Influence of the efficacy values in counterattack and defensive adjustment on the condition of winner and loser in male and female water polo.

Francisco M. Argudo Iturriaga¹, José Ignacio Alonso Roque¹, Pablo García Marín² and Encarnación Ruiz Lara¹


Abstract

This study has pursued to find the efficacy values in the playing microsituations in the counterattack and in the defensive adjustment and to analyse the relation between these and the condition of winner or loser. We analysed the matches of the 10th World Championship of Water polo which did not ended in a draw. Playing microsituations in the counterattack and in the defensive adjustment were evaluated by means of coefficients, obtaining efficacy values. Differences were revealed in male category in the following coefficients: possibility (p=.025), concretion (p=.006), definition (p=.029) and precision (p=.047). In female category differences were found in the following coefficients: possibility, concretion, definition, resolution and precision (p=.000) and accuracy (p=.001); taking as reference a value of p <.05. To conclude with, we can say that in eight, in male category, and twelve, in female category, out of the fourteen efficacy coefficients proposed for evaluating the playing microsituations in the counterattack and defensive adjustment in water polo, there are significant differences between the condition of winner or loser.

Keywords: water polo, efficacy, winner, loser, counterattack, defensive adjustment.

1. Introduction.

The aquatic sports modality we are going to carry out this study about is water polo. Although nowadays this water sport is popular and practiced everywhere, it is a young sport, since according to Majoni (1954) it appeared in the second half of the 19th century in Great Britain as a result of the Industrial Revolution. Water polo is an aquatic team sport, institutionalized and subject to some rules, which is practiced in a limited pool by two teams of seven field players (six players and the goalkeeper) intended to introduce the ball in the opponent’s goal post (Lloret, 1994). Subsequently, Lloret (1995) proposes to define water polo as: regulated sport of cooperation and opposition, which strategically communicates through the execution of some playing actions in the
water environment, carrier of praxic meaning, implicit or explicit, and whose purpose would be the mark interaction between the teams of the symmetrical duel.

The intrinsic goal of the sports practice channelled towards competition is the success in itself, that is, the attainment of the best possible results and the beating of the other contenders. The sports training has become a traditional practice to improve the preparation and thus being able to obtain better results in the competition. At first, an intense physical activity linked to the sports discipline at issue could make the sportsmen competitive; but this belongs to the past. Nowadays, the sports success has become tremendously difficult. The preparation that nowadays a sportsman and/or a team needs to be competitive at a high-level, has been becoming tremendously complex and sophisticated. It is evident therefore, that the evolution of the sports training has been one of the key factors that have contributed the most to the mentioned increase in the sports performance. The training has not only benefited from the advance of the other supporting sciences (physiology, biomechanics, psychology, etc.), but it has also been impregnating with the approaches of the scientific method along past times. So that the own system and organization of the training begin to constitute an emerging and complex scientific application.

If we wanted to assess the tactics of water polo teams, when training or in a competition, it would be very complicated to face it as a whole. Therefore, it is necessary to divide that playing situation into microsituations that maintain the structure of the sports modality. Thus, we would be facing several differentiated units that would make their quantification, valuation and action much easier, being these the phases of the sports tactical evaluation. The context in which each microsituation develops is called situational framework, defined as the set of present motor behaviours in the playing dynamics in team sports, 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 four: a) numerical equality, b) transitional, c) numerical inequality and d) penalty. In the case that occupies us, the transitional framework in water polo is a playing microsituation developed from the moment of the loss or recovery of the ball possession, to the organization and structuring of the tactical playing system, with or without possession, in the contrary goal post. We can differentiate two forms: a) the offensive transition, that can be carried out of slow form, transition with possession, or quickly, counterattack; and, b) the defensive transition, that can be carried out of slow form, transition without possession, or quickly, defensive adjustment. The transition with possession is a playing microsituation, after the recovery of the ball possession, that elapses from the disorganization of the tactical playing system in the own goal post to the structuring of the tactical playing system in the contrary goal post. The counterattack is a playing microsituation strategically predicted for, after the recovery of the ball possession, to occupy as quickly as possible the most favourable tactical-strategic spaces and to create a momentary numerical superiority. The transition without possession is a playing microsituation, after the loss of the ball possession, that elapses from the disorganization of the tactical playing system in the own goal post to the structuring of the tactical playing system in the contrary goal post. The defensive adjustment is a playing microsituation strategically predicted for, after the loss of the ball possession, to occupy as quickly as possible the
most favourable tactical-strategic spaces, to control to the player with ball possession and to avoid a momentary numerical inferiority (Argudo, 2005).

