

THROWING PROCEDURES USED AT THE EUROPEAN U17 BEACH HANDBALL CHAMPIONSHIPS – STATISTICAL ANALYSIS

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ABSTRACT. Beach handball started as a leisure sport, with the main purpose of maintaining the physical training of handball players during the summer, after the end of the internal competitions. **The purpose of the research.** The purpose of this research has been to investigate the change of throwing preferences through beach handball-specific technical procedures, to the first three teams in the initial phase of competitions (games during the groups phase), from two consecutive editions of the European Beach Handball Championship U17 - 2019 and 2021. **Materials and methods.** The study was carried out by viewing the video recordings of the first six games of the national teams ranked on the first three places of the respective editions, at the end of the competitions. After viewing the match records, observation sheets were completed which contained the quantitative values of all throwing procedures (throw and goal). The SPSS Statistics 17 program was used to interpret the data obtained. Calculations were made for descriptive statistics, obtaining the following indices: minimum, maximum, mean, standard deviation, variance and range. **Results.** The 1st place at the 2019 edition had the efficiency of finalizing at the goal through the spinshot procedure of 82.18% (DS=10.53), and the team ranked on the 1st place in 2021, had the efficiency of the same procedure of 72.95% (DS=6.22). The teams ranked 2nd in the two editions mentioned above of BH EC had an average efficiency of 87.5% (DS=14.67) in 2019 and 75.65% (DS=4.27) in 2021. The teams ranked 3rd had an average efficiency of 92.1% (DS=8.74) in 2019 and 72.86% (DS=3.9) in 2021. The 1st place in 2019 had the efficiency of finalizing at the goal through the inflight

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procedure of 81.94% (DS=11.08), and in 2021, the team ranked on the 1st place had the average efficiency of 35.08% (DS=20.59). The teams ranked 2nd in the two editions of BH EC, had an average efficiency of 78.05% (DS=17.65) in 2019 and 58.08% (DS=17.05) in 2021. The teams ranked 3rd had an average efficiency of 64.58% (DS=8.23) in 2019 and 68.45% (DS=24.14) in 2021. **Conclusions.** The trend identified by us for the 3 teams on the podium, from the U17 BH EC 2019 and 2021 editions, highlighted the fact that the share of goal throws by two points increased compared to that of goal throws capitalized by one point.

Keywords: Beach handball, throws, goals, European Championship U17

Rezumat. Procedee de aruncare la poartă folosite la Campionatele Europene U17 de Beach Handball - Analiză statistică. Beach Handball-ul a început ca un sport de loisir, având ca principal scop menținerea pregătirii fizice a jucătorilor de handbal în timpul verii, după încheierea competițiilor interne. **Scopul cercetării.** Scopul aceste cercetări a fost să investigăm schimbarea preferințelor de aruncare la poartă prin procedeele tehnice specifice Beach Handball-ului, la primele trei echipe în faza inițială a competițiilor (jocurile din grupe), de la două ediții consecutive a Campionatului European de Beach Handball U17 – 2019 și 2021. **Materiale și metode.** Studiul a fost efectuat prin vizualizarea înregistrărilor video a primelor șase jocuri ale echipelor naționale clasate în final pe primele trei locuri ale edițiilor respective. În urma vizualizării înregistrărilor meciurilor s-au completat fișe de observație care au conținut valorile cantitative ale tuturor procedeele de aruncare (aruncare și gol). Pentru interpretarea datelor obținute s-a utilizat programul SPSS Statistics 17. S-au efectuat calcule pentru statistică descriptivă, obținându-se următorii indici: minimum, maximum, mean, standard deviation, variance and range. **Rezultate.** Locul 1 la ediția din 2019 a avut eficiența finalizării la poartă prin procedeul spinshot de 82.18% (DS=10.53), iar în anul 2021, echipa clasată pe locul 1 de 72.95% (DS=6.22). Echipele clasate pe locul 2 la cele 2 ediții ale CE BH au avut eficiența medie de 87.5% (DS= 14.67) în 2019 și de 75.65% (DS= 4.27) în 2021. Echipele clasate pe locul 3 au avut Eficiența medie de 92.1% (DS= 8.74) în 2019 și de 72.86% (DS= 3.9) în 2021. Locul 1 din 2019 a avut eficiența finalizării la poartă prin procedeul aeriană (inflight) de 81.94% (DS=11.08), iar în anul 2021, echipa clasată pe locul 1 a avut eficiența medie de 35.08% (DS=20.59). Echipele clasate pe locul 2 la cele 2 ediții ale CE BH, au avut eficiența medie de 78.05% (DS= 17.65) în 2019 și de 58.08% (DS= 17.05) în 2021. Echipele clasate pe locul 3 au avut eficiența medie de 64.58% (DS= 8.23) în 2019 și de 68.45% (DS= 24.14) în 2021. **Concluzii.** Trendul identificat de noi pentru cele 3 echipe de pe podium, de la edițiile CE BH U17 din 2019 și 2021, a evidențiat faptul că ponderea aruncărilor la poartă de două puncte a crescut comparativ cu cea a aruncărilor la poartă valorificate cu un punct.

