

Marko Šibila,
Igor Justin,
Maja Pori,
Tanja Kajtna,
Primož Pori

Faculty of Sport, University of Ljubljana, Slovenia

RAZLIKE U ODABRANIH MORFOLOŠKIH I MOTORIČKIH KATAKTERISTIKA RUKOMETNIH VRATARA, RAZLIČITIH KVALITETNIH RAZINA

1.0 Introduction

Data concerning handball player's position-related model characteristics are very important from the aspect of achieving the elite results. This information contributes towards an in-depth understanding specificity of individual playing positions and consequently leads to more precise selection of the players and planning of the training process.

Playing positions and roles in Team handball are divided on the basis of attributes, abilities and characteristics of the players (Šibila, 2004). These qualities also determine the role and a model of game tactics, which a player can assume. All the playing positions demand high developed motor abilities, which are nevertheless specific for each playing position. Individual types of players differentiate among themselves in both morphological and motor dimensions. Probably it's due to the fact that differences occur in the volume and intensity of large-scale cyclic movements and the frequency of acyclic activities for players in different playing positions (Šibila, Vuleta, & Pori, 2004).

The most specific playing position in Team handball, which also carries a lot of responsibility, is a position of a goalkeeper. His basic activity is saving opponent's shots in the goalkeeper's area. Inside this area goalkeepers should follow different rules than other players. Goalkeeper has also an important tactical role when he acts outside his area. Most often this is seen at the beginning of a counter-attack, when he has to pass the ball to the best positioned team mate in the court; also when establishing verbal and other communication whilst cooperating with defence players or when trying to stop the counter-attack. Available literature includes some sources that discuss the specific role of the goalkeeper and the aspect of motor abilities (Gruić, & Vuleta, 2009), morphological characteristics or modelling characteristics of the game for this playing position (Šibila, & Pori, 2009).

The aim of the present study is to analyse two groups of goalkeepers who play in the first and the second Slovenian national handball league in selected morphological body characteristics and motor abilities.

2.0 Methodology

2.1 Sample of subjects

A group of 36 senior team handball goalkeepers of the first and the second Slovenian handball league (age: $22,6 \pm 5,4$ yr, height: $185,8 \pm 4,7$ cm, body weight: $88,7 \pm 9,1$ kg, training experience: $11,8 \pm 4,8$ yr) participated in the present study. The goalkeepers were separated in two groups, according to the competition level (first and second Slovenian national handball league).

2.2 Sample and description of the variables

The sample of variables consisted of age and training experience data, four morphological body characteristics and of six motor ability tests (Table 1).

Table 1. Sample and description of the variables

Variable	Description of the variable	Unit
Age (A)	Current age of the subjects	yr
Training experiences (TE)	Current training experiences in the junior and senior age category	yr
Morphological body characteristics		
Body height (BH)	Body height was measured to the nearest 0,001 m using a stadiometer	m
Body mass (BW)	Body mass was measured to the nearest 0,1 kg using an electronic scale	kg
Body mass index (BMI)	The body mass index (BMI) is defined as the individual's body weight divided by the square of his or her height.	kg/m ²
Triceps skin fold (TSF)	Triceps skin fold (TSF) thickness was measured using a Harpenden calliper parallel to the length of the arm over the triceps muscle midway between the acromion and olecranon.	mm
Motor ability tests		
Hip abduction (HAB)	HAB described flexibility of hip adductors and was measured with goniometer which was placed above the right knee.	degree ⁽⁰⁾
Squat jump (SJ)	SJ is a measurement of the explosive force of legs and trunk (without lunge countermovement). The object is to jump as high as possible from the position where knees are bended at 90 degrees. Hands are placed on the waist all the time. It was measured with Optojump device.	cm
Counter movement jump (CMJ)	CMJ is a measurement of the explosive-elastic force of the legs and trunk (with free lunge counter movement). Single jump starting with straight legs and performing a natural flexion before takeoff. The object is to jump as high as possible with hands placed on the waist all the time. The difference between the values for centre of gravity found in the SJ and the CMJ give an idea of the athlete's "elastic" qualities. It was measured with Optojump device.	cm

Drop jump (DJ)	DJ is a measurement of the explosive-elastic (reactive) force of the legs and trunk. DJ is a task where the performer drops down from a specified height (45 cm) and then jumps immediately upwards as high as possible. Hands are placed on the waist all the time. A DJ uses the stretch-shortening cycle. It was measured with Optojump device.	cm
Over arm throw of medicine ball (OT)	OT is a measurement of the explosive-elastic force of the arm and trunk. The object is to throw the medicine ball as far as could from the standing position without moving feet. It was measured with a measure tape located along the gym.	m
Lateral speed and agility (4 x 6 meters) (LSA)	LSA is a measurement of the speed of the lateral movements and the ability to change directions. The performer moves with lateral steps as quickly as possible from the first to the second line and back. Subjects repeated those movements three times. No cross steps are allowed. It was measured with a stopwatch which and was started when subject steps across the first line and it was stopped when subjects comes after third repetition across the first line	s

2.3 Data analysis

The SPSS statistical package was used for statistical data analyses. Basic statistics for variables were computed. Shapiro-Wilkins test was used for testing the normality of data distribution. In order to determine differences between two groups of goalkeepers a one-way analysis of variance (one-way ANOVA) was employed. A probability level of 0.05 or less was taken to indicate statistical significance.