When a water polo match ends, can we know the reasons of 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 inside a number of attempts or trials. This same author thinks the measurements and evaluations of the behaviours both alive and in vitro are very important.

Particularly in water polo, we can mention studies of conceptualization, elaboration of evaluation instruments, and first studies of the efficacy values (Argudo, 2000; Argudo & Lloret, 2006; Argudo & Ruiz, 2006a, b; Canossa, Garganta & Lloret, 2002; Dopsaj & Matkovic, 1999; Enomoto, 2004; Lloret, 1994, 1999; Platanou, 2001, 2004; Sarmento, 1991; Sarmento & Magalhaes, 1991) 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 microsituations. As resulting from the same we would have a value of efficacy, which is about a performance indicator, numerical, which reveals 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).

The goals of this study were: a) to find out the efficacy values in the playing microsituations in the counterattack and in the defensive adjustment and b) to analyze the relation between those efficacy values and the winner or loser condition in water polo at the end of the match both in the male and female modality. The hypothesis of this study was that the winning teams obtain higher efficacy values than the losing ones.

2. Method

2.1. Participants
The sample studied has been extracted from the 10th Championship of the World in Barcelona 2003. Thirty two national teams were studied, which shows a great level of homogeneity, being disputed 96 matches; though only 46 male and 47 female matches whose final result was not a draw were selected.

2.2. 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 and 2).
Figure 1. Screen to register the actions in the playing microsituations in the counterattack and in the defensive adjustment.

Figure 2. Screen of the different collective and individual efficacy values of both teams.
The variables studied have been the condition of winner or loser at the end of the match and the efficacy values obtained from the coefficients proposed to evaluate this playing microsituation that is developed subsequently:

1. Coefficient of shots possibility in counterattack. Mathematical formula that determines a numerical value of the relation between the shots carried out and the microsituations of play with possession.

$$\text{CSPC} = \frac{\sum \text{shots carried out} \times 100}{\sum \text{microsituations with possession}}.$$ 

2. Coefficient of shots concretion in counterattack. Mathematical formula that determines a numerical value of the relation between the shots scored and the microsituations of play with possession.

$$\text{CSCC} = \frac{\sum \text{shots scored} \times 100}{\sum \text{microsituations with possession}}.$$ 

3. Coefficient of shots definition in counterattack. Mathematical formula that determines a numerical value of the relation between the shots scored and the shots carried out.

$$\text{CSDC} = \frac{\sum \text{shots scored} \times 100}{\sum \text{shots carried out}}.$$ 

4. Coefficient of shots resolution in counterattack. Mathematical formula that determines a numerical value of the relation between the shots scored and the shots to goal posts.

$$\text{CSRC} = \frac{\sum \text{shots scored} \times 100}{\sum \text{shots carried out}} - (\sum \text{shots out} + \sum \text{shots blocked} + \sum \text{shots posts}).$$

5. Coefficient of shots precision in counterattack. Mathematical formula that determines a numerical value of the relation between the shots to goal posts and the microsituations of play with possession.

$$\text{CSPRC} = \frac{[\sum \text{shots carried out} - (\sum \text{shots out} + \sum \text{shots blocked} + \sum \text{shots posts})] \times 100}{\sum \text{microsituations with possession}}.$$ 

6. Coefficient of shots accuracy in counterattack. Mathematical formula that determines a numerical value of the relation between the shots to goal posts and the shots carried out.

$$\text{CSAC} = \frac{[\sum \text{shots carried out} - (\sum \text{shots out} + \sum \text{shots blocked} + \sum \text{shots posts})] \times 100}{\sum \text{shots carried out}}.$$ 

The higher these coefficients' numerical value is the greater efficacy. Besides, a series of relations is established among them:

1. CSDC should approach or equal the CSAC.
2. CSCC should approach or equal the CSPRC.
3. CSCNEP should approach or equal the CSPC.
4. CSPRC should approach or equal the CSPC.