Cuvinte cheie: Handbal pe plajă, aruncări, goluri, Campionatul European U17

Introduction

Beach handball started as a leisure sport, with the main purpose of maintaining the physical training of handball athletes during the summer, after the end of the internal competitions. Over time, beach handball has reached clear structure and regulations (van den Linder et al., 2004; Belka et al., 2015; Zapardiel, 2018).

The European Beach Handball Championships were organized for the first time in 2008, the next editions being held every two years. The last edition has taken place in 2021 in Bulgaria. In 2018, beach handball was introduced during the Youth Olympic Games, representing a first step towards achieving the Olympic dream (Zapardiel & Paramio, 2018).

The purpose of the game is, as in the game of handball, to score goals in the opponent's goal using throws. The difference between the two sports games is given by the reward of two points given for some goal-throwing procedures used in beach handball. These procedures are specified by the rules of the game (FRH.ro, 2010): spinshot, inflight, the specialist player's throw, throwing from 6 meters and the goalkeeper's throw (direct goal). Classic throws (jumping, in support, running, standing) are rewarded with 1 point.

Statistical studies have been conducted on the goal-throwing procedures used in important beach handball competitions. Thus, at the World Championships in Cadiz, a comparative study was conducted between the teams in the first places and those in the last places (Konig et al., 2009). The best-ranked teams used a 50% spinshot in most of the matches, and the teams in the last places used this procedure in a percentage of 25%, focusing on 1 point throws in a percentage of 32% -39%.

And at the 2010 World Championships in Antalya, the spinshot was the most used finalizing procedure for the best performing teams (Gehrer & Posada, 2010).

In 2013, after the European Beach Handball Championship held in Randers, Denmark, the throwing procedures used were analyzed and a balance was found regarding their use by the teams participating in this competition (Tezcan, 2013). In contrast, at the 2017 European Championships, held in the Croatian city of Zagreb, the difference in the classification of the procedures was huge, the spinshot being the most commonly used technical procedure. (Zapardiel, 2018).

The purpose of the research

The purpose of this research was to investigate what were the technical procedures of throwing at the goal used and what was the efficiency

of these throws to the teams ranked in the first three places at the U17 Beach Handball EC, in 2019 and 2021 editions.

Materials and methods

The study was conducted by viewing video recordings of the first six games (group games) of the women's national teams ranked in the top three of the U17 European Beach Handball Championships in 2019 and 2021. These teams were *de facto* subjects of the study as follows: 2019 edition – Spain (1st place), Hungary (2nd place), Germany (3rd place); 2021 edition – Hungary (1st place), Netherlands (2nd place) and Spain (3rd place). The 2019 U17 European Beach Handball Championship took place in Poland and was attended by 14 teams. The 2021 edition was held in Bulgaria, with 15 national youth teams participating.

The selection of the teams ranked in the first three places at the end of the competitions was based on the fact that the result obtained by them could illustrate the pattern of tactical preferences for goal completion chosen up to the upper stages of each edition.

After viewing the recordings of the matches from the two editions, observation sheets were completed which contained the numbers of all the throwing procedures (throwing and goal). The variables recorded in the observation sheets were: spinshot throws (SpS_Throws), spinshot goals (SpS_Goals), inflight throws (Inf_Throws), inflight goals (Inf_Goals), specialist goals (SpC_Goals), specialist throws (SpC_Throws), direct goal (DiG_Goals), direct throws (DiG_Throws), 6m goals (6mT_Goals), 6m throws (6mT_Throws), one point throws (OneP_Throw), one point goals (OneP_Goals).

