INFLUENCE OF BALL RESIN TO SHOT ACCURACY IN HANDBALL

Siniša Karišik, Danijel Božić, Tijana Tirić
Faculty of Physical Education and Sport, East Sarajevo, BOSNIA AND HERCEGOVINIA

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Abstract
Opinions of handball experts differ in terms of importance of individual elements of handball technique, but they are all in agreement that shot is relevant and important factor. Shot velocity and accuracy gain importance in terms of score outcome of the game. We may draw a conclusion that they are two basic factors and that they are extremely significant for shot efficiency. In this paper, research will be aimed answering whether and to what extent ball resin influences shot accuracy. The sample consists of 20 male handball players, members of handball clubs which play in Serbian Super league aged 17 to 36, systematically training for at least two years without longer brakes. For the purpose of accuracy assessment the participants shot equilateral triangles positioned between the goal posts in upper and lower corners. Shot was performed with size 3 handball with and without resin as follows: jump shot from 9-meter distance (SMP9M), 7-meter throw from standing position (SMP7M) and shots by positions (SMPP). For the purpose of determining the statistical significance all the data was processed at univariant level, the descriptive parameters were calculated and after that the Student's t-test for paired samples was applied at the multi-variant level and relevant parameters were defined. Results of the Student's t-test for paired sampled provided confirmation for identification of statistically significant differences between mean values: (SMP9ML – SMP9MBL .001, SMP7ML – SMP7MBL .006 and SMPPL – SMPPBL .024) at the statistical significance level p < .05.

Key words: *handball, accuracy, shot, resin*

INTRODUCTION

Shot or throw is the culmination of offense aimed at scoring a goal. This element of technique of handball play directly affects the success of player and the team regarding the result. That is exactly the reason why many players and coaches observe the shot as dominant element of handball play and devote it more time in the training process than other to other elements of the technique. Opinions of handball experts differ in terms of importance of individual elements of handball technique, but they are all in agreement that shot is relevant and important factor.

In order to achieve result success in handball players have to fulfil the basic aim which is scoring. Due to that fact many authors base their research on studying the factors which influence the shot quality. Throw is one of the most important skills in handball. (Mikkelsen & Olesen, 1976; Joris, Muijen, Ingen Scher & Kemper, 1985; Muijen, Joris, Kemper, Ingen & Schenau, 1991; Marczinka 1993).

Accuracy and velocity of the shot increasingly gain significance in the result outcome of the game. We can state that they are two basic factors extremely significant for the shot efficiency. Positive influence of anthropological abilities to ball velocity, especially of explosive strength, was confirmed by research (Rogulj, Foretić, Srhoj, Čavala, & Papić. 2007; Foretić, Erceg, Bradarić, & Tocilj. 2005). Conducted research provided evidence that the technique of performing the shot, i.e. throw (Zvonarek, N, Vuleta, D & Hraski, Ž. 1997), as well as simultaneous hand and ball movement in duration of throw (Jovanović, B. & Đukić, M. 2007) have high correlation with the throw efficiency.

Basic factors influencing the quality, velocity and power of throw was defined (Muijen, Joris, Kemper, Ingen Schenau, 1991; Karišik, S, Milićević, Lj & Božić, D. 2016) as body function, motoric ability or throwing technique. In this paper the research will be focused at providing answers to the question whether and to what extent resin influences shot accuracy.

As we are witnessing, international handball umbrella organisation has been performing tests on the handball which could be controlled in the same manner as the handball with resin. This task is entrusted to the company Molten and it is expected that "new" handballs will be available in 2018. Whether the "new" handballs would answer the requirements of the game and send the resin to history making it prohibited is something we will see in recent future. It is the fact that resin has numerous negative characteristics: it is unhealthy for players, it is mostly prohibited at courts around the world and in the region because of cleaning expenses and due to the fact that it causes damage to flooring. It is also evident in practice that parents prohibit handball to children because of use of resin and colour and brand of handball characteristic for each championship is visible only in the first minutes of the game.

