Basic physical profile of current Czech elite male ice hockey players – reference values

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Abstract: In the Czech Republic, ice hockey is a very popular sports discipline with remarkable international success. The present article analyses basic morphological parameters (body height, body weight, body mass index) in all Czech professional ice hockey players in the top league (ELH) in the Czech Republic (N = 413; average age: 25.9±5.90 years; age range 16–42 years; Goalkeepers (N = 44); Defenders (N = 151); Forwards (N = 218); 100% male). Statistical data processing was performed using a single factor ANOVA and Fisher's (LSD) post hoc test. The observed values represent the current level of development of basic morphological parameters in professional ice hockey players in the Czech Republic and can be considered reference values in this specific population group. This study is the first to report the basic physical characteristics of all male ice hockey players from the Czech Republic.

[Sigmund M, Sigmundova D, Kvintova J. **Basic physical profile of current Czech elite male ice hockey players – reference values.** *Life Sci J* 2015;12(2):9-13]. (ISSN:1097-8135). http://www.lifesciencesite.com. 2

Key words: body height; body weight; BMI; professional sport; man

1. Introduction

In the Czech Republic, anthropological research has a long lasting tradition (Riegerova, Pridalova and Ulbrichova, 2006). The issue of monitoring the development of morphological parameters has an irreplaceable role both in the area of health assessment and elite sport. Morphological characteristics of an individual represent a significant determinant in sports performance. This fact is also accented in the area of the current concept of ice hockey, where an optimum development of basic somatic parameters significantly affects the structure of performance (Burr, Jamnik, Baker, Macpherson, Gledhill and McGuire, 2008; Gröger, Oettl and Tusker, 2001; Montgomery, 2006; Sigmund, Riegerova and Dostalova, 2012; Szmatlan-Gabryś, Stanula, Gabryś and Ozimek, 2014; Zryd, Kölliker and Tschopp, 2009). Ice hockey is a relatively favourite sports activity; therefore, it arouses attention of the professional community. In the world, systematic monitoring of basic physical parameters in ice hockey players started in the second decade of 20th century (Montgomery, 2006).

The dynamics of development of this sport and increasing demands for various skills and capabilities are evidenced by the development of the morphophenotype of elite ice hockey players. Basic morphological characteristics of elite ice hockey players have gone through development and result from numerous determining factors, particularly mutual combination of the effects of the secular trend and sports selection.

With respect to the current concept of the game, a professional ice hockey player must have a developed complex of morphological and functional characteristics without which today's top level performance is not possible. Intensive training of professional ice hockey players currently focuses particularly on the development of muscle strength, aerobic capabilities, anaerobic performance and anaerobic capacity, development of speed capabilities and agility (Burr et al., 2008; Hoff, Kemi, and Helgerud, 2005; Manners, 2004; MacLean, 2008; Montgomery, 2006; Quinney et al., 2008; Ransdell and Murray, 2011; Vescovi, Murray, and Van Heest, 2006).

Within the current concept of elite ice hockey, the most successful individuals are those whose body height is over 185cm, body weight between 88–93 kilograms, and body fat proportion between 10–12% (Burr et al., 2008; Montgomery, 2006; Quinney, Dewart, Game, Snydmiller, Warburton, and Gordon, 2008; Sigmund, Riegerova and Dostalova, 2012).

The aim of this study is to present the current values of body height, body weight and BMI in contemporary professional ice hockey players in the top Czech league (ELH), taking into account their game positions. We processed the data of all players (census); the presented outcomes should represent reference values of the monitored morphological characteristics in current Czech elite ice hockey players. The results of the Czech study can be used for further comparisons with other ice hockey superpowers.

2. Materials and Methods

The present survey is of a descriptive and comparative nature (Thomas, Nelson and

Silverman, 2011). The measured values of observed morphological parameters in adult ice hockey players in the top Czech league (Ice hockey Extraleague – ELH) were analysed in 2014. A total of 413 personal player cards were processed (100% male). The data represent an absolute collection (census) of observed values in Czech professional ice hockey players in the top Czech league (ELH). The survey did not include players of other nationalities. The average age of Czech players in the monitored survey was 25.9 years (SD = 5.90; range 16–42 years). The values of the monitored parameters were assigned into subsamples as per game positions (Goalkeepers, $N = 44$; Defenders, $N = 151$; Forwards, $N = 218$). The analysed data are based on relevant information provided by the Czech Ice Hockey Association (ČSLH) and various extraleague clubs. The monitored morphological parameters were measured during a medical examination performed by a sports physician. The measurement of basic anthropological parameters was in accordance with international recommendations (ISAK) (Marfell-Jones, Olds, Stewart and Carter, 2006).