The SPSS Statistics 17 program was used to interpret the data obtained. Calculations were made for descriptive statistics, obtaining the following indices: minimum, maximum, mean, standard deviation, variance and range. After obtaining them, we analyzed the values only from a ascertaining point of view between the two editions of U17 BH EC.

Based on these, the efficiency of the gate completion (Perc) was calculated for each technical procedure used according to the following formula:

$$\eta = \frac{G}{S} \times 100$$

η = the efficiency of the gate completion for each process

G = the number of successful throws (goals) for each procedure

S = the number of throws for each procedure

In order to analyze the efficiency of the teams from the perspective of the number of points accumulated in each match at U17 BH EC, the share of points obtained from 1-point procedures (OnP) and 2-point procedures (SpS, Inf) was calculated relative to the maximum number of possible points from total throws:

$$\eta_p = \frac{G_1 + 2 * G_2}{S_1 + 2 * S_2} \times 100$$

- η_p = gate completion efficiency calculated for the number of points obtained/possible
- G_1 = the number of successful throws (goals) from the procedures which are capitalized by 1 point
- S_1 = the number of throws for procedures capitalized by one point
- G_2 = the number of successful throws (goals) from the procedures which are capitalized by 2 points
- S_2 = the number of throws for the procedures capitalized by 2 points

Results

The analysis of the data recorded in the observation sheets was done taking into account the throwing procedures used by the team players, the total number of throws at the goal, the number of goals and the number of points scored.

Table 1. Descriptive statistics for the spinshot throw used by the six teams.

Ranking		Year	N	Range	Min.	Max.	Mean	Std. Deviation	Variance	Total
I	SpS_Perc	2019	6	29	71	100	82.18	10.53	110.79	
		2021	6	15	64	79	72.95	6.22	38.75	
	SpS_Throws	2019	6	3	7	10	8.50	1.05	1.10	51
		2021	6	5	9	14	12.00	1.79	3.20	72
	SpS_Goals	2019	6	3	5	8	7.00	1.26	1.60	42
		2021	6	5	6	11	8.83	1.94	3.77	53
II	SpS_Perc	2019	6	33	67	100	87.50	14.67	215.34	
		2021	6	12	71	83	75.65	4.27	18.22	
	SpS_Throws	2019	6	2	4	6	5.00	1.10	1.20	30
		2021	6	12	12	24	16.50	4.46	19.90	99
	SpS_Goals	2019	6	3	3	6	4.33	1.03	1.07	26
		2021	6	9	9	18	12.50	3.51	12.30	75
III	SpS_Perc	2019	6	17	83	100	92.06	8.74	76.38	
		2021	6	12	68	80	72.86	3.90	15.18	
	SpS_Throws	2019	6	4	3	7	5.33	1.51	2.27	32
		2021	6	3	18	21	19.67	1.21	1.47	118
	SpS_Goals	2019	6	3	3	6	4.83	1.17	1.37	29
		2021	6	3	13	16	14.33	1.21	1.47	86

The 1st place in 2019 had the efficiency of finalizing at the goal through the spinshot procedure of 82.18% (DS=10.53), and in 2021, the team ranked on the 1st place had the average efficiency of 72.95% (DS=6.22). The teams ranked 2nd in the two editions of BH EC, had an average efficiency of 87.5% (DS=14.67) in 2019 and 75.65% (DS=4.27) in 2021. The teams ranked 3rd had an average efficiency of 92.1 % (DS=8.74) in 2019 and 72.86% (DS=3.9) in 2021.

Table 2. Descriptive statistics for the inflight throw used by the six teams.

