

International comparison of motor abilities and floorball skills in U-11 to U-14 teams from the Czech Republic and Australia

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Abstract: Floorball is a young and rapidly developing team game. At the world floorball championships, the considerable disparity in performance can be seen between the individual countries. The aim of this study was to compare the level of floorball skills and motor abilities of children in the U-11 - U-14 age category at floorball clubs in the Czech Republic and Australia. The players from FBŠ Slavia Pilsen clubs (Czech Republic) ($n=18$; $12.1y \pm 1.0$; $155.4cm \pm 10.6$; $44.7kg \pm 12.1$) and Peninsula Floorball club (Australia) ($n=18$; $12.7y \pm 1.0$; $160.7cm \pm 12.0$; $53.2kg \pm 11.6$) participated in this study. To compare the tested groups, 6 items (3 motor abilities, 3 floorball skills) were used from the test battery prepared by the Czech Floorball Association for the given age category. In motor abilities, a statistically and substantially significant difference was found only for one item (Illinois agility test without stick). In floorball skills, a statistically and substantially significant difference was found for all of the tested items. Only for one criterion of the Shooting test, namely the time required for performing the task, the difference was not statistically significant, and substantial significance reached only a medium effect. The presented results clearly indicate the different level of floorball skills between the Czech and Australian floorball players in the age category tested by us.

Keywords: Floorball skills, Motor Abilities, International Comparison, Czech Republic, Australia



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1. Introduction

Floorball is a relatively young and rapidly developing team game. The International Floorball Federation (IFF) was established only in 1986. During that time, floorball has evolved from a spontaneous recreational activity to one of the fastest growing organised sports. Currently, the IFF has more than 376,000 registered members from 74 countries (data from 2019), and other countries are still waiting for admission [1]. The Czech Republic (CZE) joined the IFF in 1993, while Australia (AUS) three years later [2]. Nevertheless, according to the IFF, there are 405 registered clubs (2018) in the Czech Republic, versus 27 clubs in Australia [3]. The numbers of registered players correlate to this number too; namely 43,095 in CZE and 1,346 in AUS (data from 2019) [1].

Of course, floorball is not only played by registered players. It can be seen more and more in school physical education lessons, and is widely practised as a recreational game in the Czech Republic and abroad. According to physical education teachers at primary schools in the Czech Republic, floorball is one of the most frequently practised games in physical education lessons. According to pupils of the 2nd grade of primary schools (12 - 15 years), floorball is the most popular sports game compared to football, basketball, volleyball and handball [4]. Likewise, physical education teachers at primary schools in the Central Slovak Region ranked floorball as the second most popular sports game. The first was football from the perspective of male teachers and volleyball from the perspective of female teachers [5].

Despite the rapidly growing popularity of the game of floorball, the research oriented towards this game is surprisingly insufficient. The conducted studies, summarised in the [6] systematic review, are primarily oriented towards the epidemiology and prevention of injuries in this game, and this research orientation still prevails [7–14]. Some of the differentially oriented studies rank floorball among sports promoting cardiovascular health [15–18]. On the international scene, there is a lack the non-match comparison of motor abilities and floorball skills of youth floorball players. Subsequently, this comparison could be used to identify the key areas forming the performance differences in youth categories. By focusing on the revealed deficiencies in the training process, huge performance differences between floorball leading

countries and other countries participating in world championships could be reduced in the future [19].

Apart from international championships, no international comparison of motor abilities and floorball skills of youth floorball players has been made so far. No internationally used test battery has been developed for these comparisons so far. Czech floorball [20] published a test battery for young people, with normative scales for individual categories [21]. This test battery is used to compare regional selections [22], but not used too much in real-life situations at club levels [23]. The aim of the presented study was to compare the levels of selected motor abilities and floorball skills of children in the U-11 - U-14 age category in Australia and the Czech Republic.