The comparison of the monitored morphological parameters with average values of adult Czech men in the Czech Republic was based on relevant data (age category 20.00–24.99 years; body height = 180.4 ± 6.53 cm; body weight = 77.1 ± 12.93 kg) (Jirkovsky, 2003). Z-score was employed to perform a comparison with reference data. The data were also subject to statistical processing. For testing the significance of differences we applied a single-factor ANOVA followed by the Fisher's LSD post hoc test. The level of statistical significance was tested at $p \leq .05$, $p \leq .01$. To assess the material significance of the results of averages and standard deviations we applied the Cohen's effect of size measure, where d 0.2 = small effect, d 0.5 = medium effect, and d 0.8 = large effect (Thomas, Nelson, & Silverman 2011). Statistical result processing was carried out using the Statistica programme, version 10.0 (Statistica, Tulsa, USA).

3. Results

The value of body weight in current Czech elite ice hockey players compared with reference values of Czech men shows a positive difference of 3.8 cm (z-score = 0.58). The highest values of body height were observed in defenders; the difference was significant with respect to goalkeepers as well as forwards ($p \leq 0.0001$) (Table 1, Table 3). The average values of body height of goalkeepers and forwards are almost identical (Table 1). The value of body weight of current Czech ice hockey players compared with reference values of Czech men is higher by ten kilograms (z-score = 0.77). In the context of game positions the highest weight values were observed in defenders, followed by forwards and goalkeepers. We observed significant differences between all game positions (Table 1, Table 3). Significantly lower values of body weight of goalkeepers compared with defenders and forwards can be considered materially significant ($d = 1.22$; $d = 0.69$). Table 2 presents individual percentile values of the monitored parameters for the whole sample as well as with respect to various game positions.

Table 1. Body height, body weight and BMI in current Czech senior ice hockey players in the top league (ELH)

Body height (cm)	***n***	**M**	**SD**	**Min.**	**Max.**	**Me**	**Mod**
All players	413	184.2	5.5	170.0	202.0	184.0	180.0
Goalkeeper	44	183.5	4.3	175.0	194.0	183.0	180.0
Defender	151	185.3	5.6	173.0	202.0	186.0	187.0
Forward	218	183.6	5.5	170.0	202.0	183.5	183.0
Body weight (kg)	***n***	**M**	**SD**	**Min.**	**Max.**	**Me**	**Mod**
All players	413	87.1	7.4	69.0	110.0	87.0	90.0
Goalkeeper	44	81.5	5.2	72.0	90.0	82.0	75.0
Defender	151	89.6	7.0	73.0	110.0	90.0	90.0
Forward	218	86.4	7.4	69.0	108.0	85.5	90.0
BMI (kg/m^2)	***n***	**M**	**SD**	**Min.**	**Max.**	**Me**	**Mod**
All players	413	25.6	1.7	20.1	30.5	25.7	25.7
Goalkeeper	44	24.3	1.8	20.1	27.1	24.3	24.8
Defender	151	26.1	1.7	21.9	30.5	25.7	25.7
Forward	218	25.6	1.6	20.8	29.8	25.5	25.1

Legend: n – frequency; M – arithmetic average; SD – standard deviation; Min. – minimum value; Max. – maximum value; Me – median; Mod – modus

Table 2. Percentile values of body height, body weight and BMI in current Czech senior ice hockey players in the top league (ELH)

		Percentile						
Body height (cm)	*n*	5th	10th	25th	50th	75th	90th	95th
All players	413	176	178	180	184	188	191	193
Goalkeeper	44	177	179.3	180	183	186	189.4	191
Defender	151	178	178	180.5	185	189	192	195
Forward	218	174	176.7	180	183	187	190	193
		Percentile						
Body weight (kg)	*n*	5th	10th	25th	50th	75th	90th	95th
All players	413	75	78	82	87	91	96.8	100.4
Goalkeeper	44	74	74.3	75.8	82	85.3	87.7	88.9
Defender	151	79.5	80	85	89	94	98	102
Forward	218	76	78	82	86	90	96	99.3
		Percentile						
BMI (kg/m^2)	*n*	5th	10th	25th	50th	75th	90th	95th
All players	413	22.9	23.5	24.6	25.7	26.9	27.8	28.4
Goalkeeper	44	21.7	22	22.9	24.3	25.7	26.6	26.8
Defender	151	23.4	23.9	24.9	26.2	27.2	28.1	28.8
Forward	218	23	23.6	24.7	25.7	26.6	27.5	28.1