3.0 Results and Discussion

Basic statistical characteristics of selected morphological and motor variables are presented in Table 2. All selected values have normal data distribution.

Table 2: Basics statistical characteristics of all parameters

Parameter	Group (G)	X	SD	min	max	Shapiro_Wilk
Age (A)	1	23,6	5,6	16	36	,121
	2	21,6	5,2	16	37	,101
Training experiences (TE)	1	9,4	4,5	3	20	,072
	2	7,3	3,1	2	18	,327
Body height (BH)	1	1.88	3,1	1.82	193	,411
	2	1.83	4,6	1.76	190	,236
Body mass (BW)	1	92,8	8,3	80	114	,516
	2	84,8	8,2	70	100	,844
Body mass index (BMI)	1	26,3	4,2	21,5	30,2	,988
	2	25,4	3,9	19,4	29,3	,167
Triceps skin fold (TSF)	1	9,3	4,2	4	20	,132
	2	9,3	3,8	4,5	17,5	,078
Hip abduction (HAB)	1	67,4	7,8	57	83	,108

	2	62,9	10,1	45	85	,718
Squat jump (SJ)	1	34,7	2,1	30,4	37,5	,213
	2	33,1	5,1	24,2	45,6	,657
Counter movement jump (CMJ)	1	36,4	3	31,1	44,4	,536
	2	35,5	4,1	26,2	45,8	,994
Drop jump (DJ)	1	33,3	4,6	23,9	44,7	,738
	2	33,1	6,3	24,7	50,1	,213
Over arm throw of medicine ball (OT)	1	25,7	3,1	20,5	33,2	,809
	2	22,3	2,1	18,5	25,7	,417
Lateral speed and agility (4 x 6 meters) (LSA)	1	7,6	0,4	6,9	8,4	,578
	2	7,8	0,5	6,8	8,7	,774

Key: Group 1 (G1) – 1th Slovenian national handball league; Group 2 (G2) – 2nd Slovenian national handball league; X - average value; SD - standard deviation; MIN, MAX - minimum and maximum values; SHAPIRO-WILK - significance of Shapiro-Wilkins test.

Tables 3 and 4 show comparative results carried out by one-way analysis of variance. The analysis was carried out by data on age and training experiences, selected morphological characteristics and motor abilities.

Table 3: Differences in age and training experiences between groups of goalkeepers

Parameter	G1	G2
Age (A) ^a	23,6	21,6
Training experiences (TE) ^b	9,4*	7,3*

Key: * $p < 0.05$; ^a no statistically significance differences; ^b $G1 > G2$

In the table 3 we can see, that the goalkeepers who played in the first Slovenian national handball league (G1), were on average two years older than the goalkeepers who played the second league (G2). Differences were not statistical significant. In the term of Training experiences (TE), we found out the statistical significant differences between two groups of goalkeepers ($p < 0.05$). It's very important information and we could explain it in two ways. First it means that performance efficiency of goalkeepers increase with their experiences which enable them to improve their playing performance. Second explanation could be in connection with the professional status of almost all first division goalkeepers in comparison with amateur status of second division goalkeepers. Professionals try to prolong their player carriers as much as possible.

Out of Table 4 it's evident that goalkeepers in the G1 are statistically significant taller and that they have statistically significant more body mass than goalkeepers in G2 ($p < 0.05$). Values of the G1 are quite similar in comparison with those of previous studies. Body height is very important for the goalkeepers (Šibila, & Pori, 2009). Higher values of the body height primary helps goalkeepers that efficiently stop shots directed at the upper corners of the goal. Surprisingly is a difference which appears bet-

ween two groups of goalkeeper's in the term of body mass. The goalkeepers of our sample that plays in the second Slovenian national handball league have approximately 8 kg less body mass than the players in G1. Wide variation in body mass values of G2 indicate huge differences in comparison with high-level international goalkeepers reported by Srhoj et al., 2009 and Šibila, & Pori, 2009.