2. Materials and Methods

2.1 Research Samples

A total of 36 youth floorball players (only boys) from both countries were tested (aged from 11 - 14 years, with their characteristics shown in Table 1. Specifically, it consisted of 18 players from the FBŠ Slavia Plzeň club (Czech Republic) and 18 players from the Peninsula Floorball Club (Australia). Australian players usually train twice a week and play floorball for an average of 4.2 years. Czech players train most of the year 3 times a week and play floorball for an average of 6 years. Written informed consent was obtained from all participants after the explanation of all details of the testing procedure.

2.2 Research methods

To compare the tested groups (CZE x AUS), 6 items from the test battery, prepared by the methodological and national section of the Czech Floorball Association [20], were used. The selected items correspond to recommendations for testing the U-12 category of younger school-age pupils. The list of items is specified in Table 2.

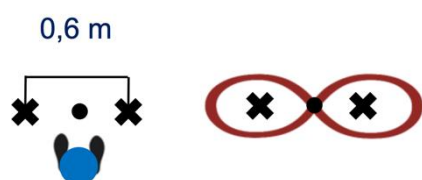
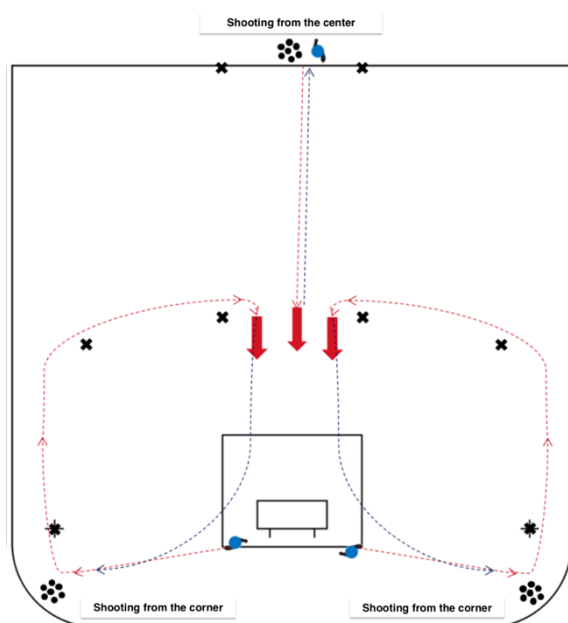
The 20m run test is focused on acceleration, sprinting explosiveness, technique of sprint, and sprinter step. The players try to run a 20m distance marked by cones as quickly as possible. Each player has 2 attempts, and the result of the better attempt is recorded.

Table 1. Anthropometrics data for each group.

	CZE group Mean ($\pm$ SD), n = 18	AUS group Mean ($\pm$ SD), n = 18
Age, y	12.1 ($\pm$ 1.0)	12.7 ($\pm$ 1.0)
Height, cm	155.4 ($\pm$ 10.6)	160.7 ($\pm$ 12.0)
Weight, kg	44.7 ($\pm$ 12.1)	53.2 ($\pm$ 11.6)

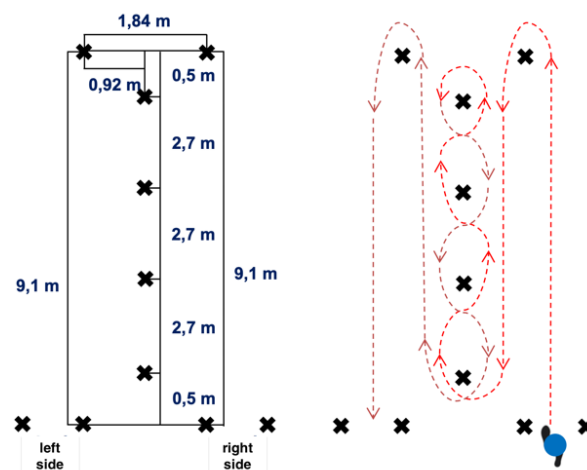
Table 2. Used tests for comparing.

Motor abilities	Floorball skills
20m run	Test of manipulation with ball
Standing long jump	Shooting test
Illinois agility test without stick	Illinois agility test with stick and ball

**Figure 1** Manipulation with ball scheme [20].**Figure 2** Shooting test scheme (Shooting test from the centre and Shooting test from the corner) [20].