7. Coefficient of shots possibility in defensive adjustment. Mathematical formula that determines a numerical value of the relation between the shots received and the microsituations of play without possession.

\[ \text{CSPDA} = \frac{\Sigma \text{shots received} \times 100}{\Sigma \text{microsituations without possession}}. \]

8. Coefficient of shots concretion in defensive adjustment. Mathematical formula that determines a numerical value of the relation between the shots inserted and the microsituations of play without possession.

\[ \text{CSCDA} = \frac{\Sigma \text{shots inserted} \times 100}{\Sigma \text{microsituations without possession}}. \]

9. Coefficient of shots definition in defensive adjustment. Mathematical formula that determines a numerical value of the relation between the shots inserted and the shots received.

\[ \text{CSDDA} = \frac{\Sigma \text{shots inserted} \times 100}{\Sigma \text{shots received}}. \]

10. Coefficient of shots resolution in defensive adjustment. Mathematical formula that determines a numerical value of the relation between the shots inserted and the shots to goal posts.

\[ \text{CSRDA} = \frac{\Sigma \text{shots inserted} \times 100}{\Sigma \text{shots received}} - (\Sigma \text{shots out} + \Sigma \text{shots blocked} + \Sigma \text{shots posts}). \]

11. Coefficient of shots precision in defensive adjustment. Mathematical formula that determines a numerical value of the relation between the shots to goal posts and the microsituations of play without possession.

\[ \text{CSPRDA} = \frac{[\Sigma \text{shots received} - (\Sigma \text{shots out} + \Sigma \text{shots blocked} + \Sigma \text{shots posts})] \times 100}{\Sigma \text{microsituations without possession}}. \]

12. Coefficient of shots accuracy in defensive adjustment. Mathematical formula that determines a numerical value of the relation between the shots to goal posts and the shots received.

\[ \text{CSADA} = \frac{[\Sigma \text{shots received} - (\Sigma \text{shots out} + \Sigma \text{shots blocked} + \Sigma \text{shots posts})] \times 100}{\Sigma \text{shots received}}. \]

The lower all these coefficients' numerical values are, the greater efficacy. Besides, a series of relations is established among them:

1. CSDDA should approach or equal the CSADA.
2. CSCDA should approach or equal the CSPRDA.
3. CSCDA should approach or equal the CSPDA.
4. CSPRDA should approach or equal the CSPDA.

13. Coefficient of shots blocked received in counterattack. Mathematical formula that determines a numerical value of the relation between the shots blocked received and the shots carried out.
CSBRC = $\Sigma$ shots blocked received x 100 / $\Sigma$ shots carried out.

14. Coefficient of shots blocked made in defensive adjustment. Mathematical formula that determines a numerical value of the relation between the shots blocked made and the shots received.
CSBMDA = $\Sigma$ shots blocked made x 100 / $\Sigma$ shots received.

While in the first coefficient the smaller the numerical value the greater will be the efficacy, in the second is contrary. Besides it is established between them a relation:

1. CSBRC should surpass the CSBMDA.

2.3. 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 is developed. The observation of the matches was carried out agreed by consensus between two trained specialists, Anguera et al. (2000) and Anguera (2003).

2.4. 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 was for the analysis of the statistically significant differences among the efficacy values in the numerical equality 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 package, accepting a level of confidence of 95% and an error probability of 5% (meaning level of .05).

3. Results

Table 1. Values of significance of the efficacy values in the counterattack and in the defensive adjustment between male teams winners and losers.

<table>
<thead>
<tr>
<th>Winners – Losers</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CSPC</td>
<td>.025*</td>
</tr>
<tr>
<td>CSCC</td>
<td>.006*</td>
</tr>
<tr>
<td>CSDC</td>
<td>.029*</td>
</tr>
<tr>
<td>CSRC</td>
<td>.131</td>
</tr>
<tr>
<td>CSPRC</td>
<td>.047*</td>
</tr>
<tr>
<td>CSAC</td>
<td>.152</td>
</tr>
<tr>
<td>CSBRC</td>
<td>.332</td>
</tr>
</tbody>
</table>
CSPDA .025*
CSCDA .006*
CSDDA .029*
CSRDA .131
CSPRDA .047*
CSADA .152
CSBRDA .332

(*) Denote significant differences (p<.05) between winners and losers.

After the statistical analysis, the comparison among the efficacy values obtained in the playing microsituations in the counterattack and in the defensive adjustment has provided the following results, as they are shown in Tables 1 and 2.

These results show that the winning male teams do not have significant differences p=.131, p=.152, p=.332, p=.152 y p=.332 respectively in the CSRC, in the CSAC, in the CSBRC, in the CSRDA, in the CSADA and in the CSBRDA as opposed to the losing teams. On the contrary the efficacy values obtained by the winning teams do show significant differences in the CSPC and in the CSPDA p=.025, in the CSCC and in the CSCDA p=.006, in the CSDC and in the CSDDA p=.029 and in the CSPRC and in the CSBRDA p=.047.

