

# Influence of changing the distance of the 3-point line in basketball

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## *INFLUENCE OF CHANGING THE DISTANCE OF THE 3-POINT LINE IN BASKETBALL*

**KEY WORDS:** Basketball, 3-point shooting, Change of rules.

**ASBTRACT:** The objectives of this study were 1) to test the influence of changing the distance in the 3-point line (from 6.25 to 6.75 meters.) on the percentage of success in the 3-point shots during the regular season and playoff games and 2) to determine if the changes affect the number of shots attempted by their different specific positions in basketball (guards, forwards and centers), and in the percentage of shots made.

The data were obtained from the official website of the ACB ([www.acb.com](http://www.acb.com)) and include all games in the regular season and playoff games during 2009-2010 ( $n = 290$  games and 7185 3-point shots) and 2010-2011 ( $n = 288$  and 6145 3-point shots). Only the players who played both seasons for the same team were taken into account ( $n = 115$ ).

The main results indicate that the number of 3-point shots in the season 2009/2010 is higher than the following one, 2010/2011, when the distance was lengthened. It can be seen in the comparison of both years, the existence of statistically significant differences between small-forwards by the number of shot attempts; also there were obtained a difference in all positions by the number of shots made and a difference in the percentages for shooting-guards; these differences were not observed in the playoffs.

The importance of changing the rules of basketball has been studied over the years by various researchers. Arias, Argudo and Alonso (2011) in a review on the subject indicate that changes must be validated empirically to determine their previous effect; and the way the rules determine the dynamics and the actions of the Basketball game. In their study of the historical evolution of changes in the rules in this sport, Ferreira, Ibáñez and Sampaio (2009), include the date of implementation of the three-point line in basketball FIBA dating from 1984, indicating that the attack has one more weapon that in many cases, it is clearly crucial, and as Díaz-Miguel (1986) said long ago, one that is difficult to counteract.

This research analyzes the difference in the number of 3-point shots attempted and made in two consecutive seasons. In the first one (2009/2010), the line that defines the three-point shot was at a distance of 6.25 meters with respect to the basket, while in the second season (2010/2011), the distance increases to 6.75 meters. We consider of great interest this change in the current regulation, as the shot is the most decisive action in basketball, with the score depending directly on it (Claramount and Balague, 2010; Wissel, 2010) we must also add the importance given by the players themselves (Montero, Ezquerro and Saavedra, 2009; Ortega, Palao, Sainz de Baranda and Garcia, 2009).

## Method

The aim of this study is to compare the number and efficiency of the shots beyond the 3-point line between two seasons, the 2009-2010 when the distance was 6.25 meters off the following

season, 2010-2011, when the 3-point line was located at 6.75 meters. Comparisons were made also between players depending on the specific position they occupied.

Data for this study were obtained from the official website of the Association of Basketball Clubs ([www.acb.com](http://www.acb.com)) and include all games played during the 2009-2010 and 2010-2011 seasons. We analyzed the data for the regular season and playoff games.

In the database used in this study included the shots of the players who participated in both seasons in the competition organized by the ACB ( $n = 115$ ). These players made a total of 7185 3-point shots in the season 2009/2010 during 290 games against the 6145 shooting in the 288 games of the 2010/2011.

In order to compare specific positions between regular season and playoff, we performed an ANOVA for independent samples. Before using the nonparametric test, the assumption of homogeneity was verified using Levene. Post hoc comparisons determined by Tukey test when the variances are equal and Howel test are not given. To analyze the differences between 3-point shots by season we performed a Student T-test. We performed a non-parametric analysis for independent samples for analysis of total releases for regular season and playoff. To realize the analysis indicated was used the SPSS version 15.0.

## Results

Here, we state the results obtained regarding the 3-point shots in the seasons 2009/2010 and 2010/2011 differentiated by the specific positions occupied by each player on the court.

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As shown in Table 1, the number of 3-point shots attempted in 2009/2010 season is higher than the shots attempted in 2010-2011 season. We can see significant differences between the number of

shots tried, shots scored, and percentage during the regular season, while the playoffs showed significant differences between for shots attempted and made, but not for the team's percentage.

	2009/2010	2010/2011	P value
<b>Regular season</b>			
<i>n</i>	<b>6549</b>	<b>5698</b>	
3 shots team attempted	22.3 ± 4.8	21.4 ± 5.1	0.000
3 shots team made	8.1 ± 3.1	7.4 ± 2.9	0.000
3 shots efficiency team	36.1 ± 11.5	34.5 ± 10.6	0.000
<b>Playoff</b>			
<i>n</i>	<b>636</b>	<b>447</b>	
3 shots team attempted	22.1 ± 4.8	20.1 ± 4.9	0.000
3 shots team made	7.5 ± 2.5	6.7 ± 2.8	0.000
3 shots efficiency team	33.8 ± 9.5	33.5 ± 11.1	ns

Table 1. Percentages of 3-point shots attempted and made for each season.

