Analysis of numerical inferiority actions during the positional attack phase at the 2016 Rio Olympic Games

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1 ABSTRACT

The aim of this study is to scientifically determine the influence that the modification of the regulation in reference to the possibility of using a change of goalkeeper for a field player without having to use different clothing from the rest of the players has had on the game. This study focuses on the observational, quantitative and relational analysis of all offensive actions in situations of numerical inferiority during the positional attack phase that were carried out in 38 men's handball matches, which were played during the 2016 Olympic Games in Rio de Janeiro.

For the conclusions of this study, we must emphasize that the number of disciplinary sanctions involved in a situation of numerical inferiority have increased in the Rio Olympic Games in comparison to the 2008 Beijing and 2012 London Olympic Games. There was no relationship between the greater or lesser average of disciplinary sanctions of the teams and final classification obtained. The use of the goalkeeper-player in situations of numerical inferiority during the positional attack phase has been used in this competition overwhelmingly (77.8%). The actions immediately following the loss of possession by the teams the used the change does not involve an excessive risk of receiving a goal in an empty goal (7%). The supposed defensive disorganization resulting from the changes does not imply a high level of risk of receiving a goal (4.1%) in the case of rapid attack after the loss of possession. The actions with a positive result made by the teams that realized a goalkeeper-player switch are 6.77% higher and in the specific case of goals obtained represent 5.6% more. A pattern of use for the goalkeeper-player change according to the partial result that is reflected in the scoreboard has not been found. During the numerical inferiority attacks made with the goalkeeper-player change, the referees show passive play warning 11.8% less. The number of attacks during the exclusion duration period is approximately the same in both cases, and sub attacks being greater if the goalkeeper-player change is not made. The play system most utilized when the change occurs is 3:3. And the shots zones tend to balance when the goalkeeper-player change happens.

2 INTRODUCTION

As can be seen on the website of the International Handball Federation (IHF) ("The Road to the New Rules of 2016"), this aims to increase the attractiveness of the game. The first step to achieve this was made with the formation of a working group in 2013 composed of Jürgen Scharoff, Hanspeter Knabenhans, Heiner Brand, Manfred Prause and Ramón Gallego who began to work on possible regulatory changes. In 2014 the IHF organized the II Forum for the future of Hanball in Denmark with the aim of *"to listen and analyse the position, profile and current status of international handball from the different points of view and discuss strategies and concerted measure concepts in the way of spreading handball"*. At that conference, a working group known as the "Game Development Group", made up of IHF experts, coaches (such as Staffan Olsson, Talant Dujshebaev, Gudmundur Gudmundsson, Ulrik Wilbek, Michael Biegler, Heiner Brand) and IHF referees discussed the different aspects of the game. Based on their proposals, different changes to the rules were tested during 2015 at the Junior Men's World Championship in Brazil and at the Youth Men's World Championship in Russia. After receiving positive feedback at all levels (coaches, referees and delegates), all of the changes were incorporated to the regulations that came into force on 1 July 2016, applying them in high competition for the first time at the 2016 Rio Olympic Games.

Any regulatory change that *per se* implies a change in the internal structure of the game, the application of the new regulations will have followers and detractors. Some of the "new images" that have been produced during the games, such as shooting to an empty goal, seven players attacking six, or the scarce presence of the actions in attacks in numerical inferiority, have surprised, pleased, upset and even elicited rejection by some persons that initially were in agreement with the changes.

According to the objective of our investigation, the two modifications to be taken into account refer to the possibility of changing the goalkeeper for a field player without distinguishing his equipment from the rest of the players *(Rule 4:1; 4:4-4:7)* and the maximum number of passes before the arbitrary penalty warning for passive play *(Rule 7:12 and clarification 4)*.

These modifications are fully described in the Game Regulations *(http://www.ihf.info/en-us/thegame/statutesandregulations.aspx?catid=5)* of and

masterfully explained on the IHF website *(http://ihfeducation.ihf.info/REFEREES/Rule-Explanations/items*.

3 METHOD

3.1 Sample

The sample was composed of all the teams that competed in the men's handball competition at the Rio 2016 Olympic Games (August 7-21). The list of participating teams and their distribution for the preliminary phase was as follows: *(Table 1)*

Participating Teams	
Group A	*Group B*
Argentina (ARG)	*Germany (GER)*
Qatar (QAT)	*Brazil (BRA)*
Croatia (CRO)	*Egypt (EGY)*
Denmark (DEN)	*Slovenia (SLO)*
France (FRA)	*Poland (POL)*
Tunisia (TUN)	*Sweden (SWE)*

Table 1: Participant teams and distribution to the preliminary phase

3.2 Variables

The variables analysed (Table 2) were as fixed criteria: Competition (COM); category (CAT); competition phase (FAS); official match number (NOP); teams participating in the match (PAR) and final result of the match (REF). The variable criteria were: team observed (EQO); match time (TP); partial result during observed action (RP); use of the new rules (UNN); offensive numeric situation (SNO); number of attacks in numerical inferiority during the exclusion period (NAI); number of sub attacks in numerical inferiority during the exclusion period (NSAI); passive play warning (AJP); defensive system used in action (SD); offensive system used in action (SO); result of attacks in numerical inferiority (RSAI); zone from which the final attack action is done (ZF); consequences of attack in numerical inferiority (CA); result of the immediately subsequent attack action (until the positional attack phase) (RCP); disciplinary sanctions in the subsequent attack (DP) and incomplete viewing of the action (VIS).

These observation criteria are complemented by the necessary categories that generate the necessary exclusivity property and completeness that any observational research must possess.

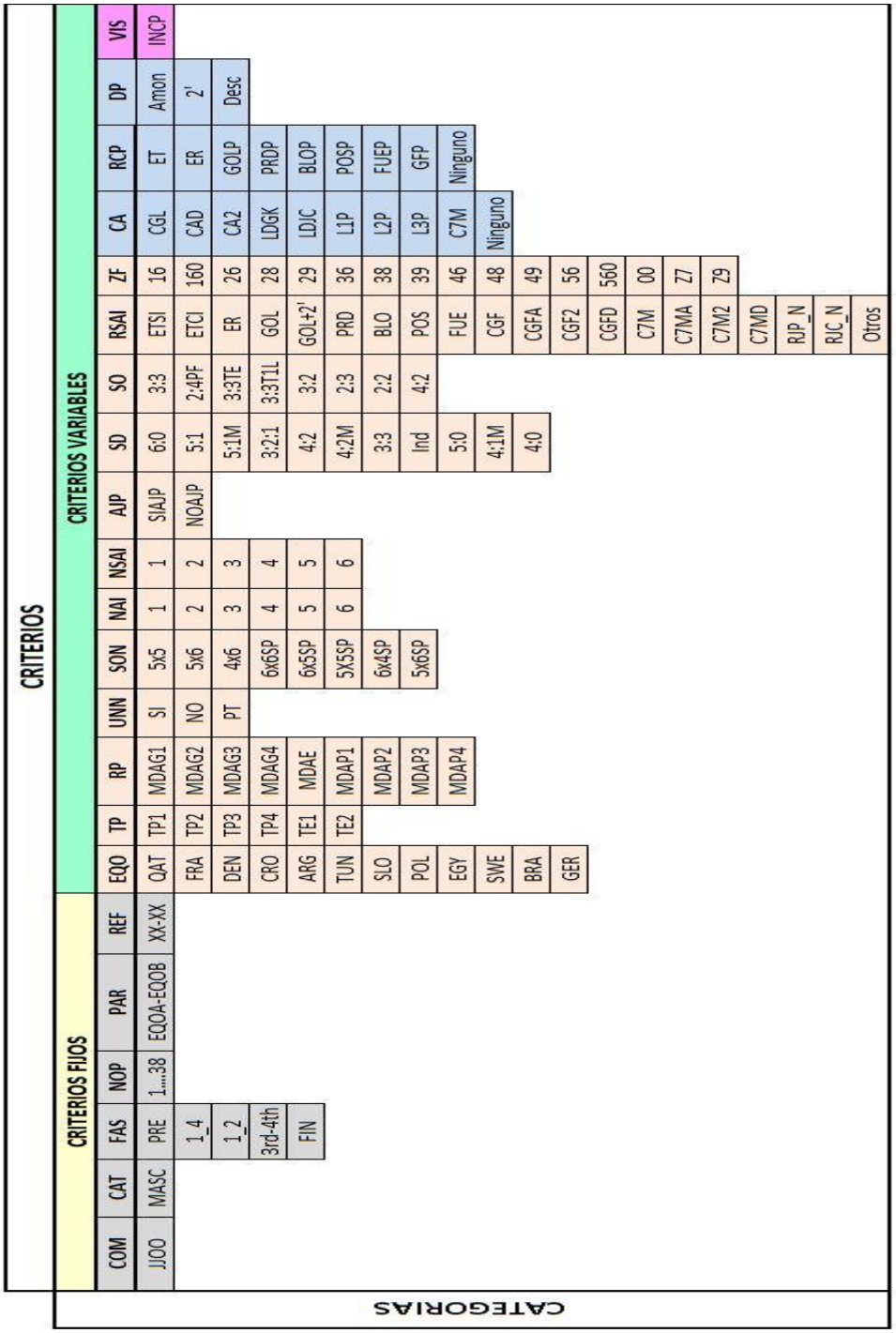


Table 2: Criteria and categories of the study

3.3 Instrument

The Dartfish TeamPro v.9 ConnectPlus software was used as a registering instrument, using a tagging panel *(Image 1 and 2)*, with the designed criteria and categories *(Table 2)*.

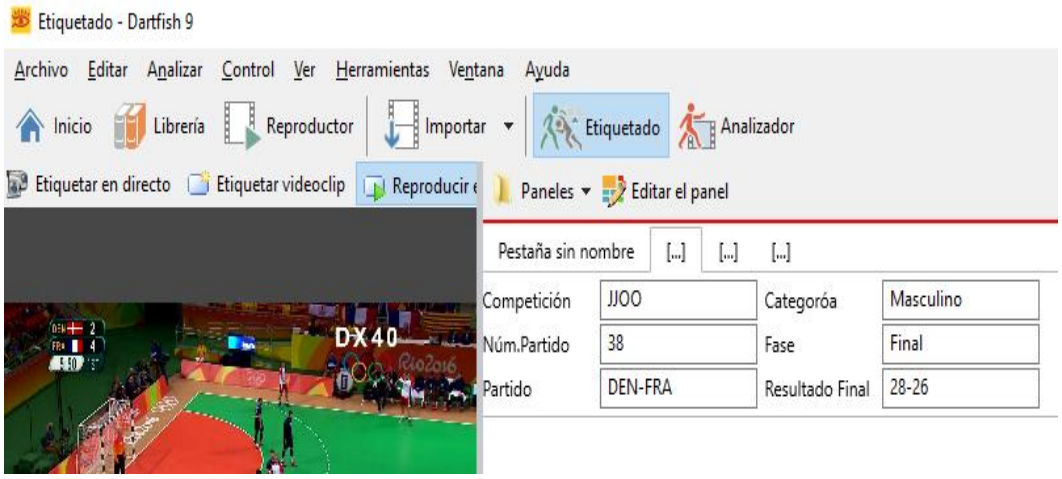


Image 1: Dartfish tagging panel. Fix criteria

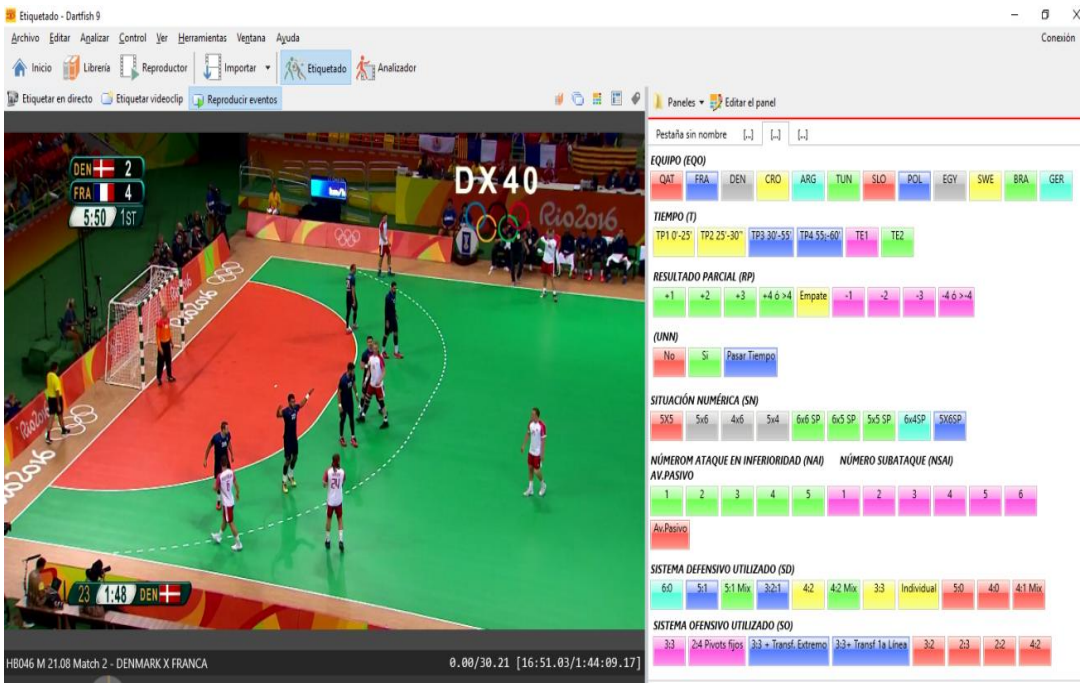


Image 2: Dartfish tagging panel. Variable criteria 1

4 PROCEDURE

A total of 916 offensive actions in numerical inferiority situations were collected by the author of the study, acting passively without influencing the behaviour of the players. Of these 916 actions, 12 were discarded since the teams did not show any intention of attacking when the recovery of the excluded player is close and it is not a situation of passive play. From the data registered by the IHF in its official statistics (public statistics, which can be found on the website of this organization[(0)]), the exact time was identified in which the disciplinary sanctions were produced that provoked the purpose of the study and the mentioned variables were registered.

[(0)] http://www.ihf.info/en-us/ihfcompetitions/olympicgames/olympicgamesrio2016/fixturesandresults.aspx

5 RESULTS

For the statistical treatment of the data, these were transferred from the files generated by the Dartfish program to the SPSS v.15 statistical program for Windows. The data was subsequently analysed. The values obtained are presented in the last point (8) as an annex, in order to facilitate the reading of this study, even if it is not academically correct.

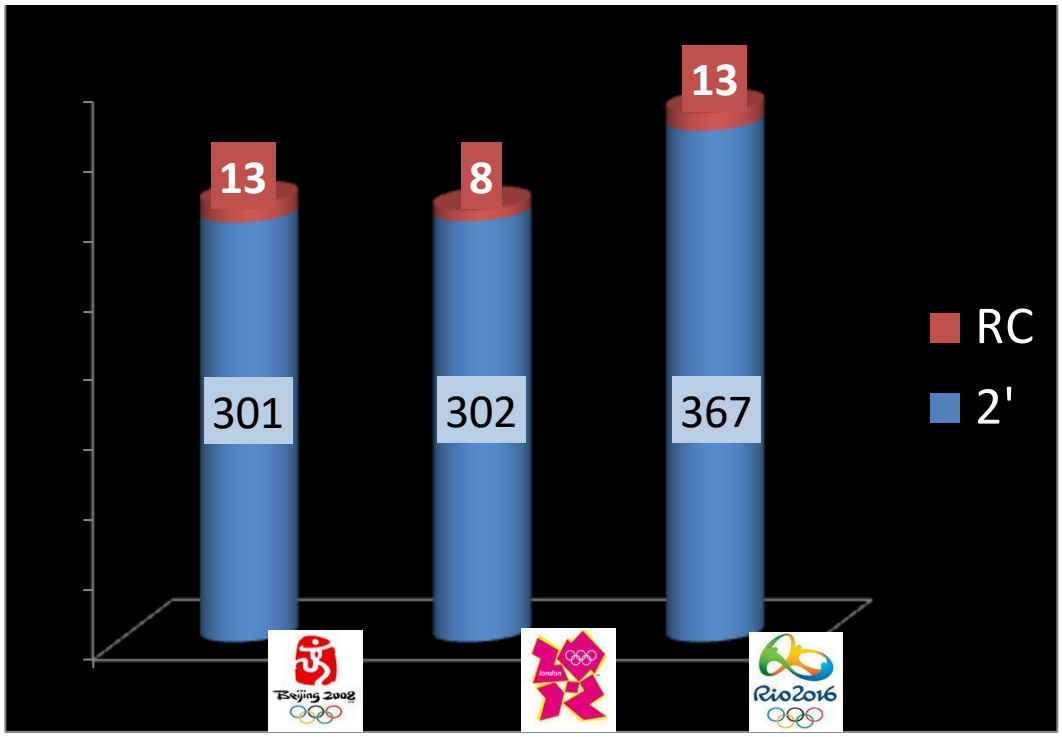
6 DISCUSSION *(In all cases referring to the offensive numerical inferiority situations)*

6.1 Number and average of disciplinary penalties

It is important to mention the increase in the disciplinary sanctions that have been received completely by the teams during the 2016 Rio Olympic Games when compared to the previous two Olympic Games. In Beijing 2008, 301 exclusions and 13 disqualifications were registered, in London 2012, 302 exclusions and 8 disqualifications, while in Rio a total of 367 exclusions [(2)] and 13 disqualifications were registered *(Graph 1)*.

