fourteenth and fifteenth male teams (see table 8).

Table 8. Values of significance of the efficacy values in simple temporary numerical inequality in water polo male teams.

Coefficient of shot precision in simple temporary numerical inequality without possession	
14° - 15°	.030*

* Denote significant differences ($p \leq .05$) in the final classification.

Finally, table 9 indicates the existence of significant differences in the coefficient of shot concretion in simple temporary numerical inequality with possession between third and seventh, twelfth, fourteenth and sixteenth, all of them female category. At the coefficient of shot definition in simple temporary numerical inequality with possession can be seen between the first and seventh, between the third and seventh, twelfth, fourteenth and sixteenth, and between the seventh and thirteenth. In the coefficient of shot resolution in simple temporary numerical inequality with possession appear between the first and seventh and fourteenth, between the third and seventh and fourteenth and between the seventh and tenth. Finally, the coefficient of shot resolution in simple temporary numerical inequality without possession of the seventh to the tenth.

Table 9. Values of significance of the efficacy values in simple temporary numerical inequality in water polo female teams.

Coefficient of shot concretion in simple temporary numerical inequality with possession	
3° - 7°	.001*
3° - 12°	.010*
3° - 14°	.028*
3° - 16°	.011*
Coefficient of shot definition in simple temporary numerical inequality with possession	
1° - 7°	.021*
3° - 7°	.001*
3° - 12°	.029*
3° - 14°	.014*
3° - 16°	.038*
7° - 13°	.019*
Coefficient of shot resolution in simple temporary numerical inequality with possession	
1° - 7°	.030*
1° - 14°	.041*
3° - 7°	.015*
3° - 14°	.023*
7° - 10°	.048*
Coefficient of shot resolution in simple temporary numerical inequality without possession	
7° - 10°	.037*

* Denote significant differences ($p \leq .05$) in the final classification.

DISCUSSION

If the results of the present study are compared with those of Argudo (2000), Argudo & Lloret (1998a,b) and Argudo & Lloret (1999), where the object of analysis focused on the tactical evaluation in water polo European Championship in 1997, it is clear that between the winner or loser condition, in female water polo, coincidences are found in the coefficient of concretion in numerical equality with possession ($p < .022$) and without possession ($p < .050$). On the other hand, there is no overlap in the coefficient of definition in numerical equality with possession ($p < .281$) and without possession ($p < .551$), in the coefficients of concretion in the counterattack and defensive adjustment ($p < .735$), in the definition ($p < .487$), in the concretion in simple temporary numerical inequality with and without possession ($p < .444$), in the definition ($p < .993$), in the concretion in the penalty with possession ($p < .969$) and without possession ($p < .093$), and in the definition with possession ($p < .427$) and without possession ($p < .818$). In the case of male water polo, coincidences are found in the coefficients of concretion in numerical equality with possession and without possession ($p < .129$) and in the definition ($p < .742$) in both cases. On the other hand, there is no overlap in the coefficients of concretion in the counterattack and defensive adjustment ($p < .762$), in the coefficients of definition of counterattack ($p < .484$) and defensive adjustment ($p < .223$), in the coefficients of concretion in simple temporary numerical inequality with and without possession ($p < .433$), in the coefficients of definition in simple temporary numerical inequality ($p < .765$) in both, in the coefficients of concretion of penalty with possession ($p < .733$) and without possession ($p < .456$) and in the coefficient of definition of penalty with possession ($p < .347$) and without possession ($p < .758$).

In numerical equality there are coincidences between female and male teams, with the winner condition in the coefficients of shot concretion with possession ($p < .733$), shot definition with possession ($p < .946$) and shot concretion without possession ($p < .347$). However, there is no overlap between the two studies regarding the coefficient of shot definition without possession ($p < .636$). On the condition of loser on three coefficients exist, as in both works are not significant differences between the teams, both female and male on condition loser in the coefficients of shot concretion with or without possession and the coefficient of shot definition without possession, with a value of $p < .193$, $p < .716$ and $p < .946$, respectively, with the aforementioned 2000. However, there is no overlap between the two studies regarding the coefficient of shot definition with possession, because in this work there are significant differences in 2000 and not ($p < .276$).

In the counterattack and defensive adjustment there are similarities between the teams, both male and female, provided the winner in the coefficient of shot concretion with possession $p < .058$, the coefficient of shot definition with possession $p < .140$, at the coefficient of shot concretion without possession $p < .051$ and in the coefficient of shot definition without possession $p < .632$. With the loser condition are coincidences at the coefficient of shot concretion with possession $p < .051$, the coefficient of shot definition with possession $p < .976$, at the coefficient of shot concretion without possession $p < .058$ and the coefficient of shot definition without possession $p < .117$.

In simple temporary numerical inequality, both male and female teams, with the winner condition are coincidences at the coefficient of shot concretion with possession $p < .260$, in the coefficient of shot definition with possession $p < .281$, in the coefficient of shot concretion without possession $p < .791$ and in the coefficient of shot definition without possession $p < .351$. With the loser condition are coincidences at the coefficient of shot concretion with

possession $p < .791$, in the coefficient of shot definition with possession $p < .351$, in the coefficient of shot concretion without possession $p < .260$ and the coefficient of shot definition without possession $p < .281$

CONCLUSION

As conclusions of the tactical quantitative evaluation done to the women's teams after the X World Championship Water Polo 2003 in the micro-situations in numerical equality, in counterattack and defensive adjustment and in simple temporary numerical inequality with and without ball possession, reveals that in twelve coefficients of efficacy were significant differences. While in the penalty in anyone were significant differences between winner or loser teams.

With regard to male teams, which is extracted in twelve coefficients of efficacy in numerical equality, eight in the counterattack and defensive adjustment, fourteen in simple temporary numerical inequality and twelve in the penalty are significant differences between the winner or loser condition.

On the numerical equality can be inferred that among the winning teams, are significant differences between sexes in five coefficients of efficacy. Referring to the loser teams can be inferred that there are significant differences between sexes in five.

Concerning the counterattack and defensive adjustment can infer that, both among the winner as loser teams, are significant differences between sexes in two coefficients of efficacy.

Relevant to the simple temporary numerical inequality can be inferred that among the winning teams, one of the coefficients of efficacy and in another, among the losers, are significant differences between sexes.

Concerning the penalties, both between teams and between winners and losers can be inferred that in none of the twelve coefficients of efficacy, are significant differences between sexes.

Finally, can infer that there are some significant differences between efficacy values and some of the positions occupied by the participating teams at the end of that championship. Specifically, these differences appear in seventeen coefficients of efficacy of the fifty-four proposed to tactical evaluation in a water polo match, which specifically include: three in numerical equality in men, seven in numerical equality in women, two in defensive adjustment in men and one and four in simple temporary numerical inequality in men and women respectively.

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