Data from the second season, differentiated by specific positions are presented in Table 2: we can observe how, all specific positions reduced both the number of shot attempts and rate of success in season 2010/2011, except among the small-forwards that maintain their percentage in both seasons. We can observe that significant differences are only seen for the regular season. More in detail, these differences become evident for the small-forwards in the number of shots attempted; at all positions in the number of shots made; and for the shooting-guards in the percentage of succes. In the second season (2010-2011) when the distance of 3-point shots was increased, the differences, with significance levels are detailed in Table 2 between the specific positions, they have

been recorded in the number of shots attempted among the specific positions: point-guard in relation to small-forward; shooting-guard in relation to point-guard and small-forward; small-forward in relation to point-guard, shooting-guard, power-forward and center and finally the center in relation to point-guard and small-forward. Respect to the shots made, the differences are: point-guard in relation to shooting-guard, small-forward, power-forward and center. The shooting-guard, small-forward and center in relation to all other specific position and finally, the power-forward in relation to point-guard and shooting-guard. Meanwhile, the percentages of success for all the five positions do not vary significantly throughout the regular season.

Playing positions	2009/2010			2010/2011		
	Attempted	Made	% Team	Attempted	Made	% Team
<b>Regular season</b>						
Point-guard	22.3 ± 4.9	8.1 ± 3.2**	36.2 ± 11.6	21.5 ± 5.0 <sup>C</sup>	7.4 ± 2.8 <sup>B,c,D,e</sup>	34.7 ± 10.6
Shooting-guard	22.0 ± 4.9	8.1 ± 3.1**	36.4 ± 11.2*	21.3 ± 5.7 <sup>a,C</sup>	7.3 ± 3.0 <sup>A,C,D,E</sup>	34.5 ± 10.4
Small -forward	22.7 ± 4.6**	8.0 ± 3.0**	35.2 ± 11.2	20.9 ± 4.8 <sup>A,b,d,E</sup>	7.1 ± 2.7 <sup>A,B,D,E</sup>	34.3 ± 10.8
Power-forward	22.1 ± 4.7	8.1 ± 3.2*	36.6 ± 11.6	21.7 ± 4.8	7.5 ± 2.9 <sup>a,b</sup>	34.6 ± 10.1
Center	22.2 ± 4.8	8.0 ± 3.2**	35.8 ± 11.6	21.9 ± 5.0 <sup>a,C</sup>	7.4 ± 2.9 <sup>A,B,c,D</sup>	34.5 ± 10.9
<b>Playoff</b>						
Point-guard	22.4 ± 4.8	7.6 ± 2.6	33.6 ± 9.8	20.1 ± 4.9	6.9 ± 2.8	34.5 ± 11.2
Shooting-guard	21.9 ± 4.7	7.2 ± 2.5	32.5 ± 8.4	20.6 ± 4.9	7.3 ± 3.1	35.2 ± 12.1
Small -forward	21.6 ± 5.0	8.0 ± 2.4	38.0 ± 11.2	20.3 ± 5.7	6.0 ± 2.9	29.3 ± 9.9
Power-forward	22.5 ± 4.5	7.7 ± 2.5	33.8 ± 8.2	20.0 ± 5.1	6.6 ± 2.5	33.2 ± 10.7
Center	21.8 ± 5.1	7.4 ± 2.6	34.1 ± 10.5	19.7 ± 4.4	6.4 ± 2.4	32.8 ± 10.9

Table 2. Percentages of 3-point shots attempted and made by specific position and season.

Note:

(\*) Significant differences between the same specific positions in the two seasons if the level is  $p \leq .05$ .

(\*\*) Significant differences between the same specific positions in the two seasons at the  $p \leq .00$ .

The differences between specific positions the 2010-2011 season are shown in capital letters if the significance level of  $p \leq .00$ , while the letters are lowercased if the significance level is  $p \leq .05$ .

(a) or (A) significant differences between the point-guards in the two seasons. (b) or (B) significant differences between the shooting-guards in the two seasons. (c) or (C) significant differences between the small-forwards in the two seasons. (d) or (D) significant differences between the power-forward in the two seasons. (e) or (E) significant differences between the centers in the two seasons.