[(1)] *From this point on and since our study focuses on the analysis of numerical inferiority offensive play, we will use the term disciplinary sanctions referring to those that imply a situation of numerical inferiority for the sanctioned team and that therefore will be limited to the exclusions and to the disqualifications, thus avoiding warnings (yellow cards)*

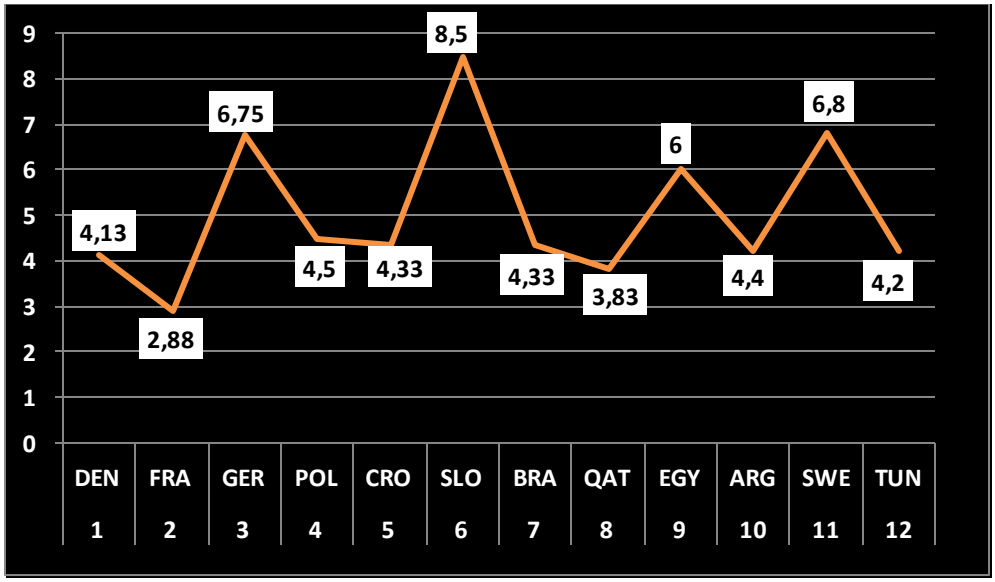
(2) If the data from this study is compared with the official statistics of the IHF, we can see two data that do not coincide (number of disciplinary sanctions for the teams from Egypt and Sweden), it is relevant to explain that these differences are due to one error in the official statistics of the IHF. In the match played between Egypt and Sweden (EGY-SWE), at minute 48':47" the exclusion of player no. 3 from Sweden, J. Gottfridsonn was registered, when the player sanctioned was actually Egyptian player no. 3 Aboubaid Mamdouh Taha.



Graph 1: Exclusions and disqualifications frequency at last Olympics meetings.

Without a doubt, the arbitral predisposition to reduce excessively hard or unsportsmanlike behaviour has been increased during this time and the application of disciplinary sanctions to combat this, has been emphasized, but, and this is something that is objectively impossible to ascertain. As a result of the data extracted in this study, in which we will see that the offensive efficiency does not decrease a great deal after suffering an exclusion, we could pose the first question to begin reflecting on the possible consequences of the modifications to the regulations applied for the first time during the Olympic tournament: Can there be less fear of suffering situations of numerical inferiority and, therefore, is there a tendency to increase defensive hardness?

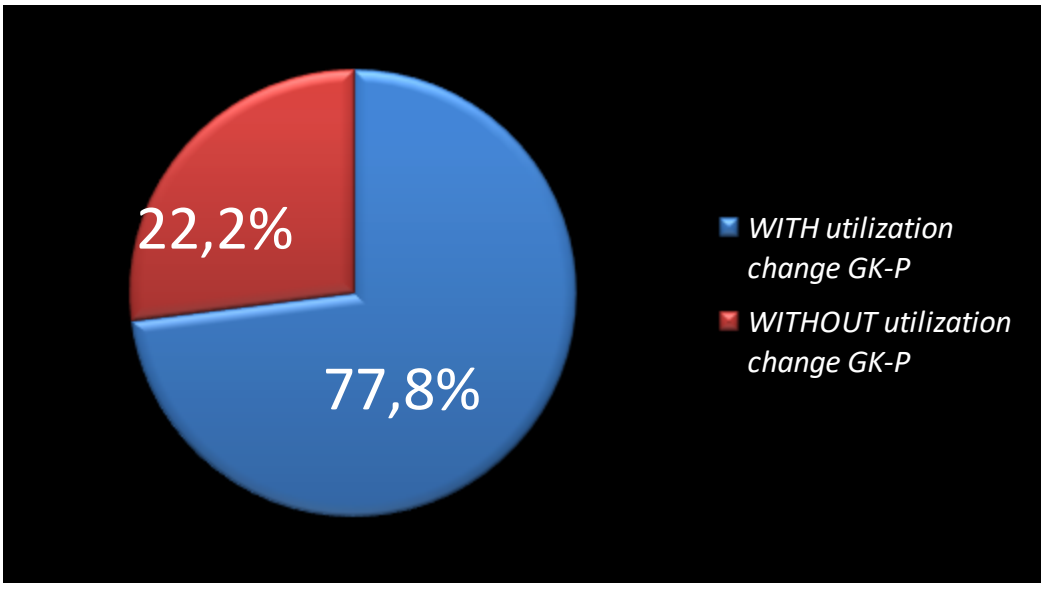
In terms of the sanctions average *(Table 3 Graph 2)* presented by the teams, we can see that there is no relationship between a greater or lesser average of disciplinary sanctions and the final ranking obtained in the competition.



Graph 2: Final classification obtained and exclusions average

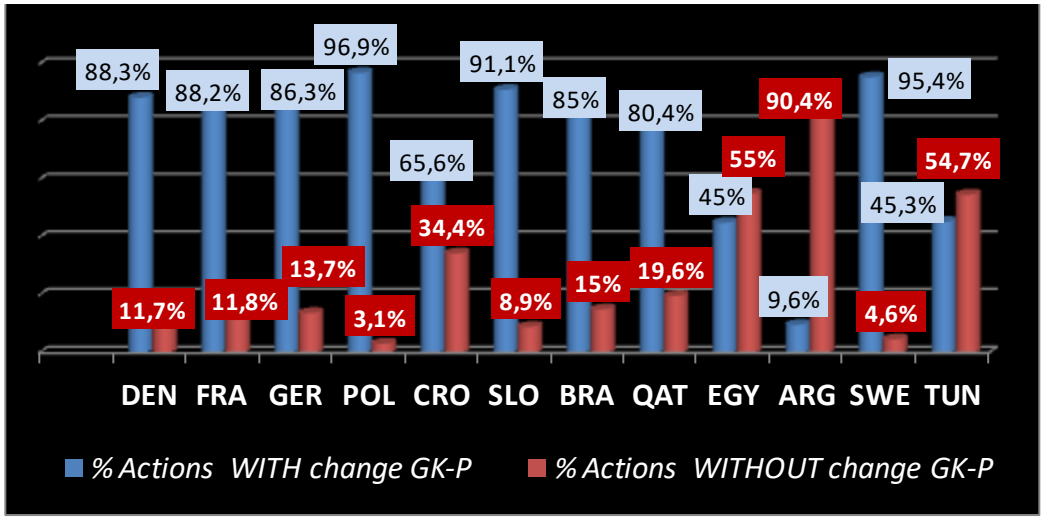
6.2 Use of the new regulations

Generally, in numerical inferiority offensive actions the goalkeeper-player change has been used in most instances (77.8%), in order to balance the numerical relation of players in attack even with the risk involved of playing without a goalkeeper *(Table 5 and Graph 3)*



Graph 3: Global average using the change goalkeeper–player in numerical inferiority situations

The individualised analysis of the teams *(Table 5 and Graph 4)* shows us a relationship between the use of change and the contending teams showing statistical significance *(p=0.000)*, mainly referring to teams from Argentina, Egypt and Tunisia, which are those who, to a lesser extent, used the goalkeeper-player change and to the teams from Poland, Sweden and Slovenia who most used this change *(Table 6)*. Likewise, it is important to note that three of the four teams (excluding Sweden) that were in the last ranking spots are those that used the goalkeeper-player change to a lesser average.



Graph 4: Percentage by teams of utilization of change GK-P in offensive numerical inferiority situations

6.3 Shots into an empty goal

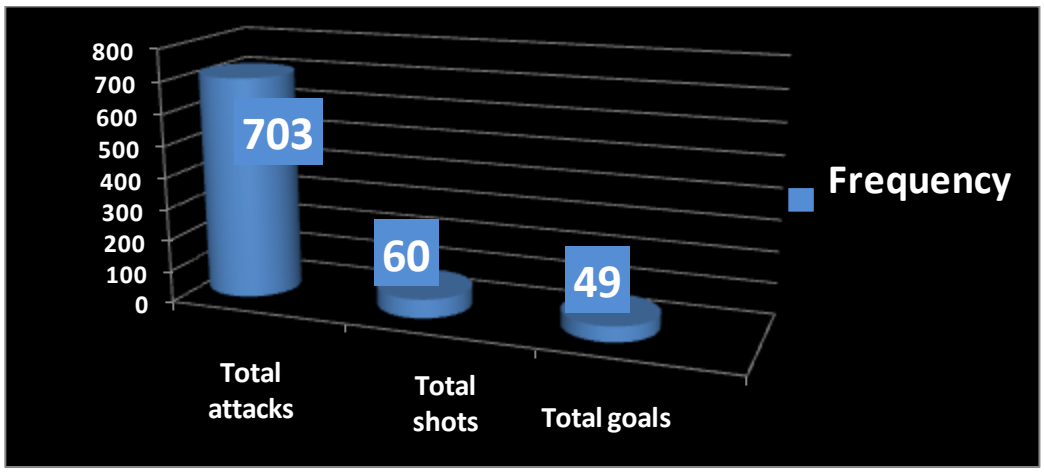
Surely the image of a shot made from a distant zone to an empty goal or with a goalkeeper who is running from the bench area has been one of the more striking of the Olympic handball competition. Because of the unusualness of this action so far, it has generated surprise for both those involved in the world of handball's different tiers and the mere spectators accustomed to watching our sport. The truth is that this image, which has sometimes happened during matches, seems to have become much more common and reflects the changes in the internal structure of the game.

Aside from what the spectator may assume, what does the use of the goalkeeper-player change really entail? We aim to find an objective answer through the

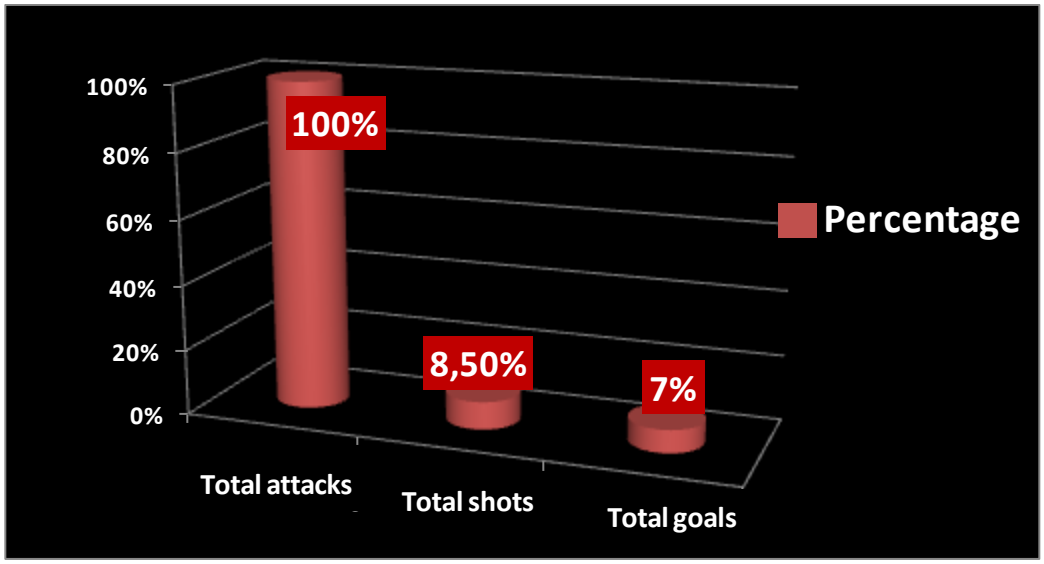
analysis of the data collected and attempt to answer a series of questions that can arise from the regulatory change.

Does it pose a great risk to those teams using it?
Statistically we can categorically answer: **No**.

There was 703 numerical inferiority attacks have been made using the goalkeeper-player change and only 60 shots have been made to an "empty goal" *(Table 8).* That is, only 8.5% of the cases in which there was an attack using the goalkeeper-player change, this tactical decision has brought a direct shot to the goal and only in 7% of cases this shot has resulted in a goal *(Graphs 5 and 6).*
That is, except in certain moments of the match (the author cannot forget what he saw on the first day of this Champions League competition during the match between Flensburg and Vezprem), final results with a draw match or winning with 1 goal, the use of the numerical inferiority attack "without a goalkeeper" does not involve significant risk or, to put it another way, implies an assumable risk.

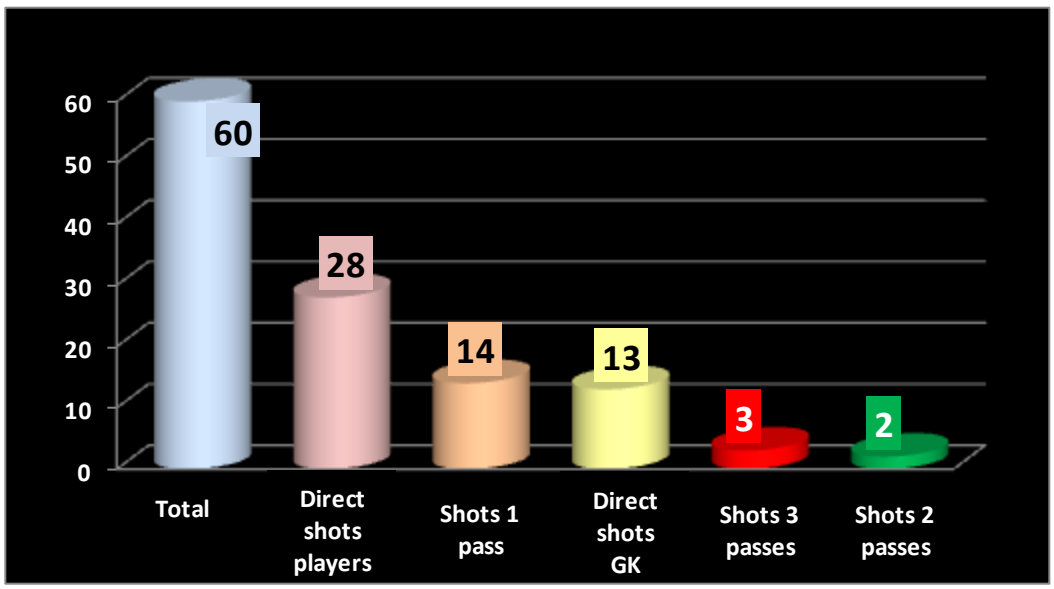


Graph 5: Global frequency of shots obtained against the teams that are using the GK-P with relationship to total actions performed



Graph 6: Global percentage of shots obtained against the teams that are using the GK-P with relationship to total actions performed

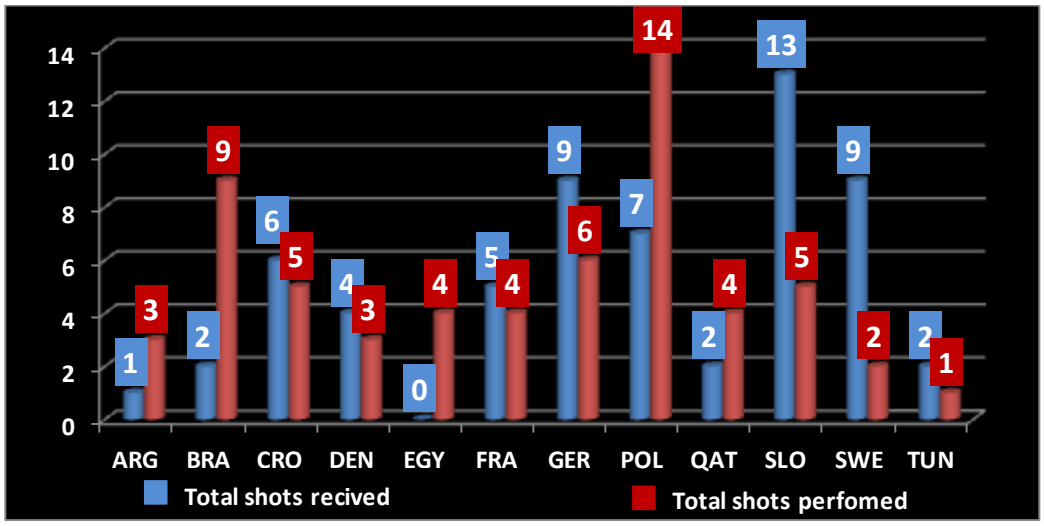
The largest number of direct shots to an "empty goal" is produced directly by field players (46.7%), followed by those who make a single pass before shooting (23.3%), then those direct shots made directly by the goalkeeper (21.7%), the shots made with a maximum of 3 previous passes (5%) and, lastly, those who from the moment of recovery of ball possession to the moment of shooting perform two passes (3.3%) *(Graph 7)*.