The purpose of the standing long jump test is to determine dynamic and explosive force capabilities of legs. With their legs together, players take off from the starting line as far as they can - squat and swing of arms are allowed. Each player has 2 attempts, and the result of the better attempt is recorded.

The Illinois agility test without stick is focused on agility and speed of running (lateral movements and changes in direction). The player's task is to run around all cones in the specified order as quickly as possible. The players holding stick towards the right side, start running from the right side, and the players holding stick towards the left side, start running from the left side. Each player has 2 attempts, and the result of the better attempt is recorded. A break of at least 5 minutes is always between the individual attempts [20].

**Figure 3** Illinois agility test with stick and ball scheme [20].

The test of manipulation with ball (Figure 1) is focused on verifying the quality of player's manipulation with the ball. The player's task is to run as many "figure eights" as possible between the cones in 45 seconds. The player takes the starting position with the ball and the stick in the middle of the cones. Players start/finish playing after the signal. Each player has one attempt [20].

The shooting test is focused on evaluating the accuracy of shooting from movement. The player's goal is to make 5 successful consecutive shooting attempts in the shortest possible time. In the case of the category tested by us, the goal area in the lower part was reduced by side boards. The shooting test consists of two parts. Shooting from the centre and from the corner of the floorball field (Figure 2). When shooting from the middle of the floorball field, the starting position is on the half-distance line, where each player had 5 balls. The player starts playing with the ball on the stick, and shoots are performed using the wrist, or in a slapping motion in front of the imaginary line between two cones (7m in front of the goal line). After shooting, the player returns to the middle of the floorball field to pick the next ball. In one attempt, each player has 5 shots. In the case of shooting from the corner, the player performs the test on one side only, depending on the side of holding the stick. The player runs out from the back corner of the large goal area, and gradually runs around the cones, takes one ball in corner of the floorball field, and shoots the ball.

The player gradually runs around the cones 5 times and shoots 5 times. In both cases of the shooting test, speed (by measuring the time) and accuracy (points for the goal scored) are evaluated. Each player has one attempt to perform a given version of the shooting test [20].

The Illinois agility test with stick and ball (Figure 3) focuses on agility, running speed (lateral movements and changes in direction), and special floorball locomotion. Players holding the stick towards the right side start from the right side, and players holding the stick towards the left side start from the left side. Each player has 2 attempts, and the result of the better attempt is recorded. A break of at least 5 minutes is always between the individual attempts [20].

2.3 Study design

The testing was carried out in Australia in October 2019, resp. in November 2019 in the Czech

Republic. In both countries, the testing was organised and carried out always by the same examiner with the help of local coaches. First, the measurement of anthropometric data was carried out. To meet the recommendations, the order of individual tests was as follows: 2 0m run, Standing long jump, Test of manipulation with ball, Shooting test, Illinois agility test without stick, and Illinois agility test with stick and ball. In both cases, the testing was carried out during one day.

2.4 Statistical analysis

The obtained data was analysed using Statistica 12 software. Data evaluation was performed using descriptive statistics (mean, standard deviation).

The data was not normally distributed according to Kolmogorov-Smirnov test (Height $D=0.17$, $p>0.2$; Weight $D=0.13$, $p>0.2$; 20_run $D=0.15$, $p>0.2$; Jump $D=0.09$, $p>0.2$; IAwos $D=0.14$, $p>0.2$; Manipulation $D=0.11$, $p>0.2$; Shoot_centre_t $D=0.11$, $p>0.2$; Shoot_centre_p $D=0.17$, $p>0.2$; Shoot_corner_t $D=0.13$, $p>0.2$; Shoot_corner_p $D=0.25$, $p>0.2$; IAwsb $D=0.18$, $p>0.2$). Therefore, the Mann-Whitney U test was used. Statistical significance was set at $p \leq 0.05$.