Ranking		Year	N	Range	Min.	Max.	Mean	Std. Deviation	Variance	Total
I	InF_Perc	2019	6	33	67	100	81.94	11.08	122.72	
		2021	6	56	0	56	35.08	20.59	423.99	
	InF_Throws	2019	6	2	4	6	5.33	1.03	1.07	32
		2021	6	6	3	9	7.50	2.35	5.50	45
	InF_Goals	2019	6	2	3	5	4.33	0.82	0.67	26
		2021	6	5	0	5	3.00	1.90	3.60	18
II	InF_Perc	2019	6	40	60	100	78.05	17.65	311.63	
		2021	6	48	33	82	58.08	17.05	290.70	
	InF_Throws	2019	6	4	1	5	3.00	1.41	2.00	18
		2021	6	8	3	11	6.00	2.76	7.60	36
	InF_Goals	2019	6	2	1	3	2.17	0.75	0.57	13
		2021	6	7	2	9	3.67	2.73	7.47	22
III	InF_Perc	2019	6	25	50	75	64.58	8.23	67.69	
		2021	6	67	33	100	68.45	24.14	582.65	
	InF_Throws	2019	6	6	3	9	5.67	2.42	5.87	34
		2021	6	6	1	7	3.67	1.97	3.87	22
	InF_Goals	2019	6	4	2	6	3.67	1.63	2.67	22
		2021	6	5	1	6	2.50	1.87	3.50	15

The 1st place in 2019 had the efficiency of finalizing at the goal through the inflight procedure of 81.94% (DS=11.08), and in 2021, the team ranked on the 1st place had the efficiency of 35.08% (DS=20.59). The teams ranked 2nd at the two editions of BH EC, had an efficiency of 78.05% (DS=17.65) in 2019 and 58.08% (DS=17.05) in 2021. The teams ranked 3rd had an efficiency of 64.58% (DS=8.23) in 2019 and 68.45% (DS=24.14) in 2021.

Table 3. Descriptive statistics for the throw of the specialist player used by the six teams.

Ranking		Year	N	Range	Min.	Max.	Mean	Std. Deviation	Variance	Total
I	SpC_Perc	2019	6	33	67	100	83.61	13.60	184.95	
		2021	6	33	50	83	72.72	12.48	155.64	
	SpC_Throws	2019	6	2	3	5	4.17	0.98	0.97	25
		2021	6	11	3	14	7.67	4.13	17.07	46
	SpC_Goals	2019	6	3	2	5	3.50	1.05	1.10	21
		2021	6	9	2	11	5.83	3.54	12.57	35
II	SpC_Perc	2019	6	40	60	100	93.33	16.33	266.67	
		2021	6	40	60	100	72.50	14.29	204.21	
	SpC_Throws	2019	6	4	1	5	2.67	1.37	1.87	16
		2021	6	2	3	5	3.50	0.84	0.70	21
	SpC_Goals	2019	6	2	1	3	2.33	0.82	0.67	14
		2021	6	1	2	3	2.50	0.55	0.30	15
III	SpC_Perc	2019	6	50	50	100	77.78	25.09	629.66	
		2021	6	90	10	100	68.61	30.74	944.91	
	SpC_Throws	2019	6	1	2	3	2.50	0.55	0.30	15
		2021	6	4	1	5	3.83	1.60	2.57	23
	SpC_Goals	2019	6	2	1	3	2.00	0.89	0.80	12
		2021	6	4	1	5	3.17	1.47	2.17	19

The 1st place in 2019 had the efficiency of finalizing at the goal through the specialist player’s throw of 83.61% (DS=13.60), while in 2021, the team ranked on the 1st place had the efficiency of 72.72% (DS=12.48). The teams ranked 2nd at the two editions of BH EC, had an efficiency of 93.33% (DS=16.33) in 2019 and 72.50% (DS=14.29) in 2021. The teams ranked 3rd had an efficiency of 77.78% (DS=25.09) in 2019 and 68.61% (DS=30.74) in 2021.

Table 4. Descriptive statistics for the goalkeeper’s throw used by the six teams.

Ranking		Year	N	Range	Min.	Max.	Mean	Std. Deviation	Variance	Total
I	DiG_Perc	2019	6	0	0	0	0.00	0.00	0.00	
		2021	6	100	0	100	33.33	51.64	2666.67	
	DiG_Throws	2019	6	0	0	0	0.00	0.00	0.00	0
		2021	6	1	0	1	0.67	0.52	0.27	4
	DiG_Goals	2019	6	0	0	0	0.00	0.00	0.00	0
		2021	6	1	0	1	0.33	0.52	0.27	2
DiG_Perc	2019	6	0	0	0	0.00	0.00	0.00		
	2021	6	100	0	100	16.67	40.82	1666.67		
DiG_Throws	2019	6	0	0	0	0.00	0.00	0.00	0	
	2021	6	1	0	1	0.17	0.41	0.17	1	