MATERIAL & METHODS

The sample consists of 20 participants, handball players, members of handball clubs which play in Serbian Super league aged 17 to 36, systematically training for at least two years without longer brakes.

Table 1. Average age, height and weight of the participants

	N	Min	Max	Mean
AGE	20	17	36	24.95
ATV	20	175	198	185.75
MAS	20	70	105	88.70

For the purpose of accuracy assessment the participants shot equilateral triangles with sides 50 cm long, positioned inside the goal frame in upper and lower corners. Each participant had two shots per corner, eight shots per test in total. Shots were performed using the size 3 handball with and without resin as follows: jump shot from 9-meter distance (SMP9M), 7-meter throw from standing position (SMP7M) and shots by positions (SMPP).

For the purpose of determining the statistical significance all the data was processed at univariant level, basic descriptive parameters were calculated and after that the Student's t-test for paired samples was applied at the multi-variant level and relevant parameters were defined. Data was processed using SPSS/20 pack.

RESULTS

Basic statistic parameters of accuracy variables for handball players in Serbian Super league are presented in Table 2. After performing the analysis of discriminative features of the measurements taken, i.e. the normality of distribution of the results by variables, we may draw a conclusion that they are within the boundaries of normal distribution which allows for application of more complex multi-variant method of data processing.

***Table 2**. Descriptive statistical results*

	N	Minimm	Maximum	Mean	Std. Dev.	Skewness	Kurtosis
SMP9ML	20	2.00	7.00	4.15	1.27	.206	.109
SMP9MBL	20	.00	6.00	2.80	1.36	.262	1.018
SMP7ML	20	3.00	8.00	5.80	1.61	-.061	-1.226
SMP7MBL	20	3.00	7.00	4.50	1.28	.253	-1.090
SMPPL	20	2.00	8.00	4.85	1.63	.105	-.836
SMPPBL	20	2.00	6.00	3.90	1.02	.548	.372

Further analysis of the results (Table 2) indicates negative asymmetry (hypo kurtosis) in one of the variables which indicates higher number of better results, whereas remaining five variables have positive asymmetry (epikurtosis) which indicates that these variables show higher number of poor results. If we observe normality of distribution using the kurtosis values, we note that that three out of six variables are negative which indicates dispersion of the results whereas remaining three variables are positive which is a sign of leptokurtic distribution where there are more average results for this variable. Upon the analysis of dispersion parameters of the variables, we note that the group of participants showed the highest level of homogeneity in the following variables: SMPPBL, SMP9ML, SMP7MBL, SMP9MBL (1.02 – 1.36). The lowest level of homogeneity of the results for this group of participants was observed in variables SMP7ML and SMPPL (1.61 – 1.63).

***Table 3.** Differences in accuracy using the handball with and without resin*

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	SMP9ML	4.15	20	1.26	.283
	SMP9MBL	2.80	20	1.36	.304
Pair 2	SMP7ML	5.80	20	1.60	.359
	SMP7MBL	4.50	20	1.27	.285
Pair 3	SMPPL	4.85	20	1.63	.364
	SMPPBL	3.90	20	1.02	.228

Legend: SMP9ML – jump shot from 9-meter distance with resin; SMP9MBL – jump shot from 9-meter distance without resin; SMP7ML – 7-meter throw from standing position with resin; SMP7MBL – 7-meter throw from standing position without resin; SMPPL – throw from all playing positions with resin; SMPPBL – throw from all playing positions without resin.

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	SMP9ML&SMP9MBL	20	.262	.264
Pair 2	SMP7ML&SMP7MBL	20	.179	.450
Pair 3	SMPPL&SMPPBL	20	.212	.370

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	SMP9ML - SMP9MBL	1.35	1.59	.35	.60	2.09	3.777	19	.001
Pair 2	SMP7ML - SMP7MBL	1.30	1.86	.41	.42	2.17	3.115	19	.006
Pair 3	SMPPL - SMPPBL	.95	1.73	.38	.13	1.76	2.454	19	.024

Further inspection of the results (Table 3) regarding mean values of the observed pairs leads to conclusion that the tests of accuracy, in cases where handball with resin was used, provided better results in all the observed variables (SMP9ML, SMP7ML and SMPPL).