Table 4: Differences in selected morphological body characteristics between groups of goalkeepers

Parameter	G1	G2
Body height (BH) ^a	1.88*	1.83*
Body mass (BW) ^b	92,8*	84,8*
Body mass index (BMI) ^c	26,3	25,4
Triceps skin fold (TSF) ^d	9,3	9,3

Key: * $p < 0.05$; ^a $G1 > G2$; ^b $G1 > G2$; ^{cd} no statistically significance differences

In recent researches authors found out that goalkeepers' skin folds are on average the most pronounced and their share of subcutaneous fat in total body mass is the highest among all playing positions in team handball (Šibila, & Pori, 2009). Authors reported that the high-level goalkeepers of their sample have on average 9,36 mm of triceps skin fold (TSF) what is comparable with result of the present study. Differences between G1 in G2 in the term of TSF are not statistical significant.

Body mass index (BMI) illustrates the relationship between body height and body weight. The results in both groups show relative high values (G1 – 26,3 kg/m²; G2 – 25,4 kg/m²). Goalkeepers' actions, which serve to save the attackers shoots to the goal, should be very fast. In the terms of body composition, we can expect a faster reaction when the body and the limbs are not heavy, followed by smaller moment of inertia in the beginning of the each movement. In that case the body fat represents an additional burden (Wilmore, & Costill, 1999). Muscle mass is desirable from the point of view of reaction so far, until positive contribute to the speed and power of goalkeepers movements. It is difficult to say what level of muscle mass is adequate in terms of reaction, but it is certain that the relative strength of goalkeepers should be on very high level. We should assume that a high level of explosive power and elasticity in optimal combination with a body mass is of a great importance for the goalkeepers.

Table 5: Differences in selected motor ability variables between groups of goalkeepers

Parameter	G1	G2
Hip abduction (HAB) ^a	67,4	62,9
Squat jump (SJ) ^b	34,7	33,1
Counter movement jump (CMJ) ^c	36,4	35,5
Drop jump (DJ) ^d	33,3	33,1
Over arm throw of medicine ball (OT) ^e	25,7*	22,3*
Lateral speed and agility (4 x 6 meters) (LSA) ^f	7,6	7,8

Key: * $p < 0.05$; ^{abcdf} no statistically significance differences; ^e $G1 > G2$

In selected motor ability variables the goalkeepers' in G1 on average achieved higher values (Table 5). But only in OT, which represents the explosive and elastic power of upper body, statistical significance differences could be confirmed ($p < 0.05$; $G1 > G2$). In general, average results of the motor ability variables obtained by our subjects, shows lower values than in reports of Chaouachi et. al, 2009, where authors measured the sample of elite male handball players.

4.0 Conclusion

Goalkeepers' playing role in Team handball is unique and defined with small playing area. Inside this area different rules are prescribed for a goalkeeper than for the other players. Findings of the present study indicate that there are differences in some morphological body characteristics as well as in motor abilities of goalkeepers of two different quality levels. Statistical significant differences between analyzed groups occurred in the terms of "Training experiences" (TE), "Body height" (BH), "Body mass" (BM) and in the "Over arm throw with the heavy ball" (OT). Based on these results we can speculate that morphological body characteristics together with playing experiences are decisive to define successful goalkeepers. Results in motor ability tests doesn't differ significantly goalkeepers of both groups. The only exception is a heavy medicine ball throw. It's somehow surprisingly while the training process for professional players in first division should effectively develop most important motor abilities. Obviously the results show just the opposite – there are no statistically significant differences between both groups distinguished by competition (quality) level. Results in motor ability tests (especially those who evaluate explosive and elastic power of lower limbs) indicate quite low level of physical fitness of almost all subjects in our sample. High level of explosive and elastic power with optimal combination with a body mass should be very important for goalkeepers' actions during the matches. Followed such statement we can conclude that further individualization and careful planning of training process is essential for the goalkeepers if we want to improve their motor abilities. It's especially true for the top level goalkeepers who must extremely develop their motor abilities.

5.0 References

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QUALITY LEVEL-RELATED DIFFERENCES IN SELECTED MORPHOLOGICAL BODY CHARACTERISTICS AND MOTOR ABILITIES OF GOALKEEPERS IN TEAM HANDBALL

The aim of the present study is to identify the quality level-related differences between two groups of team handball goalkeepers in selected morphological body characteristics and motor abilities. A group of 36 senior goalkeepers who were members of first and second Slovenian handball league clubs (age: $22,6 \pm 5,4$ yr, height: $185,8 \pm 4,7$ cm, body weight: $88,7 \pm 9,1$ kg, training experience: $11,8 \pm 4,8$ yr) participated in the present study. The goalkeepers were divided in two groups, according to their competition level. The sample of variables consisted of age and competition experience data, four morphological body characteristics and of six motor ability tests. In order to determine differences between two groups of goalkeepers in selected morphologic and motor variables a one-way analysis of variance (one-way ANOVA) was employed. Findings of the present study indicate existing of quality level-related differences between two groups of team handball goalkeepers in selected morphological body characteristics and motor abilities. Further individualization and careful planning of training process of the goalkeepers is essential if we want to improve for goalkeepers' important motor abilities and morphological body characteristics.