Furthermore, Cohen's d (Effect size) was used to verify the substantive significance of differences. Cohen's d is determined according to the formula $d = \frac{M_1 - M_2}{SD}$, where M_1 - arithmetic mean of the given variable of the first set, M_2 - arithmetic mean of the given variable of the second set, SD - value of the standard deviation of the whole set. If is the value of Cohen's d in the interval $0.2 \geq d \geq 0.49$ - is referred to as small effect size, $0.5 \geq d \geq 0.79$ - is referred to as medium effect size, when $d \geq 0.8$ - is referred to as large effect size [24].

The effect size (substantive significance) was used in addition to statistical significance due to the higher strenght of the results. Statistical significance determines whether the result of the research is achieved by chance or variability of the sample data. On the other hand, substantive significance determines whether the result is useful in the real world. Substantive significance, unlike statistical, can help evaluate the importance and usefulness of results.

from the Czech Republic (FBŠ Slavia Plzeň) and Australia (Peninsula Floorball Club).

Table 3 Descriptive statistics of individual test items and statistical comparison of differences between the tested group

		CZE	AUS	p-value
		M ± SD	M ± SD	
Motor abilities				
	20_run [s]	3.9 ± 0.3	4.1 ± 0.4	0.12
	Jump [cm]	186.1 ± 18.4	175.8 ± 33.2	0.22
	IAwos [s]	15.7 ± 0.7	17.4 ± 1.3	0.000*
Floorball skills				
	Manipulation	16.8 ± 2.9	12.0 ± 2.5	0.000*
	Shoot_centre_t [s]	29.3 ± 3.7	31.8 ± 4.7	0.09
	Shoot_centre_p	2.0 ± 1.1	0.8 ± 0.8	0.002*
	Shoot_corner_t [s]	40.7 ± 4.9	48.1 ± 7.1	0.001*
	Shoot_corner_p	2.1 ± 1.6	0.7 ± 0.7	0.01*
	IAwsb [s]	17.5 ± 0.9	20.9 ± 3.4	0.000*

Notes: CZE - Czech Republic; AUS - Australia; M – Mean; SD – standard deviation; p-value – statistical significance; 20_run - 20m run; Jump - Standing long jump; IAwos - Illinois agility test without stick; Manipulation - Test of manipulation with ball (points); Shoot_centre_t - Shooting test from centre (time); Shoot_centre_p - Shooting test from centre (points); Shoot_corner_t - Shooting test from corner (time); Shoot_corner_p - Shooting test from corner (points); IAwsb - Illinois agility test with stick and ball; * p ≤ 0.05

3. Results

Table 3 shows descriptive statistics (mean, standard deviation) and values of statistical significance of differences between the tested groups from the Czech Republic (FBŠ Slavia Plzeň) and Australia (Peninsula Floorball Club).

3.1 Motor abilities

The results of motor abilities tests (Table 3) for the 20m run and Standing long jump tests do not reach statistical significance. In the case of the 20m run test, the Cohen's d value of 0.5 - the lower limit of the medium effect size - was found [25], and in the case of Standing long jump, the value was 0.4 - the small size effect.

In the case of the Illinois agility test without stick, a statistically significant difference was found between the tested groups, and the Cohen's d value reached 1.5 - the very large effect size [26].

3.2 Floorball skills

In the case of floorball skills, statistically significant differences were observed in almost all

items (Table 3). In the case of the Test of manipulation with ball, the statistical significance was found in the differences between the groups, and the Cohen's d value reached 1.7 - the very large effect size.

In the case of the Shooting test (see Figure 2), its execution was evaluated separately - from the corner and the centre of the floorball field, while the test duration and accuracy of shooting (points - successful scoring of the goal) were evaluated. Only in the case of performing the test from the centre, no statistically significant difference was found when evaluating the duration and the Cohen's d value reached 0.59 - the medium effect size. In the items Shooting test from centre (points), Shooting test from corner (time), and Shooting test from corner (points), a statistically significant difference was found in all cases, and identically in all the mentioned cases, Cohen's d 1.2 was a very large effect.