Table 2. Values of significance of the efficacy values in the counterattack and in the defensive adjustment between female teams winners and losers.

<table>
<thead>
<tr>
<th>Winners – Losers</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CSPC</td>
<td>.000*</td>
</tr>
<tr>
<td>CSCC</td>
<td>.000*</td>
</tr>
<tr>
<td>CSDC</td>
<td>.000*</td>
</tr>
<tr>
<td>CSRC</td>
<td>.000*</td>
</tr>
<tr>
<td>CSPRC</td>
<td>.000*</td>
</tr>
<tr>
<td>CSAC</td>
<td>.001*</td>
</tr>
<tr>
<td>CSBRC</td>
<td>.738</td>
</tr>
<tr>
<td>CSPDA</td>
<td>.000*</td>
</tr>
<tr>
<td>CSCDA</td>
<td>.000*</td>
</tr>
<tr>
<td>CSDDA</td>
<td>.000*</td>
</tr>
<tr>
<td>CSRDA</td>
<td>.000*</td>
</tr>
<tr>
<td>CSPRDA</td>
<td>.000*</td>
</tr>
<tr>
<td>CSADA</td>
<td>.001*</td>
</tr>
<tr>
<td>CSBRDA</td>
<td>.738</td>
</tr>
</tbody>
</table>

(*) Denote significant differences (p<.05) between winners and losers.

On another hand, the winning women’s teams do not show significant differences p<.738 in the CSBRC and in the CSBRDA as opposed to the losing teams. However, the efficacy values obtained by the winning teams as opposed to the losing teams do show significant differences p<.001 in the CSPC, in the CSCC, in the CSDC, in the CSRC, in the CSPRC, in the CSPDA, in the CSCDA, in the CSDDA, in the CSRDA and in the CSPRDA. Also, the efficacy values obtained by the winning teams as opposed to the losing teams show significant differences p=.001 in the CSAC and in the CSADA.
4. Discussion and Conclusions

Comparing the data obtained in this study with previous studies by Argudo (2000), gives us the possibility to note that among the male teams there are no significant differences between winners and losers for the CSCC p=.762, the CSDC p=.484, the CSCDA p=.762 or the CSDDA p=.223. Likewise, among the female teams there are no significant differences between the winners and losers for the CSCC p=.735, the CSDC p=.487, the CSCDA p=.735 or the CSDDA p=.487.

As the main conclusion of the quantitative tactical evaluation of the playing microsituations in numerical equality with and without ball possession in the 10th World Championship of Water polo of 2003, carried out in the male matches, we can infer that, in eight out of fourteen efficacy coefficients there are significant differences between the winners and losers; in the CSPC, in the CSPA, in the CSCC, in the CSCDA, in the CSDC, in the CSDDA, in the CSPRC and in the CSPRDA. We can also infer from the female matches that in twelve out of fourteen efficacy coefficients there are significant differences between the winners or losers; in the CSPC, in the CSCC, in the CSDC, in the CSRDA, in the CSPRDA, in the CSAC and in the CSADA.

If we wanted to make a transfer from the conclusions we have come to, in the training of the playing microsituations in the counterattack and in the defensive adjustment in male water polo, we should keep in mind when planning the sessions and matches that, there are going to be any differences between both teams as for the shot possibilities, concretion, definition and accuracy, that is why we will have to plan some tasks whose main objective is obtaining that the ball displacement of a goal post to another be very fast and controlled, which lead to a momentary numerical imbalance in a specific space where the player can shot from with the greatest possibilities of success. By contrast, other tasks whose main objective is to stop any displacements of the players in the best conditions and the occupation of strategically favourable spaces, with what we will complicate the ball pass and the possibilities of success. In the case of female water polo, besides the importance of being accurate when shooting, the training of blocking these shots should be increased, since it can allow the players to improve the possibilities of victory.

In future studies we could tackle the analysis of the same variables with a greater number of matches, studying different games from different championships and the time of ball possession permitted, especially with the regulation modifications proposed by the FINA for the 2005-09 period, on the time ball possession permitted, comparing the data obtained with those of this study.

5. References


Lloret, M. (1999). Los coeficientes ofensivos y defensivos, una aportación al estudio práxico de los deportes de equipo [The defensive and offensive coefficients, a contribution to praxic study of the team sports]. Apunts, 55, 68-76.