Table 3. Statistical comparison of differences and assessment of material significance with respect to game positions (ELH)

Differences	**2014**		
	MD	*p*	*d*
Body height (cm)			
Goalkeepers – Defenders	1.8	0.052	0.34
Goalkeepers – Forwards	0.1	0.865	0.02
Defenders – Forwards	1.7	0.004	0.31
Body weight (kg)			
Goalkeepers – Defenders	8.1	0.0001	1.22
Goalkeepers – Forwards	4.9	0.0001	0.69
Defenders – Forwards	3.2	0.0001	0.44
BMI (kg/m^2)			
Goalkeepers – Defenders	1.8	0.0001	1.05
Goalkeepers – Forwards	1.3	0.0001	0.80
Defenders – Forwards	0.5	0.006	0.30

Legend: MD – mean difference; *p* – statistical significance;
d – Effect size (Cohen)

The observed BMI values and mutual differences in relation to game positions indicate a similar trend as in body weight. The highest values were observed in defenders, the lowest in goalkeepers. In relation to game positions we observed significant differences between all positions (Table 1, Table 3). Accordingly, the significantly lower BMI values of goalkeepers compared with defenders and forwards can be considered materially significant (d = 1.05; d = 0.80).

4. Discussions

The basic morphological parameters in Czech elite ice hockey players from 1928 to 2010 showed a positive increase in body height by 10.9 cm and body weight by 18.9 kg (Sigmund, Riegerova and Dostalova, 2012). These values correspond with foreign survey data, particularly in comparison with the values of North American elite ice hockey players (Montgomery, 2006). The size of the changes is primarily dependent on various geographical, psychosocial and economic influences. However, in terms of developmental changes in elite athletes the overall dynamics of the change is significantly influenced by the factor of sports selection, allowing predisposed individuals to achieve maximum performance in a specific area. Another significant influence is the secular trend. The mutual combination of the secular trend and sports selection represents the principal variables influencing the development of basic somatic features (Malina, Bouchard and Bar-Or, 2004).

In the Czech Republic the period of significant positive acceleration of body height and weight in elite ice hockey players was particularly 1970s and 1980s (Chovanova, 1979). A significant increase in body height and body weight in Czech elite ice hockey players also took place during the first decade of 21st century, particularly with respect to game positions (Sigmund, Riegerova and Dostalova, 2012).

The present study indicates that the basic morphological parameters of Czech ice hockey players are significantly higher than the level of reference values of Czech adult men. The difference is obvious especially in the values of body weight (10 kg). In terms of game positions the highest development of basic morphological parameters was achieved by ice hockey defenders, followed by forwards and goalkeepers. The

observed trends are in compliance with other authors (Burr et al., 2008; MacLean, 2008; Montgomery, 2006; Quinney et al., 2008; Sigmund, Riegerova and Dostalova, 2012; Vescovi, Murray and Van Heest, 2006).

The average values of body height of current Czech ice hockey players are similar to those observed in players from the top Russian league (KHL). In comparison with the players from the Canadian American NHL the values of body height of Czech players are on average lower by 1 cm. Significant differences are observed in body weight. The body weight of current Czech ice hockey players in the top ice hockey league in the Czech Republic (ELH) is on average lower by 4–5 kg compared with NHL or KHL players (Burr et al., 2008; Montgomery, 2006; Quinney et al., 2008; Sigmund and Dostalova, 2011; Sigmund, Riegerova and Dostalova, 2012; Vescovi, Murray and Van Heest, 2006). Similarly, the BMI values are the lowest in comparison with the players in elite world leagues. In this context, the BMI values are merely of an additional significance as they do not specify the proportion of various body fractions.

The present results of basic morphological parameters in current Czech elite ice hockey players represent current values and can be considered reference indicators in the observed sports specialization. The data can be used for comparison at a national level with respect to various sports. At the same time the present data show the current level of development of the monitored morphological characteristics in Czech elite ice hockey players compared with national data from other countries.

The present study shows current values of body height, body weight and BMI in current professional ice-hockey players in the top Czech league (ELH), also with respect to game positions. We analysed the data of all players from the top Czech league from all fourteen extraleague clubs. This is an absolute collection (census) (N = 413; 100% male). The outcomes of the study represent reference values of the monitored morphological characteristics in current Czech professional ice hockey players in the top league in the Czech Republic.

Acknowledgements

Authors are grateful to the Ministry of education, youth and sport of Czech Republic for financial support to carry this work. The study is dedicated to the project: Physical activity and inactivity of inhabitants of the Czech Republic in the context of behavioral changes, No.: MSM 6198959221.

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1/23/2015