A statistically significant difference was found at the Illinois agility testing item with stick and ball, and also the Cohen's value reached 1.5 - the very large effect size.

4. Discussion

The presented study addresses the issues of evaluation of differences in selected motor abilities and floorball skills of floorball players in the U-11 to U-14 age categories. It should be mentioned that the Czech Republic is one of the most developed countries in terms of world floorball. Australia is rather a developing country in this respect. Despite the fact that floorball has been part of the IFF for a long time, this game does not have a sufficiently long tradition or developed player base in Australia [1,3].

When comparing the differences in motor abilities between the groups, the statistically significant difference was found only in one item (Table 3). At this point, it is necessary to mention the differences in somatic prerequisites among the Czech and Australian players. On average, the Australian players were taller by more than 5 cm (Table 1).

When comparing the differences in floorball skills between these groups, the statistically significant differences were found in almost all evaluated criteria. These statistically significant differences were confirmed by finding the large effect size. No statistically or effect size differences were found only in the evaluated criterion Shooting test from centre (time). It should be noted that in the Shooting test, gaining points (number of goals scored) is more important than the time of completing the test. The results in these items clearly show the different level of floorball skills between Czech and Australian players. However, it is necessary to point out the small size of tested groups, which could have influenced the statistical significance calculations. Therefore, a non-parametric calculation method was used (based on the Kolmogorov-Smirnov test results) and the results are supplemented by a substantive significance calculation.

Due to the different level of floorball skills found, it is necessary to mention the different quality and frequency of training units. Training units are much better organised in the Czech Republic than at the Australian club, which also relates to education of coaches in this game [27]. There is no floorball league in Australia for the U-14 and younger age categories. Players can only try real matches approximately three times a year during national tournaments. On average, Australian players play floorball almost 2 years less, although their average age is higher. In connection with this, it is necessary to mention that more than 80% of Australian players also engage in other sports

at the performance level, while only about 25% of players [27] in the Czech Republic.

The study has the following strengths. The study compares players across continents. We do not know of any such comparisons in this area. Use of items from the Czech Floorball Association test battery. These results can be further compared. On the other hand, our study has several limitations. A small number of probands in groups. Due to the limited player base in Australia, it was not possible to test more probands. Wide age range of probands. This is associated with a limited player base in the Australian club.

Differences in the level of floorball skills are visible not only at world championships, but they are also confirmed by our comparison of younger categories. For example, the arrival of foreign coaches, training camps, international internships, or exchange stays could help the development of floorball in Australia and other countries [19].

5. Conclusion

The presented study shows that the level of floorball skills of players in the U-11 to U-14 age categories from the Czech Republic are significantly better than the same skills of players in Australia. These findings illustrate the difference in the player quality of these countries, being visible at the World Championships Senior teams. The reasons for this situation can be seen in the different quality of training, the level of education of coaches, the size of club and player bases, the financial support of clubs, although Australia has been part of the IFF only three years less than the Czech Republic.

As our study is based only on a comparison of players from two selected clubs in the given countries, we cannot generalise its results. To illustrate the situation regarding the level of floorball in the world, we propose testing of younger categories also in other countries. Specifically, in countries where floorball is popular, such as Finland, Sweden, Switzerland, and in countries where floorball develops, such as the USA or Canada. This means, among other things, the need to create an internationally used test battery to be used for these purposes. For sharing experience between floorball developed and developing countries, we propose, for example, more frequent friendly matches and international fellowships of coaches and players.

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Ethics Approval

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Informed Consent

Written consent was obtained from all participants.

Conflict of interest

All authors have agreed to publish the present article and declared that no competing interest exists.

Does this article screened for similarity?

Yes

Author's contribution

Study design and conceptualization – K.S., M.M. and D.B.; Data collection – M.M.; Statistical analysis – K.S., T.F. and D.B.; Interpretation of results – K.S., M.M. and D.B.; Draft preparation - K.S., T.F. and D.B.; All authors read and approved the final version of the draft.

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