Graph 7: Frequency of goals achieved in function the GK-P change in relationship with the total shots

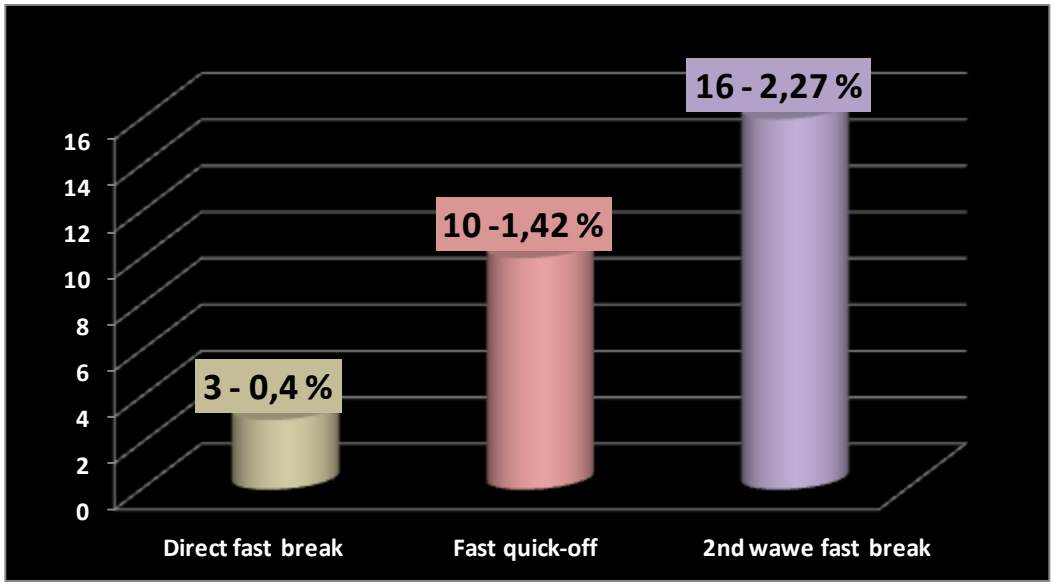
The shots made without the opposite goalkeeper being in the goal mainly happen when the attacking team makes a technical error (57.1%) and in the action subsequent to the stationary shot (221.4%) *(Table 7)*.

In terms of shots received and made *(Graph 8)*, it is important to note the 14 made by the Polish team and the 13 received by the Slovenian team throughout the championship. To further reinforce the idea of low risk that involves attacking in an numerical inferiority situation without a goalkeeper, this figure (maximum) of 13 shots received only represents 11.6% of the 112 attacks made in numerical inferiority and in those that the mentioned team used the goalkeeper-player change.



Graph 8: Goals by teams achieved in function of the use the change GK-P in relationship with the total actions performed

We also point out in this section the possible consequences that the attack in numerical inferiority -making the goalkeeper-player change- can involve difficulties for the attacking team in terms of undoing the change and organising at the moment when possession of the ball is lost and before the "fast" attacks from the rival team, that is, facing situations of fast quick-off, direct fast break or second wave fast break attacks. As in the case of shots to the empty goal, the chances and percentages in which the opposing team scores a goal during any of the fast break phases is extremely low *(Graph 9)*. On the one hand, it demonstrates the training of the teams so that the goalkeeper-player change and defensive organisation is fast and effective, while, on the other hand, it reaffirms that the risk of attacking without a goalkeeper and with numerical inferiority is not high.



Graph 9: Frequency and percentage by teams of goals achieved using fast attack immediately after to lose the possession the teams that make change GK-P

6.4 Result of the numerical inferiority actions

Of the categories designed and based on the final result of each recorded action, three groups of actions have been drawn up: positives, negatives or neutrals. A general calculation *(Table 11)* and another by team has been differentiated, discriminating between those in which the teams opted to make the goalkeeper-player change *(Table 12)* and in which the aforementioned change was not made *(Table 13)*.

"*Positive actions"* are the following categories registered within the criteria of "Results of numerical inferiority action" *(RSAI)*:

Goal achievement *(GOL)*; goal achievement and exclusion *(GOL+2')*; achievement of 7 mt. *(C7M)*; achievement of 7 mt. and warning *(C7MA)*; achievement of 7 mt. and exclusion *(C7M2);* achievement of 7 mt. and disqualification *(C7MD):* achievement of free throw and exclusion *(CGF2)* and achievement of free throw and disqualification *(CGFD).*

"Negative actions" are the following categories registered within the criteria of "Results of numerical inferiority action" *(RSAI)*:

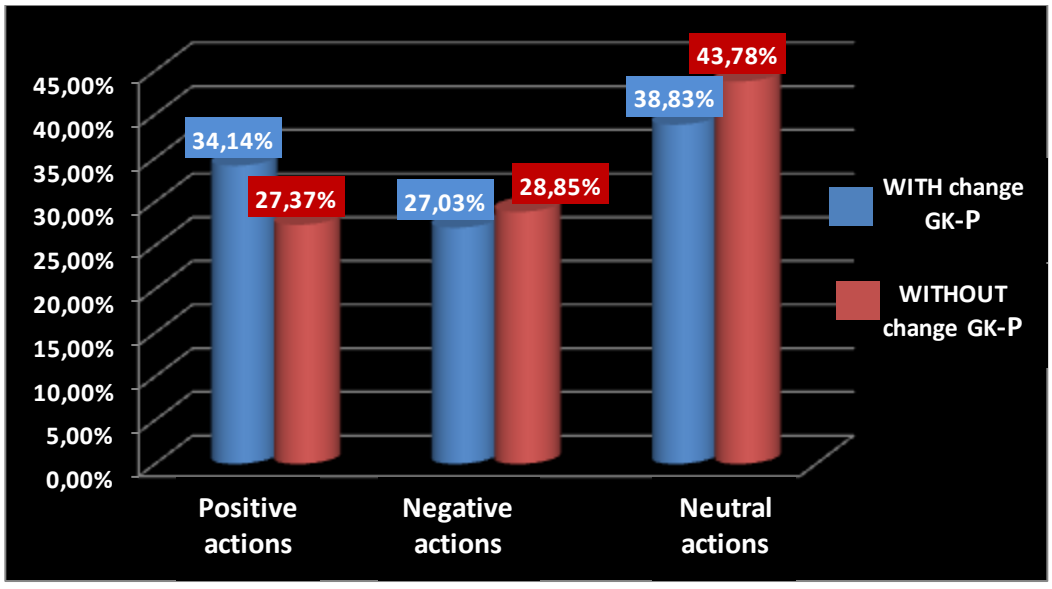
Regulatory mistake *(ER)*; technical mistake without interception *(ETSI)*: technical mistake with interception *(ETCI)*; saved shot *(PRD)*; missed shot *(FUE)*; shot to the post *(POS)* and blocked shot *(BLO)* (provided that it involves a definite loss of possession).

"Neutral actions" are the following categories recorded within the criteria of "Results of numerical inferiority action" *(RSAI)*:

Achievement of free throw *(CGF)*; achievement of free throw and warning; *(CGFA);* recovery of player excluded from team observed *(RCP_N)*; recovery of player excluded from opposing team *(RCP_N)*; blocked shot *(BLO)* (provided that this does not involve a definite loss of possession) and others *(Others)*

From this grouping of variables, the results generally obtained *(Table 11 and Graph 10)* indicate that these variables taken wholly do not present statistically significant differences *(p=0.187)*, whether or not the goalkeeper-player change is used. Percentage-wise, we can confirm that when the goal-keeper change was used, the positive actions are 6.77% greater, the negative actions 1.82% less and 4.95% less for the neutral actions when the aforementioned change was used *(Graph 10)*.

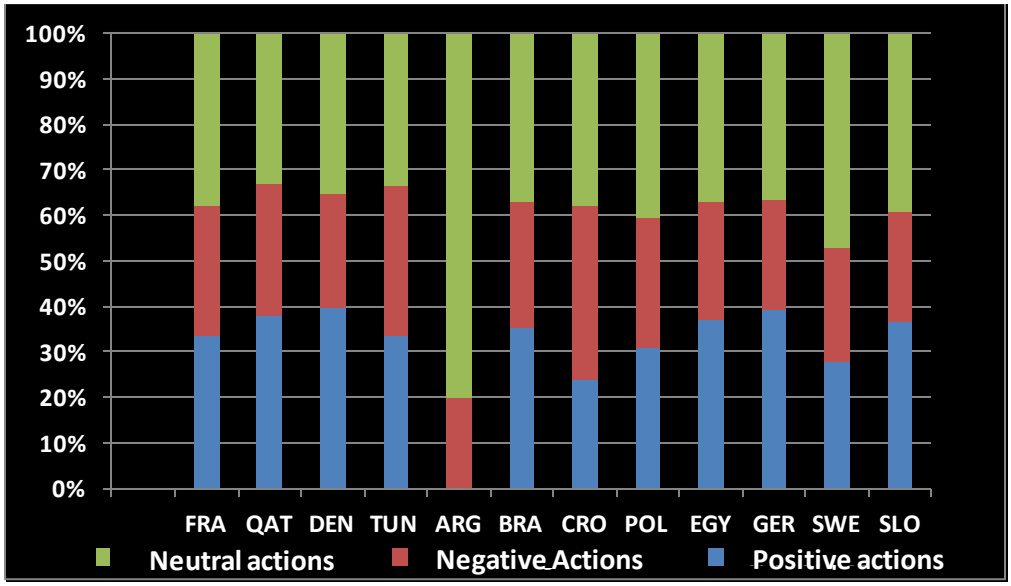
Therefore, if the increases of risk when implementing numerical inferiority attacks without the goalkeeper only involves, as well have seen in the above point, a minimum increase in risk in conceding a goal to the empty goal and involves an almost 7% increase in positive actions, it is possible to argue that the disciplinary sanctions that involving exclusion lose, if the modification to the regulations is exploited, part of the disadvantage that they caused before the new rules went into force.



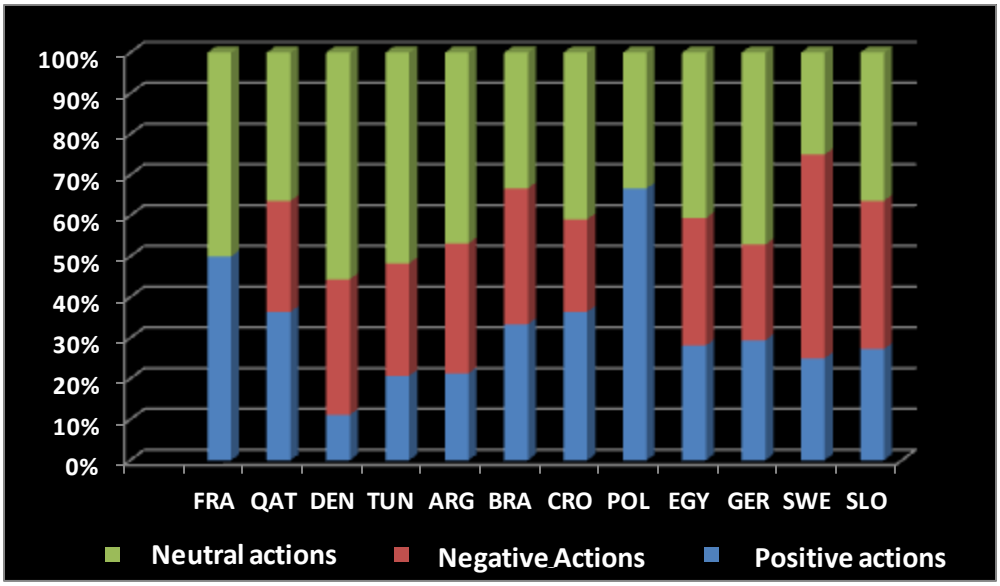
Graph 10: General percentage using change GK-P in function of the result obtain

Our opinion as observers based on the data obtained can be justified according to the belief that the attacks in which the goalkeeper-player change is not used, the teams attempt to secure free throw situations in order to increase possession time (neutral actions), risk little in their final attacks, which balances the errors in each case (negative actions), and achieve fewer offensive successes (positive actions) as a result of the previous circumstances

Therefore, after analysing the data obtained, we could say that there are no excessive differences between teams in terms of positive actions with and without the goalkeeper-player change *(Graphs 11 and 12);* that in terms of negative actions, and with the exception of Argentina, there also are no significant differences between teams, in the computation of neutral actions where there is a greater percentage difference specifically for the teams of Argentina, Egypt and Tunisia (those that are fewer use the goalkeeper-player change). This circumstance could be attributed to the search by the team that does not use the modification to the regulations to carry out positional attack phases, which thorough the implementation of individual and collective actions that lead to a free throw, to help maintenance of possession of the ball to a greater extent, rather than achievement of a goal during the time in which the team remains in an numerical inferiority situation.