T-test for paired samples was used for assessing the influence of ball resin to shot accuracy in all three tested situations: jump shot from 9-meter distance, 7-meter throw from standing position and throw from all playing positions.

Analysing the test for jump shot from 9-meter distance with and without resin (SMP9ML – SMP9MBL) statistically significant increase of values for accuracy was observed, as follows: from (M = 2.80, SD = 1.36) to (M = 4.15, SD = 1.26); t(19) = 3.77, p = .001 (2-tailed). Mean increase is 1.35, whereas the confidence interval of 95 % runs from lower .60 to upper 2.09. Eta-square value of (0.42) provides evidence that influence of ball resin to jump shot from 9-meter distance is extremely high.

Analysing the test for 7-meter throw from standing position with and without resin (SMP7ML - SMP7MBL) statistically significant increase of values for accuracy was observed, as follows: from (M = 4.50, SD = 1.27) to (M = 5.80, SD = 1.60); t (19) = 3.11, p = .006 (2-tailed). Mean increase is 1.30 and the confidence interval of 95 % runs from lower .42 to upper 2.17. Eta square value (0.33) provides evidence that influence of ball resin to 7-meter throw from standing position is extremely high.

It was determined by interpretation of test results for shots performed from all playing positions with and without resin (SMPPL – SMPPBL) that there was statistically significant increase in values for accuracy, as follows: from (M = 3.90, SD = 1.02) to (M = 4.85, SD = 1.63); t (19) = 2.45, p = .024 (2-tailed). Mean increase is .95, whereas the confidence interval of 95% runs from lower .13 to upper 1.76. Eta square value (0.24) provides evidence that influence of ball resin to shots performed from all playing positions is extremely high.

DISCUSSION

In the introduction to this paper we pointed out the most frequently researched areas which have the highest influence to accuracy in handball. It is widely accepted that anthropometric characteristics are one of three most commonly tested dimensions of athletes (Milanović, Jukić, Vuleta, Šimek & Šentija, 2005) and anthropometric constitutional characteristics are also one of the basic criteria for selection (Blašković, 1979; Cercel, 1986; Delija, Šimenc & Vuleta, 1995). If we add that the shot efficiency also depends on shot technique (mechanics), player's body shape, physical predisposition, psychological characteristics and shot selection (Mikić, B. & Alić-Partić, M. 2002), the question is whether the strength of grip and the quality of connection between the hand and the ball contribute to the results.

In the basis of each throw, important element is the quality of the grip on the handball. In order to send the ball with high quality and velocity towards the goal, it is essential to provide high level of contact with the hand. Holding a ball is specific feature of handball, and hand dimensions (length and planimetric parameter) directly affect the quality of the grip. Research results suggest that planimetric parameter of the hand significantly determines the quality of throw, which eventually influences the final result of shot accuracy (Karišik, S, Goranović, S., Milićević, Lj & Božić, D. 2016). Being led by this research, we may draw a conclusion that players with larger hands can achieve better results in shot accuracy due to better grip achieved by hand dimensions. Based on our research, we may conclude that

using the ball resin handball players increase the grip quality, hence achieving better results in the area of accuracy.

CONCLUSION

Additionally, it is important to mention that resin helps players with smaller hand dimensions to achieve better quality shots. Influence of the resin is more pronounced in case of wing players. To them, ball resin allows for "prolonged" contact with handball and realisation of specific shots in the game, such as "popcorn" or "dry lief".
We hope that the "new" ball will have similar characteristics as resin and sufficiently improve the connection between the hand and the ball in order to make possible for players to perform attractive and accurate shots. If not, the game of handball and the players will be highly at loss in terms of game quality and diversity, especially in the offense phase, which will directly influence popularity and development of handball game.

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Corresponding author:
Siniša Karišik
e-mail: sinisa.karisik@yahoo.com