Ranking		Year	N	Range	Min.	Max.	Mean	Std. Deviation	Variance	Total
II	DiG_Goals	2019	6	0	0	0	0.00	0.00	0.00	0
		2021	6	1	0	1	0.17	0.41	0.17	1
	DiG_Perc	2019	6	0	0	0	0.00	0.00	0.00	
		2021	6	50	0	50	8.33	20.41	416.67	
	DiG_Throws	2019	6	0	0	0	0.00	0.00	0.00	0
		2021	6	2	0	2	0.33	0.82	0.67	2
III	DiG_Goals	2019	6	0	0	0	0.00	0.00	0.00	0
		2021	6	1	0	1	0.17	0.41	0.17	1

The 1st place in 2019 had the efficiency of finalizing at the goal by scoring from goal to goal through the goalkeeper's throw of 0% (DS=0.00), and in 2021, the team ranked on the 1st place had the efficiency of 33.33% (DS=51.64). The teams ranked 2nd in the two editions of BH EC, had an efficiency of 0% (DS=0.00) in 2019 and 16.67% (DS=40.82) in 2021. The teams ranked 3rd had an efficiency of 0% (DS=0.00) in 2019 and 8.33% (DS=20.41) in 2021.

Table 5. Descriptive statistics for the 6 meter throw used by the six teams.

Ranking		Year	N	Range	Min.	Max.	Mean	Std. Deviation	Variance	Total
I	6mT_Perc	2019	6	20	80	100	87.22	9.98	99.63	
		2021	6	50	50	100	77.78	25.09	629.66	
	6mT_Throws	2019	6	1	5	6	5.17	0.41	0.17	31
		2021	6	3	1	4	2.50	1.38	1.90	15
	6mT_Goals	2019	6	1	4	5	4.50	0.55	0.30	27
		2021	6	1	1	2	1.67	0.52	0.27	10
II	6mT_Perc	2019	6	33	67	100	90.28	15.29	233.86	
		2021	6	100	0	100	50.00	54.77	3000.00	
	6mT_Throws	2019	6	1	3	4	3.33	0.52	0.27	20
		2021	6	3	0	3	1.50	1.05	1.10	9
	6mT_Goals	2019	6	2	2	4	3.00	0.63	0.40	18
		2021	6	3	0	3	1.17	1.33	1.77	7
III	6mT_Perc	2019	6	50	50	100	75.83	15.94	254.17	
		2021	6	50	50	100	91.67	20.41	416.67	
	6mT_Throws	2019	6	1	4	5	4.17	0.41	0.17	25
		2021	6	3	2	5	3.17	1.33	1.77	19
	6mT_Goals	2019	6	2	2	4	3.17	0.75	0.57	19
		2021	6	4	1	5	3.00	1.55	2.40	18

The 1st place in 2019 had the efficiency of finalizing at the goal by scoring through 6 meter throws of 77.78% (DS=25.09), and in 2021, the team ranked on the 1st place had the efficiency of 87.22% (DS=9.98). The teams ranked 2nd in the two editions of BH EC, had an efficiency of 50% (DS=54.77) in 2019 and 90.28% (DS=15.29) in 2021. The teams ranked 3rd had an efficiency of 91.67% (DS=20.41) in 2019 and 75.83% (DS=15.94) in 2021.

Table 6. Descriptive statistics for the one-point throw used by the six teams.

Ranking		Year	N	Range	Min.	Max.	Mean	Std. Deviation	Variance	Total
I	OnP_Perc	2019	6	10	65	75	71.36	3.89	15.11	
		2021	6	33	67	100	92.06	13.69	187.53	
	OnP_Throws	2019	6	8	11	19	15.67	2.66	7.07	94
		2021	6	6	1	7	3.50	2.07	4.30	21
	OnP_Goals	2019	6	6	8	14	11.17	1.94	3.77	67
		2021	6	5	1	6	3.17	1.83	3.37	19
II	OnP_Perc	2019	6	19	57	76	66.93	7.87	61.90	
		2021	6	13	88	100	97.92	5.10	26.04	
	OnP_Throws	2019	6	3	14	17	15.83	1.47	2.17	95
		2021	6	7	1	8	4.00	2.53	6.40	24
	OnP_Goals	2019	6	5	8	13	10.67	2.07	4.27	64
		2021	6	6	1	7	3.83	2.23	4.97	23
III	OnP_Perc	2019	6	11	78	89	82.14	4.40	19.35	
		2021	6	100	0	100	33.33	51.64	2666.67	
	OnP_Throws	2019	6	2	18	20	18.67	0.82	0.67	112
		2021	6	1	0	1	0.33	0.52	0.27	2
	OnP_Goals	2019	6	2	14	16	15.33	1.03	1.07	92
		2021	6	1	0	1	0.33	0.52	0.27	2