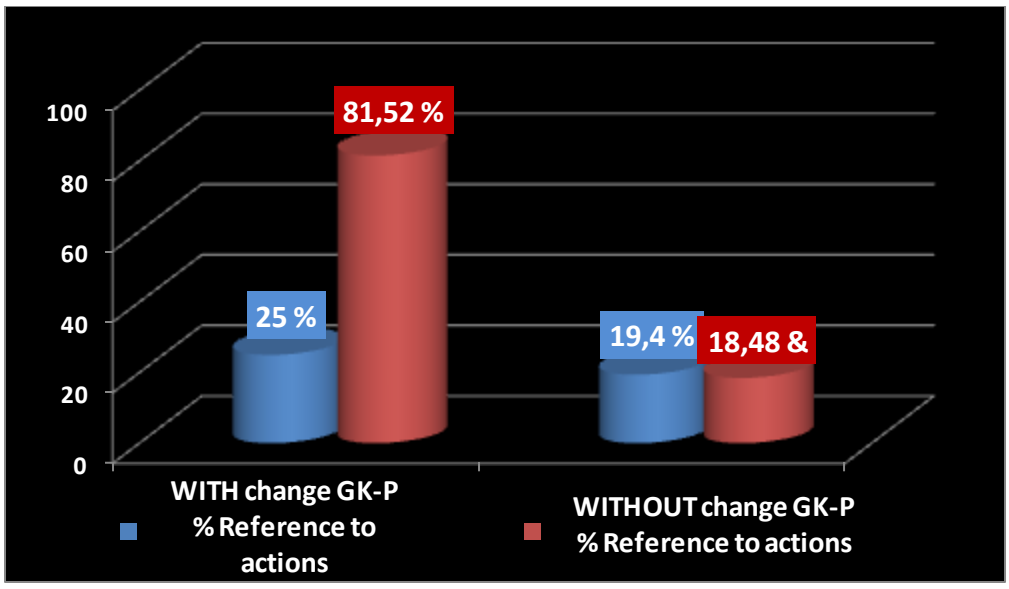


Graph 11: Percentage by teams using the change GK-P in function of the result obtained



Graph 11: Percentage by teams that don´t use the change GK-P in function of the result obtained

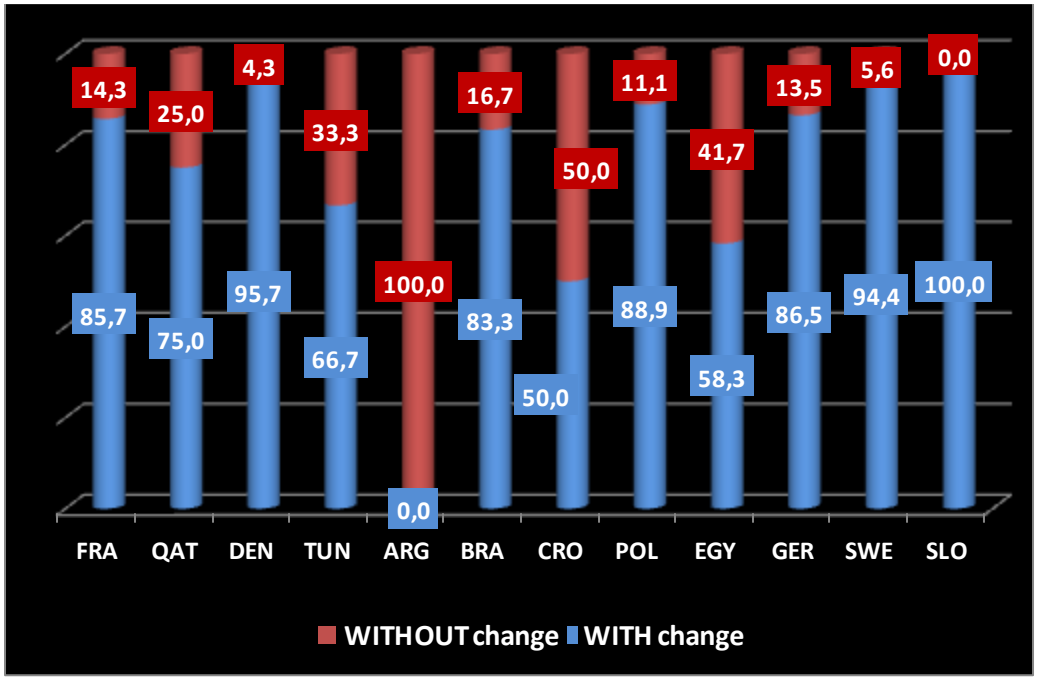
Restricted to goals obtained *(Table 17 and Graph 13)* in this section, of the total number of goals scored in general offensive situations of numerical inferiority 5.6% more goals were achieved when the teams used the goalkeeper-player switch, reinforcing this data yet again regarding the reduction of the punitive character of the disciplinary sanctions. This difference obviously arises from the number of occasions that the teams used the new regulations.



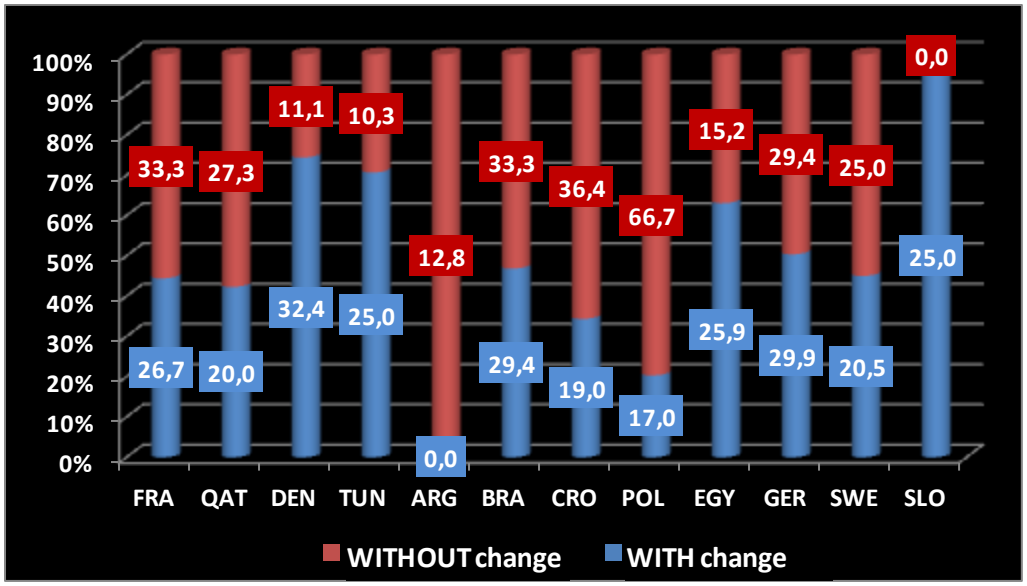
Graph 13: General average of goals in function the utilization of change GK-P

According to the distribution of goals obtained by teams, we have calculated two percentages, one based on the number of goals obtained for each in numerical inferiority team *(Graph 14)* and a second based on the total number of actions that each one of the teams executed in the same numeric situation *(Table 18, Graph 15)*. In the first case (goals), only the Argentine team did not score making the goalkeeper-player change while the Croatian team made the same number of goals using both the change and playing with one less player during attack (this fact is reflected in *table 15* on the comparison of proportions and in which only the Balkan and Danish teams are proportionally related). The rest of the teams, including Egypt and Tunisia, which did not use the change as much, present much higher values in those cases where the new regulations were used.

In the second case (actions), the difference is not as significant but the percentage of goals when the goalkeeper-player change is used reaches 4.4.% more than when not used. In particular, the teams of France, Qatar, Argentina, Brazil, Croatia and Sweden show a lower percentage of goals in the game with the goalkeeper-player change but does not wholly alter the percentage weight of the rest of the teams.



Graph 14: Percentage by teams of goals obtained in function of using the change GK-P and in relationship with the total of goals obtained



Graph 15: Team's percentage of goals obtained in function the change GK-P and in relationship with the total actions performed

6.5 Partial result at the time of registering the action

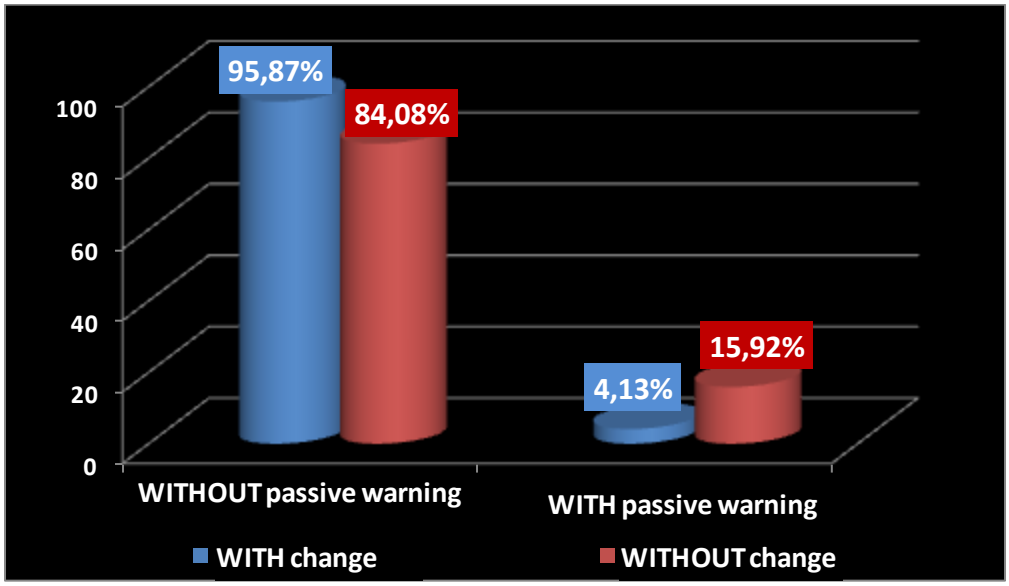
When do coaches mostly use the goalkeeper-player change? We can answer that based on the results obtained, in general there is not significant statistical differences *(Table 20)* to define a pattern of game use with the goalkeeper-player change or without it in numerical inferiority situations according to the partial result of the match and, therefore, we could argue that except in circumstances in which the partial result is combined with the match time, the coaches are in favour of taking advantage of the modification to the regulations, more to look for attacks in situations of 6x6 (without goalkeeper) than according to the criteria with which we are now dealing. From the analysis by teams *(Tables 21 and 22),* statistically significant results have been obtained *(Table 23),* where we can observe some proportional relationships *(Tables 24 to 30)* in the case of results of +4 or more goal or -4 or less goal difference as well in those cases of ties.

6.6 Actions with or without warning of passive play

The results obtained from the registering of the actions performed under the referees warning of passive play indicate that 15.9% of these are indicated in cases in which the teams do not make the goalkeeper-player change and only 4.1% when the attackers used the change. In other words, the teams that make the goalkeeper-player change suffer the warning of referees in 11.8% fewer

occasions than those who do not (Graph 15). Another piece of data to take into account to demonstrate the advantages to the attacking in numerical inferiority attacking team offered by the new regulations.

In view of the general proportionality tests, it can be stated that these percentages are statistically significant. *(Table 31)*



Graf 15: Percentage by teams of goals obtained in function of the use the change GK-P & in relationship with total actions performed

6.7 Attacks and sub attacks for each exclusion period

In this point, we analysed the data registered according to the number of attacks and sub attacks that occur during each period of exclusion. *(Tables 36, 37, 39 and 40)*. For clarification, the definitions of the terms attack and sub attack are found below:

Attack:

Period from which the team in numerical inferiority (observed team) initiates ball possession and until when it definitively loses possession of the ball

Example:

- The goalkeeper save a ball and with intermediate actions in a positional play, a player shot to the goal, either scoring or missing.
    - **Registered as "Attack 1 – Sub attack 1"**

- If during the exclusion period the observed team performs a second similar action (began with possession and final loss)
    - **Will be registered as "Attack 2 – Sub attack 1"**

Sub attack:

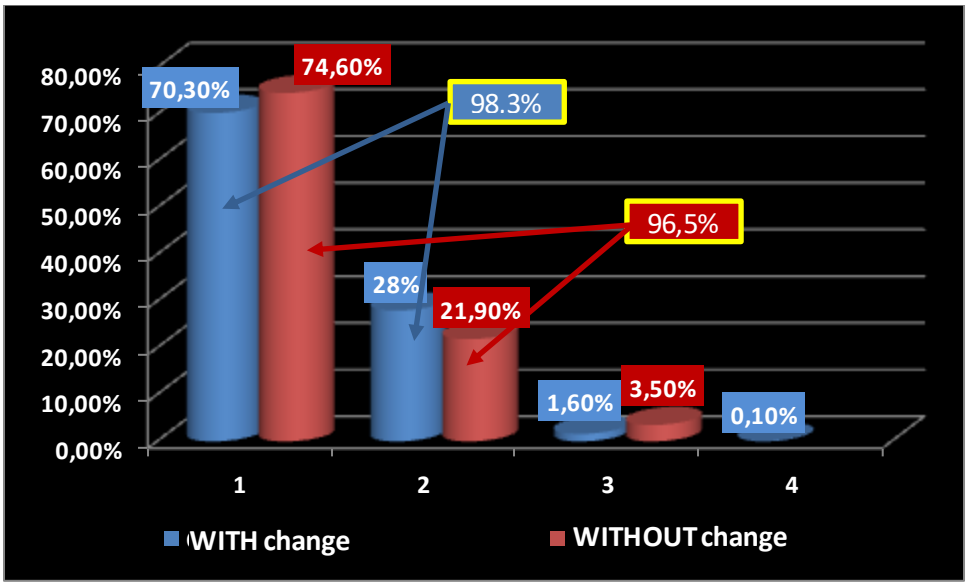
Period from which the team in numerical inferiority (observed team) initiates ball possession and until when it definitively loses possession of the ball or when there is an action that temporarily interrupts the attack.

Example:

The goalkeeper save a ball and with intermediate actions in a positional play, and a player has a free throw.

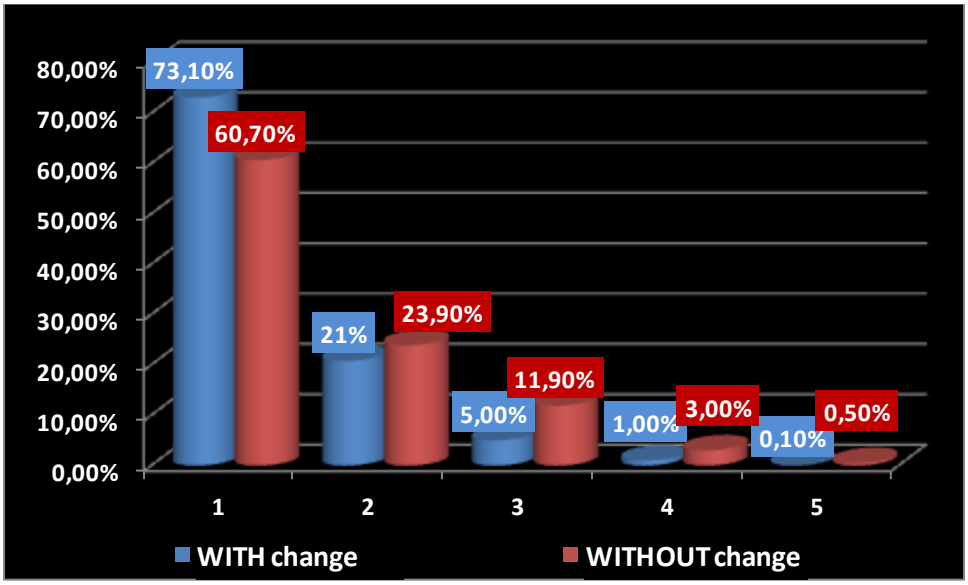
- **Registered as "Attack 1 – Sub attack 1"**
    - Play continues and after the free throw a player scores o shot out
- **Registered as "Attack 1 – Sub attack 2" (and so on)**

Once the concepts of attack and sub attack have been determined, we have observed that there are no statistically significant differences between the number of attacks that the team makes during the period that a disciplinary sanction forces them to perform their action in numerical inferiority *(Table 36 and Graph 16)*, with two attacks, at 98.3% (in the case of teams that make the change) and 96.5% (in the case of teams that do not make it), the number of occasions in which there is an attack in an outnumbered situation during the period of exclusion.



Graph 16: Attacks percentage during the exclusion period

As for sub attacks, if differences can be established between the use of the goalkeeper-player change. In the case of the teams that use it, in 73.1% of the cases a sub attack is enough to complete the cycle of possession of each attack, while the teams that do not use the change, this first sub attack only means 60.7%. If we add a second sub attack, the total number of teams that make the change increases to 94% while those that do not amount to 84.6%, which is why in 11.9% of instances, a third sub attack is added to complete the cycle of possession *(Table 37 and Graph 17)*



Graph 17: Sub attack's percentage in each attack

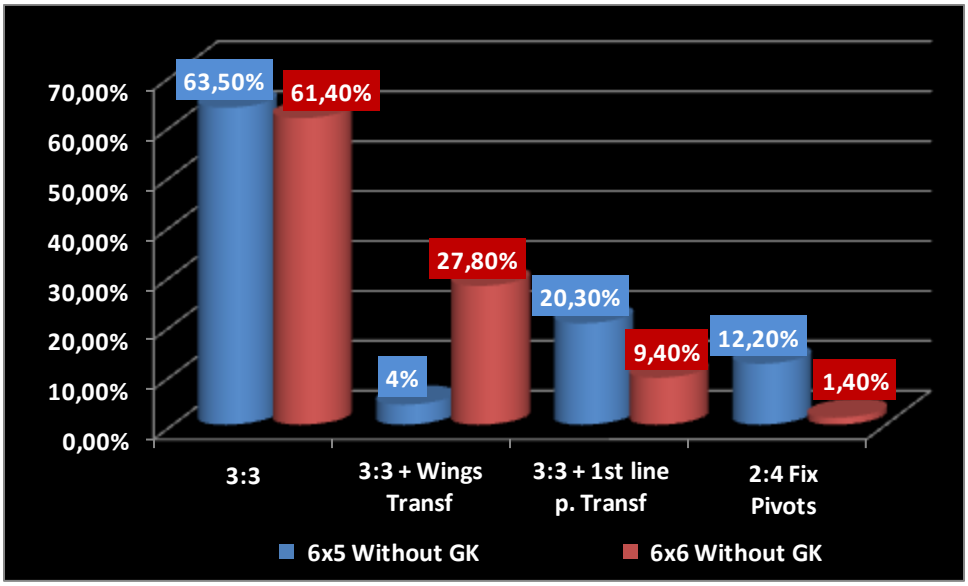
Therefore, interpretation of this data leads us to determine that the teams that do not make the goalkeeper-player change attempt to slow their possession through the pursuit of free throws in order to avoid more attacks in situations of defensive inferiority, while the teams that use the change intend to carry out an attack whose objective is more focused on obtaining a goal than allowing the sanction time to be depleted.