## Discussion

The results of this study confirm that, with the change of the distance from the three-point line has changed the number of shots taken, with lower field-goals as longer the distance. These data agree with those found by Romanowich, Vollmer, and Bourret (2007) who, analyzing 57 NBA players from the season 1991/1992 to 1999/2000, showed that both, the number of shots and the success rate (%) increased in the years that the line was at a shorter distance (6.70 meters) producing the opposite effect when the three-point line is further away, in this case, 7.25 meters.

Secondly, there is also an influence on the success rate of the 3-point shots, decreasing when the line is at 6.75 meters, matching the data recorded by Štrumbelj, Vračar, Robnik-Šikonja,

Dežman, and Erčulj (2011) in their study of the influence of changing the rules in categories 1A and 1B of slovenian male basketball.

These results should be completed with the modifications that the new rules allow regarding the rates of stretching and amplitude indicated by Bourbousson, Seve, and McGarry (2010). In this way, the difference in the number of shots seems to focus on 2-point-attempts. The lack of statistically significant differences in 3-point attempts in the playoffs of the first season seems to indicate that the players of top teams are also those who have more ability to score the long distance shots. It would be useful to track the shooting patterns taking into account other factors such as playing time, score, streaks in any aspects of the game, etc.

### *INFLUENCIA DEL CAMBIO DE LA DISTANCIA DE LA LÍNEA DE TRES PUNTOS EN LOS PORCENTAJES DE TIRO EN BALONCESTO*

**PALABRAS CLAVE:** Baloncesto, Lanzamiento de 3 puntos, Cambio de reglas.

**RESUMEN:** Los objetivos del presente estudio fueron: 1) comprobar la influencia de la modificación de la distancia en la línea que delimita el triple (de 6.25 a 6.75 metros) sobre el porcentaje de acierto en los tiros de 3 puntos, durante los partidos de liga regular y playoff y 2) determinar si dicha modificación influye en la cantidad de tiros realizados por los diferentes puestos específicos en baloncesto (base, escolta, alero, ala pívot y pívot), así como en el porcentaje de acierto.

Los datos se obtuvieron de la web oficial de la ACB ([www.acb.com](http://www.acb.com)) e incluyen todos los partidos de la liga regular y del playoff jugados durante las temporadas 2009-2010 ( $n = 290$  partidos y 7185 lanzamientos de 3 puntos) y 2010-2011 ( $n = 288$  partidos y 6145 lanzamientos de 3 puntos); registrando, únicamente, a los jugadores que participaron ambas temporadas en dicha competición en el mismo equipo ( $n = 115$ ).

Los principales resultados indican que el número de tiros de 3 realizados en la temporada 2009/2010 es superior a los realizados en la temporada siguiente, 2010/2011, en la que se retrasa la línea que delimita el triple. Se puede apreciar, en la comparación de ambas temporadas, la existencia de diferencias estadísticamente significativas entre aleros por el número de lanzamientos intentados, entre todos los puestos por el número de lanzamientos convertidos y entre escoltas en los porcentajes de acierto del conjunto del equipo; diferencias que no se manifiestan en los partidos de playoff.

### *INFLUÊNCIA DA MUDANÇA DA MUDANÇA DA LINHA DE TRÊS PONTOS NAS PERCENTAGENS DE LANÇAMENTO NO BASQUETEBOL*

**PALAVRAS-CHAVE:** Basquetebol, Lançamento de 3 pontos, Mudança de regras.

**RESUMO:** Os objetivos deste estudo foram: 1) comprovar a influência da alteração da distância na linha de determina o triplo (6.25-6.75 metros) sobre a percentagem de acerto nos lançamentos de três pontos, durante os jogos da fase regular e dos *playoff* e 2) determinar se esta modificação influencia a quantidade de lançamentos realizados por diferentes posições específicas no basquetebol (bases, extremos e postes), assim como a percentagem de acerto. Os dados foram obtidos a partir do site oficial da ACB ([www.acb.com](http://www.acb.com)) e incluem todos os jogos da temporada regular e dos *playoff* jogados durante as temporadas 2009-2010 ( $n = 290$  jogos e 7.185 lançamentos de 3 pontos) e 2010-2011 ( $n = 288$  jogos e 6.145 lançamentos de 3 pontos); reportando-se, apenas, aos jogadores que participaram em ambas as temporadas na mesma competição e equipa ( $n = 115$ ). Os principais resultados indicam que o número de lançamentos de três pontos na temporada 2009/2010 é superior aos realizados na temporada seguinte, 2010/2011, na qual se recua a linha que determina o triplo. Pode-se constatar, na comparação entre as duas temporadas, a existência de diferenças estatisticamente significativas entre os bases relativamente ao número de tentativas de lançamento, entre todas as posições pelo número de lançamentos convertidos e entre postes nas percentagens de sucesso de toda a equipa; diferenças que não se manifestam em jogos do *playoff*.

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