The team on the 1st place in 2019 had the efficiency of finalizing at the goal by one-point throws of 71.36% (DS=3.89), and in 2021, the team ranked on the 1st place had the efficiency of 92.06% (DS=13.69). At the same time, the teams ranked 2nd in the two editions of BH EC, had an efficiency of 66.93% (DS=7.81) in 2019 and 97.92% (DS=5.10) in 2021. The teams ranked 3rd had the efficiency of 82.14% (DS=4.40) in 2019 and 33.33% (DS=51.64) in 2021.

Table 7. Descriptive statistics on the efficiency of the throws at the goal of the six teams.

Ranking		Year	N	Range	Min.	Max.	Mean	Std. Deviation	Variance
I	Eff	2019	6	5.30	77.78	83.08	80.33	2.31	5.33
		2021	6	8.00	62.96	70.97	66.28	3.50	12.27
II	Eff	2019	6	17.66	70.91	88.57	79.00	6.23	38.79
		2021	6	15.22	64.44	79.66	73.32	5.27	27.75
III	Eff	2019	6	9.38	75.00	84.38	78.68	3.48	12.14
		2021	6	13.72	68.42	82.14	75.70	5.50	30.24

In the beach handball game, goals scored with 2 points can be decisive in the evolution of a team during a competition or towards winning it.

From table no. 7 we notice a decrease in the efficiency of the goals scored by 2 points from one competition to another. This situation may indicate that in the competitive course of the three teams, a higher number of throws was allowed, followed by a decrease in the efficiency of completion, but with a higher average goals per game than in the 2019 edition.

The team on the 1st place in 2019 had the efficiency of the goals scored by 2 points of 80.33% (DS=2.31), and in 2021, the team ranked on the 1st place had the efficiency of 70.97% (DS=3.50). At the same time, the teams ranked 2nd in the two editions of BH EC, had an efficiency of 79% (DS=6.23) in 2019 and 73.32% (DS=5.27) in 2021. The teams ranked 3rd had efficiency of 78.68% (DS=3.48) in 2019, and 75.70% (DS=5.50) in 2021.

Conclusions

The trend identified by us for the three teams on the podium, from the U17 BH EC editions in 2019 and 2021, highlighted the fact that the share of goal throws by two points increased compared to that of goal throws capitalized by one point.

The two spectacular goal-scoring procedures, spinshot and inflight, had a higher share of use during the 2021 edition of U17 BH EC compared to the 2019 edition. The average goals scored was higher per match, but close values of the standard deviation can be seen, both to the total throws at goal and the goals scored, this indicating a coherent strategy during the first stages of U17 BH EC.

The specialist player is the only one who benefits from 2 points for each goal scored, regardless of the procedure chosen by them. We notice a decrease in its efficiency from one edition to another from the results obtained,

but the number of throws on goal and the number of goals scored are higher in the 2021 edition, this fact indicating a greater involvement during the games.

Goalkeepers in the beach handball game can score much faster and more goals compared to those in the handball game, the ball being put back into play immediately after the goal is scored or if the shot is missed by the opponents. We noticed an increase in goal throws, goals scored and their efficiency from one edition to another, the goalkeepers being much more involved in the game, the attacks of their own team starting with them.

The efficiency of 1-point throws increased at U17 BH EC edition in 2021 compared to the 2019 edition, but a decrease in these throws at goal during the games can be observed from the results, the teams preferring to score goals in the 2-point procedures.

The obtained results indicate a qualitative increase of the beach handball game from one edition to another of the U17 European Beach Handball Championship, by increasing the efficiency of the goal-scoring actions capitalized by 2 points.

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