6.8 Play system used by teams that make the goalkeeper-player change

With analysis of this situation, we intend to establish whether the teams that make the goalkeeper-player change usually use some type of offensive system to benefit both the attack and the change player-goalkeeper that they must do order to facilitate a better and faster defensive organisation. In the cases of 6x6 and

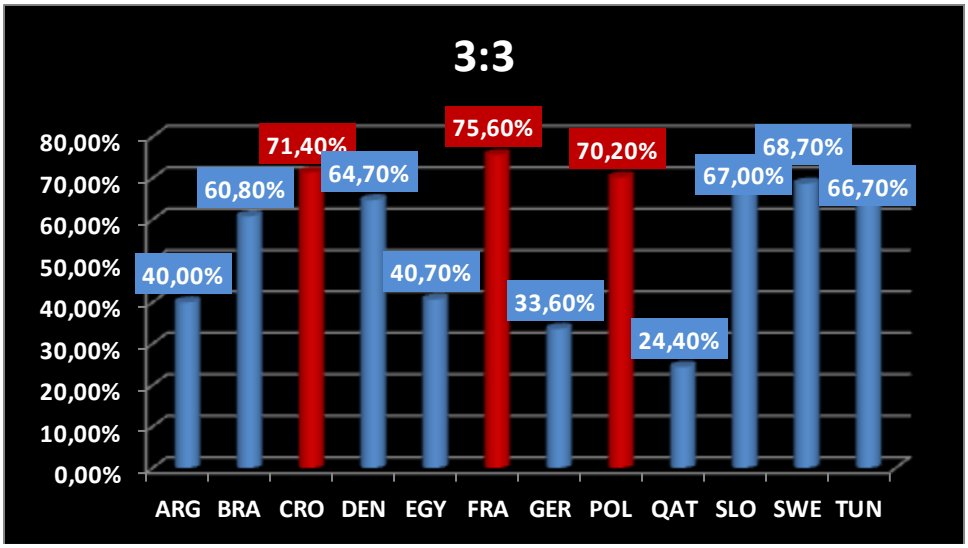
6x5 attack (in the latter case there are two teams with a player excluded and the attacking team makes the goalkeeper-player change), we observe greater use of traditional play with an offensive disposition 3:3, followed by the use of the transformation of wings to second pivot and, finally, the actions of transformation of the back court players to second pivot *(Table 50)*.

We have kept from our analysis those systems that present a 2:3 and 3:2 arrangement (shown in table 50) when dealing with situation in which the teams have two sanctioned players or other types of casuistry with low frequency. *(Graph 18)*

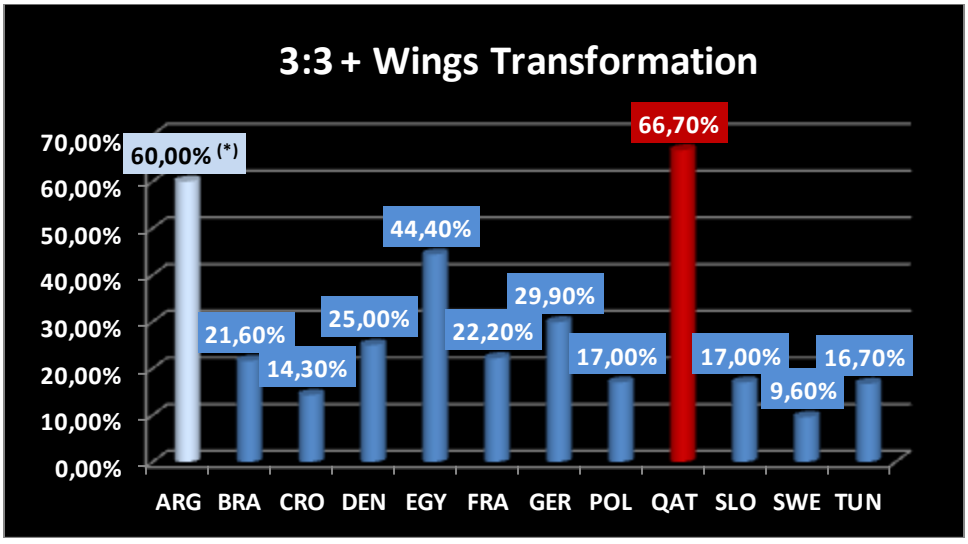


Graph 18: Percentage of the systems used by teams that performed change GK-P in numerical situation 6x6 & 6x5

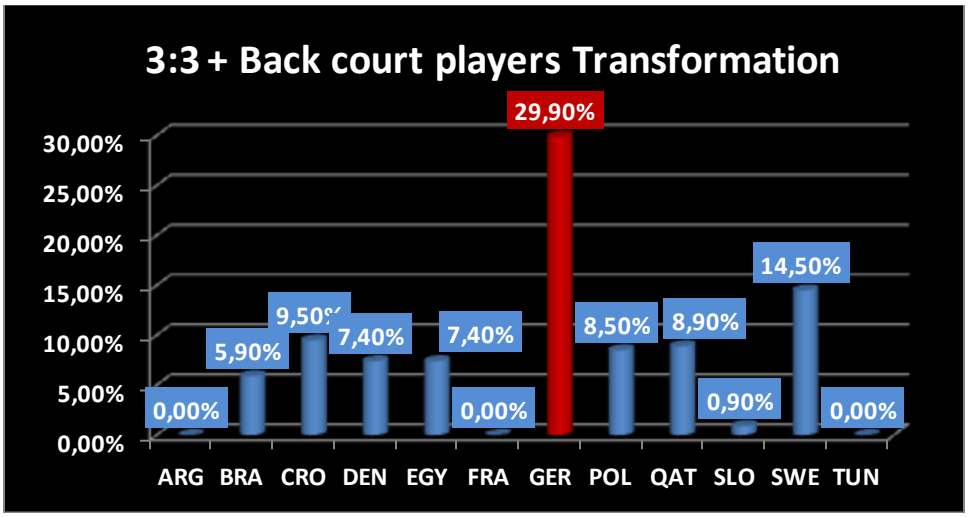
In terms of the preference for the systems used by the teams, the use of the 3:3 system is emphasized (>70%) by the national teams from Denmark, France and Poland *(Graph 19);* the transformation of wings to second pivot is led by Qatar (66.7%) (the percentage of the Argentine team is 60% but the frequency is very low therefore it cannot be taken into account too much) *(Graph 20)*, while the 3:3 system with back court players transformation is mainly used by Germany (29.9%).



Graph 19: Percentage of the system 3:3 using by teams that performed change GK-P in numerical situation 6x6 & 6x5



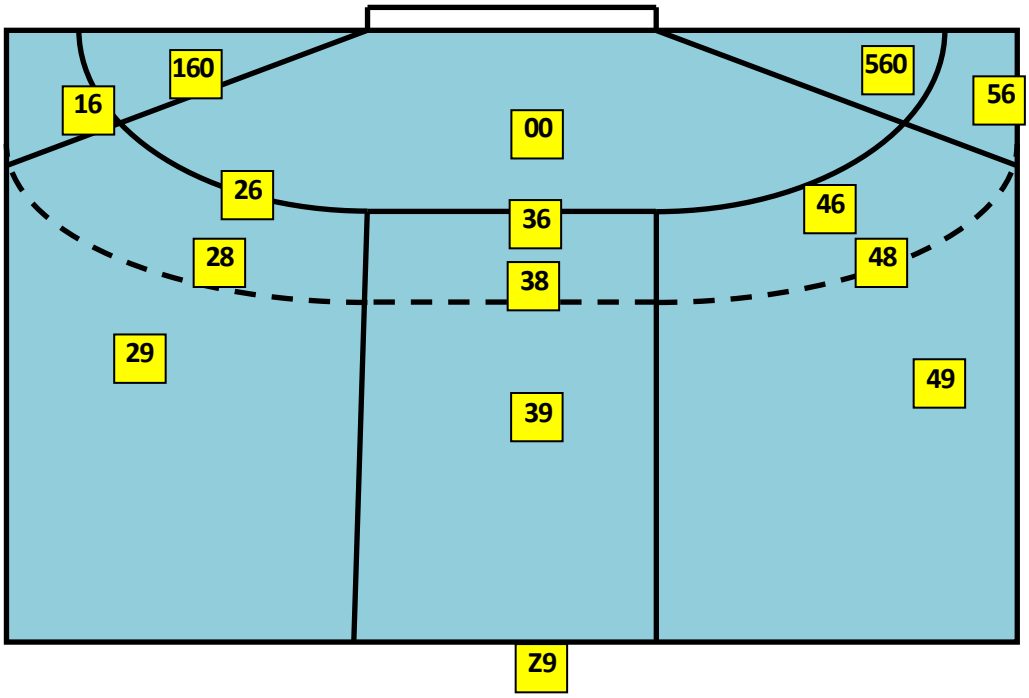
Graph 20: Percentage of the system 3:3 + Wings transformation using by teams that performed change GK-P in numerical situation 6x6 & 6x5



Graph 21: Graph 20: Percentage of the system 3:3 + Back court players transformation using by teams that performed change GK-P in numerical situation 6x6 & 6x5

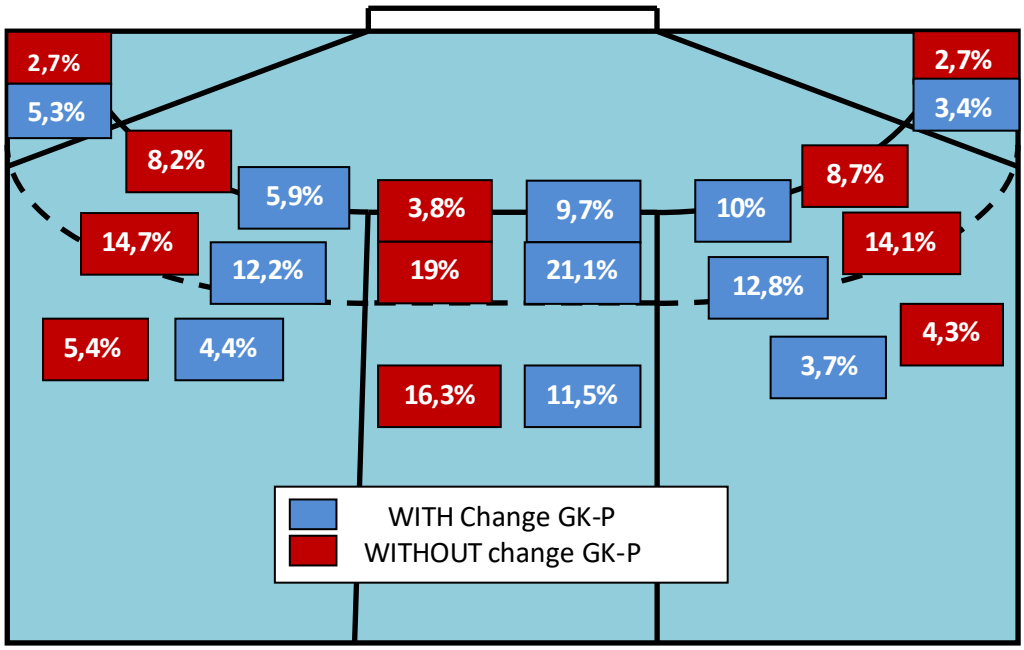
6.9 Finalization zone used

The finalization zones can be seen in the following graph *(Graph 22)*



Graph 22: Finalizations zones distribution's

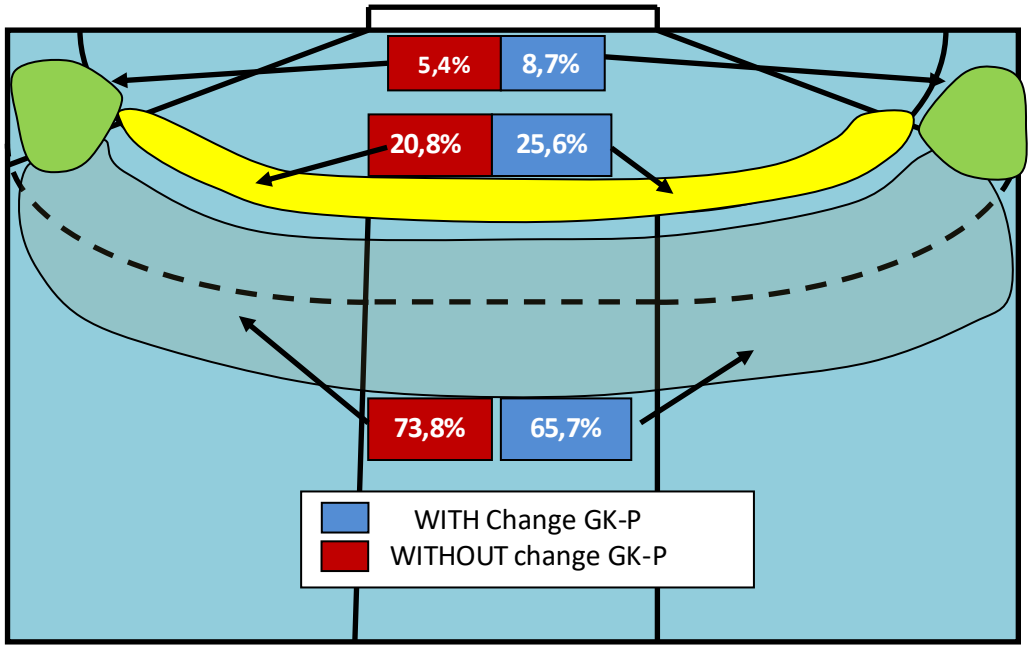
As seen *(Table 55 and Graph 22)*, the percentages referring to shots zones do not excessively differ whether or not the change of goalkeeper-player is used.



Graph 22: Percentage by zones of finalization

Only a small percentage of inequality exists if we group the zones *(Graph 23)* so that we wholly consider the shot zones in the wing, pivot and back court players. In this case, we can underscore that in those teams in which the change is made, the percentage in the shot zones of the wings increases 3.3% and in the execution zone of the pivots (6 metre line) 4.8% at the expense of the shots of the back court players, which logically decreases by 8.1%.

Obviously, the numerical inferiority play without a goalkeeper implies a numerical situation of offensive-defensive equality that allows the game in width (hence the increase in shooting percentage at the wings) and in depth (hence the increase in spaces for play with pivot), which is difficult in 5x6 play situations (without goalkeeper-player change) and that appears to tend to finish at a higher percentage of back court players.



Graph 23: Distribution of percentage grouped by finalitation's zones

As for the result by team *(Tables 56 and 57)*, it is important to note that in the situations where the teams use the goalkeeper-player change, the teams from Denmark, Germany, Slovenia and Tunisia are above the average (8.7%) in percentage of shots from the wings. Egypt, Germany, Poland and Slovenia have higher values than the average (25.6%) in shots from the 6 metre line. Argentina,

Brazil, Croatia, France, Qatar and Sweden surpass the average (65.7%) of the shots made by back court players.

In the situations in which the goalkeeper-player change was not made, the average of shots from the wings (5.40%) is surpassed by Argentina, Brazil, Denmark, Germany, Qatar and Slovenia. Brazil, Egypt, France, Germany, Poland and Qatar exceed the average (20.8%) in the 6 metre zone. And shots made from the action area on the back court players come from the national teams of Argentina, Croatia, Denmark, Slovenia, Sweden and Tunisia, topping the average (73-8%).

7. CONCLUSIONS

The competition studied, the 2016 Olympic Games in Rio de Janeiro, the number of disciplinary penalties that entail exclusion increased, in comparison to the two previous Olympic competitions: Beijing 2008 and London 2012.

- No relationship was found between the average of exclusions suffered by each team in the matches played and the final ranking obtained
- The goalkeeper-player change has been used mainly in the positional attack phase in this competition, when the teams are in an offensive situation of numerical inferiority.
- In situations of numerical inferiority, the use of the goalkeeper-player change results in an acceptable risk because of the small number of direct goals (to an empty goal) that result.
- The attacks immediately subsequent to the loss of possession by the team in numerical inferiority in the form of a fast quick off, direct fast break or fast break in second-wave pose low risk in terms of receiving a goal because of possible defensive disorganisation caused by the necessary change of the player by the goalkeeper.
- The result of the actions in which the teams have made the goalkeeper-player change, both in the so-called positive actions and exclusively limited to goals, has resulted in a higher percentage, therefore the idea of a search for offensive success is reinforced, which is the numeric relationship and suitability of performing a substitution of a goalkeeper for a field player.

- For the teams that did not make the goalkeeper-player change, the so-called neutral actions were percentage-wise higher, since the willingness to perform attacks, through the attainment of free throw, is lengthened in time to try to reduce the number of defensive numerical inferiority actions.
- There were not relationships between the use of the goalkeeper-player change and the marker that was reflected at the moment when it was decided whether or not to make the change.
- The percentage of actions where there was warning of passive play to the team that was attacking in a situation of numeric inferiority without making the goalkeeper-player change was significantly higher than those teams who made the change.
- The number of attacks that the teams make in a situation of offensive numerical inferiority in the positional phase during the exclusion period does not present a significant percentage difference between the teams making the goalkeeper-player change and those not making the change.
- The teams that do not make the goalkeeper-player change in situations of offensive numerical inferiority in the positional phase during the exclusion period present a higher percentage of sub-attacks than those teams who make the change.
- The play systems used for the teams that make the goalkeeper-player change are mostly 3:3, 3:3 with transformation of wings to double pivot and 3:3 with transformation of back court players to double pivot.
- The teams that make the goalkeeper-player change share better distribution percentage-wise of the shot zones. The teams that do not make the change present a greater percentage of shot centring on the central outer zones.

In light of these conclusions the author considers:

- The use of the goalkeeper-player change in offensive situations of numerical inferiority during the positional phase may be considered positive for the teams that use it in that it offers more advantages than disadvantages.
- The punishment reduction is at least questionable that those infracting teams only suffer numerical inferiority in the defensive phase given that based on the results, the risk of play without the goalkeeper during the offensive risk is acceptable.

8. ANNEX

As we have explained in point 5 (Results), we have determined to show in point 8 (Annex) the results tables that have been obtained from the statistical treatment of the records collected. Our only interest is to offer the reader greater agility when reading this study and to also offer, in the case that it interest him or her, the possibility of reviewing the aforementioned data.

Clarifying note: As can be observed in some of the proportion comparison tables, below there are some symbols, -.(a) y .(b), in which some of the variables are not compared. This happens because the test used (test Z for variable comparison) includes a series of conditions that in some cases are not fulfilled. Their meaning is as follows:

.(a) This category is not used in comparisons because its column proportion is equal to zero or one.

.(b) This category is not used in comparisons because the sum of case considerations is less than two

In the cases where these symbols only appear within the comparison table, both the size of the table and its interior will be reduced in size as it does not contain valuable data.

8.1 Results of the number and average of exclusions by team

In this section the data regarding the total of exclusions and disqualifications along with the average per match of each one of the participating teams in al of the matches played at the 2016 Rio Olympic Games is reflected *(Table 3)*

Classific.	Team	Matches played	Number. exc+desq	Match aver. ($\bar{X}$)
2	FRA	8	23	2,88
8	QAT	6	23	3,83
1	DEN	8	33	4,13
12	TUN	5	21	4,2
10	ARG	5	22	4,4
7	BRA	6	26	4,33
5	CRO	6	26	4,33
4	POL	8	36	4,5
9	EGY	5	30	6
3	GER	6	54	6,75
11	SWE	5	34	6,8
6	SLO	6	51	8,5
Total			379	9,97

Table 3: Final classification, total exclusions, disqualifications & teams average by match.

Below we present the maximum and minimum number of exclusions and disqualifications that occurred in all of the matches played *(Table 4)*

N. Maximum exclusions (+RC) of one team	*13*	*SLO*	*BRA_SLO*
Nº Minimum exclusions (+RC) of one team	*1*	*FRA QAT*	*FRA-TUN GER-QAT*
N. Maximum exclusions (+RC) in 1 match	*19*	*BRA-SLO*	
Nº Minimum exclusions (+RC) in 1 match	*5*	*CRO-TUN*	

Table 4: Exclusions y disqualifications: Maximum & minimum

8.2 Results according to use of new regulations

In the table below are the registering of the frequencies and percentages of actions observed, differentiating those where the teams chose to perform the goalkeeper-player change and those in which the aforementioned change did not occur *(Table 5)*.

Classific.	*Team*	*Observed actions*	*Without change GK-P*	*%*	*Without change GK-P*	*%*
1	*DEN*	*77*	*9*	*11,7 %*	*68*	*88,3 %*
2	*FRA*	*51*	*6*	*11,8 %*	*45*	*88,2 %*
3	*GER*	*124*	*17*	*13,7 %*	*107*	*86,3 %*
4	*POL*	*97*	*3*	*3,1 %*	*94*	*96,9 %*
5	*CRO*	*64*	*22*	*34,4 %*	*42*	*65,6 %*
6	*SLO*	*123*	*11*	*8,9 %*	*112*	*91,1 %*
7	*BRA*	*60*	*9*	*15 %*	*51*	*85 %*
8	*QAT*	*56*	*11*	*19,6 %*	*45*	*80,4 %*
9	*EGY*	*60*	*33*	*55 %*	*27*	*45 %*
10	*ARG*	*52*	*47*	*90,4 %*	*5*	*9,6 %*
11	*SWE*	*87*	*4*	*4,6 %*	*83*	*95,4 %*
12	*TUN*	*53*	*29*	*54,7 %*	*24*	*45,3 %*
	Total	*904*	*201*	*22,2%*	*703*	*77,8 %*
J^2 Pearson	***p=,000***					

Table 5: Frequency & percentage by teams of the total of observed actions with and without change GK-P

	DEN	ARG	SWE	TUN	FRA	GER	POL	CRO	SLO	BRA	QAT	EGY
	(A)	*(B)*	*(C)*	*(D)*	*(E)*	*(F)*	*(G)*	*(H)*	*(I)*	*(J)*	*(K)*	*(L)*
Without change GK-P		A C D E F G H I J K L		A C E F G I J K				C G I			G	A C E F G I J K
With change GK-P	B D L		B D H L	B	B D L	B D L	B D H K L	B	B D H L	B D L	B D L	B

Table 6: Comparison of proportions (Test Z) by teams of the total of observed actions with and without change GK-P

8.3 Results according to throws to empty goal

Below is the data of the throws executed and received into the empty goal, in general and by team, as a result of the attack of numerical inferiority teams who used the goalkeeper-player change *(Tables 7, 8, 9 and 10)*

	Shot 1 pass	***Shot 2 passes***	***Shot 3 passes***	***Shot. Direct GK***	***Shot. direct Players***	***Total***
Ball Blocked					*1*	*1*
Regulatory Error	*4*	*0*	*1*	*1*	*3*	*9*
Technical Error without interception	*4*	*1*	*1*	*0*	*11*	*17*
Technical Error without interception	*4*	*0*	*0*	*8*	*5*	*17*
Out	*0*	*1*	*0*	*1*	*0*	*2*
Save	*2*	*0*	*1*	*3*	*6*	*12*
Post					*2*	*2*
Total	*14*	*2*	*3*	*13*	*28*	*60*

Table 7: General frequency of shots to empty goal immediately after attacks in numerical inferiority with goalkeeper-player change and causes of loss of possession in attack

	Shot 1 pass	***Shot 2 passes***	***Shot 3 passes***	***Shot. Direct GK***	***Shot. direct Players***	***Total***	***%***
Goal	*13*	*1*	*2*	*11*	*22*	*49*	*81,6*
Save			*1*			*1*	*1,7*
Out	*1*			*2*	*6*	*9*	*15*
Ball blocked		*1*				*1*	*1,7*
Total	*14*	*2*	*3*	*13*	*28*	*60*	

Table 8: Result of shots to empty goal

	Shot 1 pass	Goal	Shot 2 passes	Goal	Shot 3 pass	Goal	Shots Direct GK	Goal	Shots direct Play.	Goal	Total Shots	Total Goals
ARG	1	1	0	-	0	-	0	-	0	-	1	1
BRA	2	2	0	-	0	-	0	-	0	-	2	2
CRO	1	1	0	-	0	-	0	-	5	4	6	5
DEN	1	1	1	0	0	-	0	-	2	2	4	3
EGY	0	-	0	-	0	-	0	-	0	-	0	-
FRA	0	-	0	-	0	-	1	0	4	2	5	2
GER	5	4	0	-	1	0	1	1	2	2	9	7
POL	0	-	1	1	0	-	3	3	3	3	7	7
QAT	0	-	0	-	0	-	0	-	2	2	2	2
SLO	3	3	0	-	2	2	4	4	4	2	13	11
SWE	1	1	0	-	0	-	3	2	5	4	9	7
TUN	0	-	0	-	0	-	1	1	1	1	2	2
Total	14	13	2	2	3	2	13	11	28	22	60	49

Table 9: Frequency by teams of shots and goals received to empty goal

	Shot 1 pass	Goal	Shot 2 passes	Goal	Shot 3 pass	Goal	Shots Direct GK	Goal	Shots direct Play.	Goal	Total Shots	Total Goals
ARG	-	-	1	0	-	-	-	-	2	1	3	1
BRA	2	2	-	-	1	1	4	3	2	1	9	7
CRO	1	1	-	-	-	-	1	0	3	3	5	4
DEN	1	1	-	-	-	-	-	-	2	1	3	2
EGY	1	1	1	1	1	1	-	-	1	0	4	3
FRA	1	1	-	-	-	-	2	2	1	1	4	4
GER	-	-	-	-	-	-	4	4	2	2	6	6
POL	5	5	-	-	-	-	2	2	7	6	14	13
QAT	1	0	-	-	-	-	-	-	3	2	4	2
SLO	-	-	-	-	1	0	-	-	4	4	5	4
SWE	2	2	-	-	-	-	-	-	-	-	2	2
TUN	-	-	-	-	-	-	-	-	1	1	1	1
Total	14	13	2	1	3	2	13	11	28	24	60	49

Table 10: Frequency by teams of shots performed to empty goal

8.4 Results according to success of finalization

Below are the general frequencies and percentages and by team of the actions observed according to the results of the finalization of possession in both grouped form (Tables 11, 12 and 13) and exclusively goals obtained *(Tables 17 and 18)*

	Without change GK-P		With change GK-P	
	Actions	%	Actions	%
Positive actions	55	27,4 %	240	34,1 %
Negative Actions	58	28,8 %	190	27,0 %
Neutral actions	88	43,8 %	273	38,8 %
Total	201	100 %	703	100 %
J^2 Pearson	p=,187			

Table 11: General frequency and percentage of total actions observed, positive, negative and neutral with using change GK-P

Team	With change GK-P	Positive actions	%	Negative Actions	%	Neutral actions	%
FRA	45	15	33,3 %	13	28,9 %	17	37,8 %
QAT	45	17	37,8 %	13	28,9 %	15	33,3 %
DEN	68	27	39,7 %	17	25,0 %	24	35,3 %
TUN	24	8	33,3 %	8	33,3 %	8	33,3 %
ARG	5	0	-	1	20,0 %	4	80,0 %
BRA	51	18	35,3 %	14	27,5 %	19	37,3 %
CRO	42	10	23,8 %	16	38,1 %	16	38,1 %
POL	94	29	30,9 %	27	28,7 %	38	40,4 %
EGY	27	10	37,0 %	7	25,9 %	10	37,0 %
GER	107	42	39,3 %	26	24,3 %	39	36,4 %
SWE	83	23	27,7 %	21	25,3 %	39	47,0 %
SLO	112	41	36,6 %	27	24,1 %	44	39,3 %
Total	703	240	34,14 %	190	27,03	273	38,83 %
J^2 Pearson		p=,000		p=,000		p=,000	

Table 12: Frequency and percentage by teams of total observed actions, positive, negative and neutral with change GK-P

Team	With change GK-P	Positive actions	%	Negative Actions	%	Neutral actions	%
FRA	6	3	50,0 %	0	0,0 %	3	50,0 %
QAT	11	4	36,4 %	3	27,3 %	4	36,4 %
DEN	9	1	11,1 %	3	33,3 %	5	55,6 %
TUN	29	6	20,7 %	8	27,6 %	15	51,7 %
ARG	47	10	21,3 %	15	31,9 %	22	46,8 %
BRA	9	3	33,3 %	3	33,3 %	3	33,3 %
CRO	22	8	36,4 %	5	22,7 %	9	40,9 %
POL	3	2	66,6 %	0	0,0 %	1	33,3 %
EGY	33	9	27,3 %	11	30,33 %	13	39,4 %
GER	17	5	29,4 %	4	23,5 %	8	47,1 %
SWE	4	1	25,0 %	2	50,0 %	1	25,0 %
SLO	11	3	27,3 %	4	36,4 %	4	36,4 %
Total	201	55	27,37 %	58	28,85 %	88	43,78 %
J^2 Pearson		p=,000		p=,000		p=,000	

Table 13: Frequency and percentage by teams of total observed actions, positive, negative and neutral without change GK-P

	Positive actions											
	ARG	BRA	CRO	DEN	EGY	FRA	GER	POL	QAT	SLO	SWE	TUN
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Without Change	.(a)		D J		D H J K							
With Change	.(a)			C E				E		C E	E	

Table 14: Comparison of proportions (Test Z) by teams of total positive actions with and without change GK-P

	Negative actions											
	ARG	BRA	CRO	DEN	EGY	FRA	GER	POL	QAT	SLO	SWE	TUN
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Without Change	B C D G I J K				G J K	.(a)		.(a)				
With Change		A	A	A		.(a)	A E	.(a)	A	A E	A E	

Table 15: Comparison of proportions (Test Z) by teams of total negative actions with and without change GK-P

	Neutral actions											
	ARG	BRA	CRO	DEN	EGY	FRA	GER	POL	QAT	SLO	SWE	TUN
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Without Change GK-P	B C D F G H I J K		H K		G H J K							B D G H J K
With Change GK-P		A L	A	A L		A	A E L	A C E L	A	A E L	A C E L	

Table 16: Comparison of proportions (Test Z) by teams of total neutral actions with and without change GK-P

		With Change GK-P		Without Change GK-P	
	Tot Goals	Goals	%	Goals	%
Goals	211	172	81,5 %	39	18,5 %
Total	**211**	**172**	**81,5 %**	**39**	**18,5 %**

Table 17: General frequency and percentage of total goals with & without using change GK-P

		With Change GK-P				Without Change GK-P			
Team	Total goals inferior.	Total actions inferior.	Goals	% Goals (Reference total actions)	% Goals (Reference total goals	Total actions inferior.	Goals	% Goals (Reference total actions)	% Goals (Reference total goals
FRA	14	45	12	26,7 %	85,7 %	6	2	33,3 %	14,3 %
QAT	12	45	9	20,0 %	75,0 %	11	3	27,3 %	25,0 %
DEN	23	68	22	32,4 %	95,7 %	9	1	11,1 %	4,3 %
TUN	9	24	6	25,0 %	66,7 %	29	3	10,3 %	33,3 %
ARG	6	5	0	-	-	47	6	12,8 %	100,0 %
BRA	18	51	15	29,4 %	83,3 %	9	3	33,3 %	16,7 %
CRO	16	42	8	19,0 %	50,0 %	22	8	36,4 %	50,0 %
POL	18	94	16	17,0 %	88,9 %	3	2	66,7 %	11,1 %
EGY	12	27	7	25,9 %	58,3 %	33	5	15,2 %	41,7 %
GER	37	107	32	29,9 %	86,5 %	17	5	29,4 %	13,5 %
SWE	18	83	17	20,5 %	94,4 %	4	1	25,0 %	5,6 %
SLO	28	112	28	25,0 %	100,0 %	11	0	-	-
Total	**211**	**703**	**172**	**25,0 %**	**81,52%**	**201**	**39**	**29,4 %**	**18,48 %**
		J^2 Pearson	p=,000						

Table 18: Frequency & percentage by teams total observed actions that finalize in goal with & without using the change GK-P

	Goals											
	ARG	BRA	CRO	DEN	EGY	FRA	GER	POL	QAT	SLO	SWE	TUN
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Without Change GK-P	-		D							-		
With Change GK-P	-			C						-		

Table 19: Comparison of proportions (Test Z) by teams of goals with & without change GK-P

8.5 Results according to the partial scoreboard during the action

Below are the general frequencies and percentages and by team of the actions in which the teams use and do not use the new regulations according to the team goal difference during the positional attack phase reflected in the scoreboard *(Tables 20, 21 and 22)*

	+4 ó >4	-1	1	-2	2	-3	3	-4 ó >-4	Draw	
With Change GK-P	128	94	77	65	68	57	39	99	76	703
	18,2 %	13,4 %	11 %	9,2 %	9,7 %	8,1 %	5,5 %	14,1 %	10,8 %	
Without Change GK-P	36	21	17	12	20	16	18	42	19	201
	17,9 %	10,4%	8,5%	6%	10%	8%	9%	20,9%	9,5 %	
Total	164	115	94	77	88	73	57	141	95	904
	18,1 %	12,7 %	10,4 %	8,5 %	9,7 %	8,1 %	6,3 %	15,6 %	10,5 %	
J^2 Pearson		,0161								

Table 20: General frequency total observed actions in relationship with the partial result with & without the change GK-P

	With Change GK-P									
	+4 ó >4	-1	1	-2	2	-3	3	-4 ó >-4	Draw	
ARG	0	0	1	0	1	0	0	3	0	5
	-	-	1,3%	-	1,5%	-	-	3,0%	-	0,7%
BRA	2	6	2	1	3	11	5	21	0	51
	1,6%	6,4%	2,6%	1,5%	4,4%	19,3%	12,8%	21,2%	-	7,3%
CRO	4	9	1	2	5	2	2	10	7	42
	3,1%	9,6%	1,3%	3,1%	7,4%	3,5%	5,1%	10,1%	9,2%	6,0%
DEN	16	5	12	3	8	5	6	5	8	68
	12,5%	5,3%	15,6%	4,6%	11,8%	8,8%	15,4%	5,1%	10,5%	9,7%
EGY	0	6	4	2	5	2	1	5	2	27
	-	6,4%	5,2%	3,1%	7,4%	3,5%	2,6%	5,1%	2,6%	3,8%
FRA	12	3	1	2	8	2	5	1	11	45
	9,4%	3,2%	1,3%	3,1%	11,8%	3,5%	12,8%	1,0%	14,5%	6,4%
GER	28	10	11	7	20	7	6	9	9	107
	21,9%	10,6%	14,3%	10,8%	29,4%	12,3%	15,4%	9,1%	11,8%	15,2%
POL	20	18	6	14	1	4	1	23	7	94
	15,6%	19,1%	7,8%	21,5%	1,5%	7,0%	2,6%	23,2%	9,2%	13,4%
QAT	6	10	10	4	5	4	3	0	3	45
	4,7%	10,6%	13,0%	6,2%	7,4%	7,0%	7,7%	-	3,9&	6,4%
SLO	34	13	15	12	9	7	5	6	11	112
	26,6%	13,8%	19,5%	18,5%	13,2%	12,3%	12,8%	6,1%	14,5%	15,9%
SWE	6	12	14	11	1	11	4	6	18	83
	26,6%	13,8%	19,5%	18,5%	13,2%	12,3%	12,8%	6,1%	14,5%	15,9%
TUN	0	2	0	7	2	2	1	10	0	24
	-	2,1%	-	10,8%	2,9%	3,5%	2,6%	10,1%	-	3,4%
Total	128	94	77	65	68	57	39	99	76	703

Table 21: Frequency and percentage by teams with change GK-P in relationship with the partial result

	Without Change GK-P									
	+4 ó >4	-1	1	-2	2	-3	3	-4 ó >-4	Draw	
ARG	5	4	2	2	3	9	3	17	2	47
	13,9%	19,0%	11,8%	16,7%	15,0%	56,3%	16,7%	40,5%	10,5%	23,4%
BRA	4	0	1	0	1	1	1	1	0	9
	11,1%	-	5,9%	-	5,0%	6,3%	5,6%	2,4%	-	4,5%
CRO	12	2	1	1	2	0	1	1	2	22
	33,3%	9,5%	5,9%	8,3%	10,0%	-	5,6%	2,4%	10,5%	10,9%
DEN	3	2	2	0	0	0	2	0	0	9
	8,3%	9,5%	11,8%	-	-	-	11,1%	-	-	4,5%
EGY	0	5	4	2	4	3	0	9	6	33
	-	23,8%	23,5%	16,7%	20,0%	18,8%	-	21,4%	31,6%	16,4%
FRA	4	0	0	0	2	0	0	0	0	6
	11,1%	-	-	-	10,0%	-	-	-	-	3,0%
GER	1	4	0	2	3	1	4	0	2	17
	2,8%	19,0%	-	16,7%	15,0%	6,3%	22,2%	-	10,5%	8,5%
POL	0	0	0	0	0	0	0	2	1	3
	-	-	-	-	-	-	-	4,8%	5,3%	1,5%
QAT	2	1	3	0	1	0	4	0	0	11
	5,6%	4,8%	17,6%	-	5,0%	-	22,2%	-	-	5,5%
SLO	3	1	2	0	0	0	2	2	1	11
	8,3%	4,8%	11,8%	-	-	-	11,1%	4,8%	5,3%	5,5
SWE	1	0	0	0	0	0	0	0	3	4
	2,8%	-	-	-	-	-	-	-	15,8%	2,0
TUN	1	2	2	5	4	2	1	10	2	29
	2,8%	9,5%	11,8%	41,7%	20,0%	12,5%	5,6%	23,8%	10,5%	14,4%
Total	36	21	17	12	20	16	18	42	19	201

Table 21: Frequency and percentage by teams without change GK-P in relationship with the partial result.

	+4 ó >4	-1	1	-2	2	-3	3	-4 ó >-4	Draw
J^2 Pearson	,000	,000	,002	,001	,022	,000	,176	,000	,000

Table 23: J^2 Pearson values of actions with & without change GK-P in relationship with the partial result

	+4 ó >4											
	ARG	BRA	CRO	DEN	EGY	FRA	GER	POL	QAT	SLO	SWE	TUN
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Without Change GK-P	.(a)	G J	D G J		.(b,a)			.(a)				.(b,a)
With Change GK-P	.(a)			C	.(b,a)		B C	.(a)		B C		.(b,a)

Table 24: Comparison of proportions (Test Z) by teams with & without change GK-P in relationship with the partial result (+4 ó >4).

	-1											
	ARG	BRA	CRO	DEN	EGY	FRA	GER	POL	QAT	SLO	SWE	TUN
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Without Change GK-P	.(a)	.(a)				.(a)		.(a)			.(a)	
With Change GK-P	.(a)	.(a)				.(a)		.(a)			.(a)	

Table 25: Comparison of proportions (Test Z) by teams with & without change GK-P in relationship with the partial result (-1)

	1											
	ARG	BRA	CRO	DEN	EGY	FRA	GER	POL	QAT	SLO	SWE	TUN
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Without Change GK-P						.(b,a)	.(a)	.(a)			.(a)	.(a)
With Change GK-P						.(b,a)	.(a)	.(a)			.(a)	.(a)

Table 26: Comparison of proportions (Test Z) by teams with & without change GK-P in relationship with the partial result. (1)

	-2											
	ARG	BRA	CRO	DEN	EGY	FRA	GER	POL	QAT	SLO	SWE	TUN
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Without Change GK-P	.(a)	.(b,a)		.(a)		.(a)		.(a)	.(a)	.(a)	.(a)	
With Change GK-P	.(a)	.(b,a)		.(a)		.(a)		.(a)	.(a)	.(a)	.(a)	

Table 27: Comparison of proportions (Test Z) by teams with & without change GK-P in relationship with the partial result. (-2)

	-3											
	ARG	BRA	CRO	DEN	EGY	FRA	GER	POL	QAT	SLO	SWE	TUN
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Without Change GK-P	.(a)		.(a)	.(a)		.(a)		.(a)	.(a)	.(a)	.(a)	
With Change GK-P	.(a)		.(a)	.(a)		.(a)		.(a)	.(a)	.(a)	.(a)	

Table 28: Comparison of proportions (Test Z) by teams with & without change GK-P in relationship with the partial result.(-3)

	-4 ó >-4											
	ARG	BRA	CRO	DEN	EGY	FRA	GER	POL	QAT	SLO	SWE	TUN
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Without Change GK-P	B C H J			.(a)	B H	.(b,a)	.(a)		.(b,a)		.(a)	B H
With Change GK-P		A E L	A	.(a)		.(b,a)	.(a)	A E L	.(b,a)	A	.(a)	

Table 29: Comparison of proportions (Test Z) by teams with & without change GK-P in relationship with the partial result. (-4 ó >-4))

	Draw											
	ARG	BRA	CRO	DEN	EGY	FRA	GER	POL	QAT	SLO	SWE	TUN
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Without Change GK-P	.(a)	.(b,a)		.(a)	J K	.(a)			.(a)			.(a)
With Change GK-P	.(a)	.(b,a)		.(a)		.(a)			.(a)	E	E	.(a)

Table 30: Comparison of proportions (Test Z) by teams with & without change GK-P in relationship with the partial result. (Draw)

8.6 Results according to the actions with or without passive play warning

In this section we describe the general frequencies and percentages and teams observed according to whether the actions are made under an referees warning for passive play *(Tables 31 and 33)* in offensive situations of numerical inferiority

	Without passive play warning	%	With passive play warning	%
Without Change GK-P	169	84,1 %	32	15,9 %
With Change GK-P	674	95,9 %	29	4,1 %
Total	703	100	201	100
J^2 Pearson	p=,000			

Table 31: General frequency and percentage of attacks performed with warning of passive play

	Without passive play warning	With passive play warning
	(A)	(B)
Without Change GK-P		A
With Change GK-P	B	

Table 32: General comparison of proportions (Test Z) of total passive play warnings with & without change GK-P

	Without passive play warning		With passive play warning		Total
	With Change GK-P	Without Change GK-P	With Change GK-P	Without Change GK-P	
ARG	5	39	0	8	52
	100 %	83,0 %	-	17,0 %	
BRA	49	9	2	0	60
	96,1 %	100 %	3,9 %	-	
CRO	41	20	1	2	64
	97,6 %	90,9 %	2,4 %	9,1 %	
DEN	64	3	4	6	77
	94,1 %	33,3 %	5,9 %	66,7 %	
EGY	25	26	2	7	60
	92,6 %	78,8 %	7,4 %	21,2 %	
FRA	44	6	1	0	51
	97,8 %	100 %	2,2 %	-	
GER	102	16	5	1	124
	95,3 %	72 %	4,7 %	5,9 %	
POL	91	3	3	0	97
	96,8 %	100 %	3,2 %	-	
QAT	41	8	4	3	56
	91,1 %	72,7 %	8,9 %	27,3 %	
SLO	108	10	4	1	123
	96,4 %	90,9 %	3,6 %	9,1 %	
SWE	80	3	3	1	87
	96,4 %	75,0 %	3,6 %	25,0 %	
TUN	24	26	0	3	53
	100 %	89,7 %	-	10,3 %	
Total	674	169	29	32	904
J^2 Pearson	p=,000				

Table 33: Frequency and percentage total by teams of passive play warning in actions with & without change GK-P

	Without passive play warning											
	ARG	BRA	CRO	DEN	EGY	FRA	GER	POL	QAT	SLO	SWE	TUN
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Without Change GK-P	B C D E F G H I J K L		D H J K		B D F G H I J K							B D F G H I J K
With Change GK-P		A E L	A	A C E L	A	A E L	A E L	A C E L	A E L	A C E L	A C E L	A

Table 34: General comparison of proportions (Test Z) without passive play warning of the total of actions with & without change GK-P

	With passive play warning											
	ARG	BRA	CRO	DEN	EGY	FRA	GER	POL	QAT	SLO	SWE	TUN
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Without Change GK-P	.(a)	.(a)				.(b,a)		.(a)				.(a)
With Change GK-P	.(a)	.(a)				.(b,a)		.(a)				.(a)

Table 35: General comparison of proportions (Test Z) with passive play warning of the total of actions with & without change GK-P

8.7 Results according to the attacks and sub attacks of each exclusion period

Below are the frequencies and percentages observed according to the number of attacks and sub attacks that occur during each period of general exclusion *(Tables 36, 37)* and by teams *(Tables 39, 40, 44 and 45)*

	Ball possessions during the 2' of exclusion (attacks in numerical inferiority. With change GK-P	%	Ball possessions during the 2' of exclusion (attacks in numerical inferiority. Without change GK-P	%
1	494	70,3 %	150	74,6 %
2	197	28,0 %	44	21,9 %
3	11	1,6 %	7	3,5 %
4	1	0,1 %		
5				
Total	703		201	
J^2 Pearson	p=,122			

Table 36: General frequency and percentage of actions with & without change GK-P in relationship with the number of attacks performed in each sanction period

	Sub attacks in each ball possession with change GK-P	%	Sub attacks in each ball possession without change GK-P	%
1	514	73,1 %	122	60,7 %
2	146	20,8 %	48	23,9 %
3	35	5,0 %	24	11,9 %
4	7	1,0 %	6	3,0 %
5	1	0,1 %	1	0,5 %
J^2 Pearson	p=,000			

Table 37: General frequency and percentage of actions with & without change GK-P in relationship with the number of sub attacks performed in each sanction period

	Sub attacks				
	1	2	3	4	5
	(A)	(B)	(C)	(D)	(E)
Without changes			A		
With changes	C				

Table 38: General comparison of proportions (Test Z) of the total of observed actions with & without change GK-P in relationship of the number of sub attacks performed in each sanction period.

	NAI 1		NAI 2		NAI 3		NAI 4		Total
	Fr.	%	Fr.	%	Fr.	%	Fr.	%	
ARG	4	80,0 %	1	20,0 %	0	-	0	-	5
BRA	35	68,6 %	16	31,4 %	0	-	0	-	51
CRO	31	73,8 %	9	21,4 %	2	4,8 %	0	-	42
DEN	45	66,2 %	23	33,8 %	0	-	0	-	68
EGY	22	81,5 %	4	14,8 %	1	3,7 %	0	-	27
FRA	30	66,7 %	14	31,1 %	1	2,2 %	0	-	45
GER	73	68,2 %	33	30,8 %	1	0,9 %	0	-	107
POL	70	74,5 %	22	23,4 %	2	2,1 %	0	-	94
QAT	31	68,9 %	14	31,1 %	0	-	0	-	45
SLO	77	68,8 %	34	30,4 %	1	0,9 %	0	-	112
SWE	57	68,7 %	22	26,5 %	3	3,6 %	1	1,2 %	83
TUN	19	79,2 %	5	20,8 %	0	-	0	-	24
Total	494	70,3 %	197	28,0 %	11	1,6 %	1	0,1 %	703

Table 39: Frequency and percentage by teams in actions with change GK-P in relationship with the number of sub attacks performed in each sanction period

	NAI 1		NAI 2		NAI 3		Total
	Fr.	%	Fr.	%	Fr.	%	
ARG	42	89,4 %	5	10,6 %	0	-	1
BRA	5	55,6 %	3	33,3 %	1	11,1 %	47
CRO	11	50,0 %	10	45,4 %	1	4,55 %	9
DEN	8	88,9 %	1	11,1 %	0	-	22
EGY	25	75,8 %	5	15,2 %	3	9,1 %	9
FRA	3	50,0 %	3	50,0 %	0	-	33
GER	15	88,2 %	2	11,8 %	0	-	6
POL	2	66,7 %	1	33,3 %	0	-	17
QAT	8	72,7 %	3	27,3 %	0	-	3
SLO	6	54,5 %	4	36,4 %	1	9,1 %	11
SWE	2	50,0 %	1	25,0 %	1	25,0 %	11
TUN	23	79,3 %	6	20,7 %	0	-	4
Total	150	74,6	44	21,9 %	7	3,5 %	201

Table 40: Frequency and percentage by teams in actions without change GK-P in relationship with the number of sub attacks performed in each sanction period

	NAI 1	NAI 2	NAI 3	NAI 4
J^2 Pearson	,000	,000	,452	*

Table 41: J^2 of Pearson values of actions with & without change GK-P in relationship with the number of attacks performed in each sanction period. .

	NAI 1											
	ARG	BRA	CRO	DEN	EGY	FRA	GER	POL	QAT	SLO	SWE	TUN
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Without change GK-P	B C D E F G H I J K L		H K		B D F G H J K							B D F G H J K
With change GK-P		A E L	A	A E L	A	A E L	A E L	A C E L	A	A E L	A C E L	A

Table 42: Comparison of proportions (Test Z) by teams of the total attacks observed with & without change GK-P (NAI 1)

	NAI 2											
	ARG	BRA	CRO	DEN	EGY	FRA	GER	POL	QAT	SLO	SWE	TUN
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Without change GK-P	D G H J K		D G H J K		D G							D G H K
With change GK-P				A C E L			A C E L	A C L		A C	A C L	

Table 43: Comparison of proportions (Test Z) by teams of the total attacks observed with & without change GK-P (NAI 2)

	NSAI 1		NSAI 2		NSAI 3		NSAI 4		NSAI 5		Total
	Fr.	%	Fr.	%	Fr.	Fr.	Fr.	%	Fr.	%	
ARG	3	60,0 %	1	20,0 %	1	20,0	0	-	0	-	5
BRA	35	68, 6 %	12	23,5 %	3	5,9	1	2,0 %	0	-	51
CRO	30	71,4 %	9	21,4 %	2	4,76	1	2,4 %	0	-	42
DEN	57	83,8 %	9	13,2 %	2	2,94	0	-	0	-	68
EGY	24	88,9 %	3	11,1 %	0	-	0	-	0	-	27
FRA	36	80,0 %	7	15,6 %	2	4,44	0	-	0	-	45
GER	78	72,9 %	24	22,4 %	5	4,67	0	-	0	-	107
POL	68	72,3 %	18	19,1 %	7	7,45	1	1,1 %	0	-	94
QAT	33	73,3 %	12	26,7 %	0	-	0	-	0	-	45
SLO	77	68,8 %	26	23,2 %	5	4,46	3	2,7 %	1	0,9 %	112
SWE	57	68,7 %	20	24,1 %	6	7,23	0	-	0	-	83
TUN	16	66,7 %	5	20,8 %	2	8,33	1	4,2 %	0	-	24
Total	514	73,1 %	146	20,8 %	35	4,98	7	1,0 %	1	0,1 %	703

Table 44: Frequency and percentage by teams in actions with change GK-P in relationship with the number of sub attacks performed in each sanction period

	NSAI 1		NSAI 2		NSAI 3		NSAI 4		NSAI 5		Total
	Fr.	%	Fr.	%	Fr.	Fr.	Fr.	%	Fr.	%	
ARG	30	63,8 %	8	17,0 %	6	12,8 %	3	6,4 %	0	-	47
BRA	8	88,9 %	1	11,1 %	0	-	0	-	0	-	9
CRO	14	63,6 %	7	31,8 %	0	-	0	-	1	4,5 %	22
DEN	3	33,3 %	2	22,2 %	3	33,3 %	1	11,1 %	0	-	9
EGY	17	51,5 %	9	27,3 %	6	18,2 %	1	3,0 %	0	-	33
FRA	2	33,3 %	2	33,3 %	2	33,3 %	0	-	0	-	6
GER	11	64,7 %	4	23,5 %	2	11,8 %	0	-	0	-	17
POL	1	33,3 %	2	66,7 %	0	-	0	-	0	-	3
QAT	8	72,7 %	3	27,3 %	0	-	0	-	0	-	11
SLO	9	81,8 %	1	9,1 %	1	9,1 %	0	-	0	-	11
SWE	1	25,0 %	1	25,0 %	1	25,0 %	1	25,0 %	0	-	4
TUN	18	62,1 %	8	27,6 %	3	10,3 %	0	-	0	-	29
Total	122	60,7 %	48	23,9 %	24	11,9 %	6	3,0 %	1	0,5 %	201

Table 45: Frequency and percentage by teams in actions without change GK-P in relationship with the number of sub attacks performed in each sanction period

	NSAI 1	NSAI 2	NSAI 3	NSAI 4	NSAI 5
J^2 Pearson	,000	,000	,002	,152	,157

Table 46: J^2 of Pearson values of actions with & without change GK-P in relationship with the number of sub attacks performed in each sanction period

	NSAI 1											
	ARG	BRA	CRO	DEN	EGY	FRA	GER	POL	QAT	SLO	SWE	TUN
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Without change GK-P	B C D E F G H I J K L		D H K		D F G H J K							D F G H J K
With change GK-P		A	A	A C E L	A	A E L	A E L	A C E L	A	A E L	A C E L	A

Table 47: Comparison of proportions (Test Z) by teams of the total sub attacks observed with & without change GK-P (NSAI 1)

	NSAI 2											
	ARG	BRA	CRO	DEN	EGY	FRA	GER	POL	QAT	SLO	SWE	TUN
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Without change GK-P	B G H J K				B G H J K							J K
With change GK-P		A E					A E	A E		A E L	A E L	

Table 48: Comparison of proportions (Test Z) by teams of the total sub attacks observed with & without change GK-P (NSAI 2)

	NSAI 3											
	ARG	BRA	CRO	DEN	EGY	FRA	GER	POL	QAT	SLO	SWE	TUN
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Without change GK-P		.(a)	.(a)		.(a)			.(a)				
With change GK-P		.(a)	.(a)		.(a)			.(a)				

Table 49: Comparison of proportions (Test Z) by teams of the total sub attacks observed with & without change GK-P (NSAI 3)

8.8 Results according to the play system used by the teams in numerical inferiority that make the change GK-P

In this section we describe the frequencies and percentages observed according to the offensive arrangement that the teams adapt in offensive situations of numerical inferiority that use the goalkeeper-player change in the positional attack phase *(Tables 50 and 52)*

	2:3	3:2	4:2	3:3	3:3 + Transf. Wings	3:3+ Transf Back court players	2:4 Fix Pivots	TOT
5x5 SP	0	4	0	0	0	0	0	4
5X6SP	1	24	0	0	0	0	0	24
6x4SP	0	0	0	1	0	0	0	1
6x5 SP	0	0	0	47	3	15	9	76
6x6 SP	0	0	5	365	165	56	8	597
Total	1	28	5	413	168	71	17	703
%	0,14%	3,98 %	0,71 %	58,75 %	23,90%	10,1%	2,42%	
J^2 Pearson		p=,000						

Table 50: General frequency and percentage in actions with change GK-P in relationship with the play systems used

	2:2	2:3	2:4 Fix Pivots	3:2	3:3	3:3 + Transf. Wing	3:3+ Transf Back court players	4:2
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
Without change GK-P	E F	E F	.(a)	E F			.(a)	.(a)
With change GK-P			.(a)		A B D	A B D	.(a)	.(a)

Table 51: General comparison of proportions (Test Z) in actions with & without change GK-P in relationship with the play systems used

	2:3	3:2	4:2	3:3	3:3 + Transf. Wings	3:3 + Transf Back court players	2:4 Fix Pivots	Total
ARG	0	0	0	2	3	0	0	5
	-	-	-	40,0 %	60,0 %	-	-	
BRA	0	3	3	31	11	3	0	51
	-	5,9 %	5,9 %	60,8 %	21,6 %	5,9 %	-	
CRO	0	0	1	30	6	4	1	42
	-	-	2,4 %	71,4 %	14,3 %	9,5 %	1 %	
DEN	0	2	0	44	17	5	0	68
	-	2,9 %	-	64,7 %	25,0 %	7,4 %	-	
EGY	0	2	0	11	12	2	0	27
	-	7,4 %	-	40,7 %	44,4 %	7,4 %	-	
FRA	0	0	0	34	10	0	1	45
	-	-	-	75,6 %	22,2 %	-	1 %	
GER	0	6	0	36	32	32	1	107
	-	5,6 %	-	33,6 %	29,9 %	29,9 %	1 %	
POL	0	4	0	66	16	8	0	94
	-	4,3 %	-	70,2 %	17,0 %	8,5 %	-	
QAT	0	0	0	11	30	4	0	45
	-	-	-	24,4 %	66,7 %	8,9 %	-	
SLO	1	6	0	75	19	1	10	112
	0,9 %	5,4 %	-	67,0 %	17,0 %	0,9 %	8,9 %	
SWE	0	5	1	57	8	12	0	83
	-	6,0 %	1,2 %	68,7 %	9,6 %	14,5 %	-	
TUN	0	0	0	16	4	0	4	24
	-	-	-	66,7 %	16,7 %	-	4	
Total	1	28	5	413	168	71	17	703
	0,1 %	4,0 %	0,7 %	58,7 %	23,9 %	10,1 %	2,4 %	

Table 52: Frequency and percentage in actions with change GK-P in relationship with the play system used

	2:3	3:2	4:2	3:3	3:3 + Transf. Wings	3:3 + Transf Back court players	2:4 Fix Pivots
J^2 Pearson	,422	,000	*	,025	,138	*	*

Table 53: j^2 of Pearson of actions by teams with change GK-P in relationship with the play systems used

	Offensive play systems (3:2)											
	ARG	BRA	CRO	DEN	EGY	FRA	GER	POL	QAT	SLO	SWE	TUN
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Without change GK-P	.(a)		.(a)		H J K	.(a)			.(a)			.(a)
With change GK-P	.(a)		.(a)			.(a)		E	.(a)	E	E	.(a)

Table 54: Comparison of proportions (Test Z) by teams in actions with & without change GK-P in relationship with the play systems used

8.9 Results according to finalization zone

In this section, we describe the frequencies and percentages observed according to the finalization zone of the teams in an offensive situation of numerical inferiority during the positional attack phase *(Tables 55, 56 and 57)*

	16	26	28	29	36	38	39	46	48	49	56
Without change GK-P	5	15	27	10	7	35	30	16	26	8	5
%	2,7%	8,2 %	14,7 %	5,4 %	3,8 %	19,0 %	16,3 %	8,7%	14,1 %	4,3 %	2,7 %
With change GK-P	34	38	78	28	62	135	74	64	82	24	22
%	5,3%	5,9 %	12,2 %	4,4 %	9,7 %	21,1 %	11,5 %	10,0 %	12,8 %	3,7 %	3,4 %
J^2 Pearson	p=,245										

Table 55: General frequency and percentage of the shot zones used in actions with & without change GK-P

	16	26	28	29	36	38	39	46	48	49	56
ARG	0	0	1	0	0	3	0	0	0	1	0
	-	-	20,%0	-	-	60,0%	-	-	-	20,0%	-
BRA	1	2	3	3	2	16	6	3	10	1	2
	2,0%	4,1%	6,1%	6,1%	4,1%	32,7%	12,2%	6,1%	20,4%	2,0%	4,1%
CRO	3	2	3	2	1	14	5	1	7	2	0
	7,5%	5,0%	7,5%	5,0%	2,5%	35,0%	12,5%	2,5%	17,5%	5,0%	-
DEN	4	3	6	1	5	11	4	3	15	5	3
	6,7%	5,0%	10,0%	1,7%	8,3%	18,3%	6,7%	5,0%	25,0%	8,3%	5,0%
EGY	1	1	0	0	2	6	2	6	6	0	1
	4,0%	4,0%	-	-	8,0%	24,0%	8,0%	24,0%	24,0%	-	4,0%
FRA	2	1	6	2	4	11	2	5	5	1	1
	5,0%	2,5%	15,0%	5,0%	10,0%	27,5%	5,0%	12,5%	12,5%	2,5%	2,5%
GER	6	5	14	5	9	11	12	13	11	3	2
	6,6%	5,5%	15,4%	5,5%	9,9%	12,1%	13,2%	14,3%	12,1%	3,3%	2,2%
POL	1	7	7	7	11	13	10	12	9	4	5
	1,2%	8,1%	8,1%	8,1%	12,8%	15,1%	11,6%	14,0%	10,5%	4,7%	5,8%
QAT	2	1	4	4	3	5	11	5	5	4	1
	4,4%	2,2%	8,9%	8,9%	6,7%	11,1%	24,4%	11,1%	11,1%	8,9%	2,2%
SLO	7	10	18	1	17	21	8	6	7	0	5
	7,0%	10,0%	18,0%	1,0%	17,0%	21,0%	8,0%	6,0%	7,0%	-	5,0%
SWE	4	5	12	3	6	17	13	6	7	3	1
	5,2%	6,5%	15,6%	3,9%	7,8%	22,1%	16,9%	7,8%	9,1%	3,9%	1,3%
TUN	3	1	4	0	2	7	1	4	0	0	1
	13,0%	4,3%	17,4%	-	8,7%	30,4%	4,3%	17,4%	-	-	4,3%
Total	34	38	78	28	62	135	74	64	82	24	22
	5,3%	5,9%	12,2%	4,4%	9,7%	21,1%	11,5%	10,0%	12,8%	3,7%	3,4%

Table 56: Frequency & percentage by teams of the shot zones used in actions with change GK-P

	16	26	28	29	36	38	39	46	48	49	56
ARG	3	4	10	3	1	10	6	2	4	0	1
	6,82	9,1%	22,7%	6,8%	2,3%	22,7%	13,6%	4,5%	9,1%	-	2,3%
BRA	0	1	1	0	1	1	1	1	0	0	1
	-	14,3%	14,3%	-	14,3%	14,3%	14,3%	14,3%	-	-	14,3%
CRO	0	2	2	2	1	6	2	0	3	1	0
	-	10,5%	10,5%	10,5%	5,3%	31,6%	10,5%	-	15,8%	5,3%	-
DEN	0	0	1	1	0	0	1	0	2	1	1
	-	-	14,3%	14,3%	-	-	14,3%	-	28,6%	14,3%	14,3%
EGY	0	3	6	0	2	5	4	4	5	2	0
	-	9,7%	19,3%	-	6,4%	16,1%	12,9%	12,9%	16,1%	6,4%	-
FRA	0	0	0	0	0	1	1	3	0	0	0
	-	-	-	-	-	20,0%	20,0%	60,0%	-	-	-
GER	1	2	0	2	1	2	2	2	1	1	1
	6,7%	13,3%	-	13,3%	6,7%	13,3%	13,3%	13,3%	6,7%	6,7%	6,7%
POL	0	1	0	0	0	0	1	0	1	0	0
	-	33,3%	-	-	-	-	33,3%	-	33,3%	-	-
QAT	0	1	1	1	1	1	1	1	1	1	1
	-	10,0%	10,0%	10,0%	10,0%	10,0%	10,0%	10,0%	10,0%	10,0%	10,0%
SLO	1	0	1	1	0	2	2	0	4	0	0
	9,1%	-	9,1%	9,1%	-	18,2%	18,2%	-	36,4%	-	-
SWE	0	0	0	0	0	1	2	0	1	0	0
	-	-	-	-	-	25,0%	50,0%	-	25,0%	-	-
TUN	0	1	5	0	0	6	7	3	4	2	0
	-	3,6%	17,9%	-	-	21,4%	25,0%	10,7%	14,3%	7,1%	-
Total	5	15	27	10	7	35	30	16	26	8	5
	2,7%	8,1%	14,7%	5,43%	3,8%	19,0%	16,3%	8,7%	14,1%	4,3%	2,7%

Table 57: Frequency & percentage by teams of the shot zones used in actions without change GK-P

	16	26	28	29	36	38	39	46	48	49	56
J^2 Pearson	,015	,010	,000	,063	,004	,000	,000	,026	,000	,108	,451

Table 58: J^2 of Pearson values of actions by teams with & without change GK-P in relationship with the shot zones

	Finalization zone 28											
	ARG	BRA	CRO	DEN	EGY	FRA	GER	POL	QAT	SLO	SWE	TUN
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Without change GK-P	D J				.(a)	.(a)	.(a)	.(a)			.(a)	
With change GK-P				A	.(a)	.(a)	.(a)	.(a)		A	.(a)	

Table 59: Comparison of proportions (Test Z) by teams with & without change GK-P in relationship with the shot zones (28)

	Finalization zone 36											
	ARG	BRA	CRO	DEN	EGY	FRA	GER	POL	QAT	SLO	SWE	TUN
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Without change GK-P	.(b,a)			.(a)		.(a)		.(a)		.(a)	.(a)	.(a)
With change GK-P	.(b,a)			.(a)		.(a)		.(a)		.(a)	.(a)	.(a)

Table 60: Comparison of proportions (Test Z) by teams with & without change GK-P in relationship with the shot zones (36)

	Finalization zone 38											
	ARG	BRA	CRO	DEN	EGY	FRA	GER	POL	QAT	SLO	SWE	TUN
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Without change GK-P	B F J K			.(a)				.(a)				
With change GK-P		A		.(a)		A		.(a)		A	A	

Table 61: Comparison of proportions (Test Z) by teams with & without change GK-P in relationship with the shot zones (38)

	Finalization zone 39											
	ARG	BRA	CRO	DEN	EGY	FRA	GER	POL	QAT	SLO	SWE	TUN
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Without change GK-P	.(a)											G H I K
With change GK-P	.(a)						L	L	L		L	

Table 62: Comparison of proportions (Test Z) by teams with & without change GK-P in relationship with the shot zones (39)

	Finalization zone 48											
	ARG	BRA	CRO	DEN	EGY	FRA	GER	POL	QAT	SLO	SWE	TUN
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Without change GK-P	.(a)	.(a)				.(a)						.(a)
With change GK-P	.(a)	.(a)				.(a)						.(a)

Table 63: Comparison of proportions (Test Z) by teams with & without change GK-P in relationship with the shot zones (48)