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Original research papers

EXPLORING CROSS-CULTURAL DIFFERENCES IN FUNDAMENTAL MOTOR SKILLS PROFICIENCY BETWEEN POLISH AND LATVIAN CHILDREN

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Abstract
Introduction. Fundamental motor skills (FMS) are a critical component of success in various sports and lifelong physical activity (PA). This study aimed to evaluate and compare the FMS proficiency levels of 7-9-year-old children from Poland and Latvia, providing insights into the current state of motor competence in these populations. ***Material and Methods.*** A cross-sectional study design was utilized, incorporating a sample of 163 boys and girls. The FUS test (Fundamental Motor Skills in Sport), a comprehensive, qualitative, and process-oriented assessment tool was used to assess FMS. The FUS test encompassed a range of movement tasks, including hurdles, jumping rope, forward roll, ball bouncing, ball throwing and catching, and kicking and stopping a ball that allows for a thorough evaluation of FMS proficiency. ***Results.*** The study revealed alarmingly low FMS proficiency levels in both countries, with 93.3% of students displaying 'insufficient FMS proficiency'. The Mann-Whitney U test showed that Latvian boys outperformed their Polish peers in jumping rope and forward roll ($p < 0.05$), while Polish boys exhibited superior results in kicking and stopping a ball ($p < 0.05$). In contrast, Polish girls achieved significantly higher scores in hurdles and kicking and stopping a ball ($p < 0.05$) compared to Latvian girls, who scored higher in jumping rope ($p < 0.05$). ***Conclusions.*** These findings highlight the urgent need for effective, evidence-based interventions to improve motor competence in both countries, emphasizing the importance of incorporating FMS development into physical education curricula and promoting regular PA for children.

Key words: fundamental movement skills, motor competence, physical education, FUS test

Introduction

Fundamental motor skills (FMS) comprise the essential movements and actions that underpin the performance of a wide variety of sports and physical activities. Among the most common FMS are running, jumping, throwing, catching and kicking. FMS proficiency is linked to increased participation in sports and physical activity (PA), thus contributing significantly to a child's physical, social, and emotional development [1, 2]. Children who lack proficiency in FMS may be less likely to engage in PA, leading to a sedentary lifestyle that can negatively impact their health [3]. Contrary to popular belief, the acquisition of FMS is not innate and does not occur naturally during the maturation. Children require appropriate instruction and practice to become proficient in FMS [4]. Therefore, it is crucial to introduce developmentally appropriate activities aimed at teaching and enhancing FMS, particularly during early childhood when children are most receptive to learning and acquiring new skills [5].

As awareness of the importance of FMS in promoting PA, health, and wellbeing grows, there has been a notable increase in the inclusion of FMS development in school curricula worldwide [6]. In addition to school curricula, other activities are also being implemented to develop FMS among children. Many communities and sports clubs offer FMS-focused programs and activities for children outside of school. Some countries have implemented national initiatives aimed at improving FMS proficiency among children that provide funding and organizational support for schools and community organizations. Despite these efforts, research has shown that FMS proficiency among children remains low in the vast majority of countries [7]. This highlights the urgent need to pay more attention to FMS development and the implementation of effective, evidence-based teaching and learning activities in schools and other environments where children can acquire and practice these skills.

The development of FMS among children is a complex and multifaceted process influenced by a wide range of factors, including the sporting culture of a given country. Consequently, exploring disparities in FMS proficiency between countries is

a crucial approach in understanding this development [8, 9]. Gaining such insights is essential for creating effective PA programs tailored to help children in specific countries acquire and refine the FMS they need for a healthy and active lifestyle. For instance, a study by Laukkanen et al. [9] found significant differences in overall FMS proficiency in 6-9-year-old children across northern, central, and southern European regions. Intriguingly, their results showed that girls and overweight children underperformed in FMS compared to boys and healthy-weight children, particularly in regions with lower overall motor competence levels. Another study [10] showed that Belgian children demonstrated superior performance in both locomotor and object control skills compared to their American counterparts. The researchers attributed these differences to various factors, such as the organization and structure of PA, particularly within the context of physical education (PE). In Belgium, children have access to PE classes, which are offered from the age of three and are generally taught by a specialist in PE. In contrast, no state in the United States currently mandates PE programs for preschool-aged children. The findings of another study [8] demonstrated that Chinese children exhibited higher levels of overall FMS proficiency, locomotor skills and object control skills compared to their English peers. Notably, FMS development is emphasized as a critical outcome in both Chinese and English PE curricula, as outlined by the Ministry of Education [11] and the Department for Education [12], respectively. Both countries are required to ensure that students receive a minimum of 60 minutes of moderate to vigorous PA during the school day [13, 14]. However, there are significant differences in the structure and implementation of PE programs between the two countries. For example, primary school children in China are required to participate in at least four weekly PE classes, each lasting 35-45 minutes. In contrast, English children are mandated to have only two weekly PE lessons. Furthermore, China has made significant efforts to promote health and PA through the release of "Healthy China 2030" [15], which includes specific goals and action plans to improve the PA and fitness levels of children.

Poland and Latvia are two Eastern European countries with similar expectations regarding sport culture and PA. In Poland, the purpose of PE is to support children's physical, mental, intellectual, and social development and to prepare them for healthy and active lifestyles [16]. Similarly, in Latvia, there is a focus on enhancing children's knowledge and understanding of healthy lifestyles. This involves emphasizing the importance of regular PA to preserve and strengthen health, as well as encouraging participation in diverse sporting activities to enhance physical abilities [16]. However, there are also differences in how primary-school PE is approached. One significant difference is the age at which children start primary school. Polish children begin at the age of 7, while Latvian children start at 6 years old. The time allocated to PE is 3 x 45 minutes per week for children aged 7-9 in Poland and 2 x 40 minutes per week in Latvia. In Poland, PE classes are typically taught by early childhood education teachers, who are responsible for teaching all subjects. As a result, these teachers may not have specialized qualifications in PE. In contrast, in Latvia, PE classes are taught by qualified PE teachers, who have undergone specialized training in this field.

Under the assumption that cross-cultural environmental differences may influence proficiency in FMS, the present study aimed to assess and compare the level of proficiency in FMS among 7-9 year-old children from Poland and Latvia. Comparing FMS proficiency levels in these two countries can provide insights into the underlying reasons for any observed differences. This knowledge can then be used to develop culturally sensitive and effective interventions aimed at enhancing FMS proficiency in these populations.

Material and Methods

Participants

Cross-sectional data were collected in two countries for this study. The sample included 163 children aged 7-9, with 42 boys and 41 girls from Poland, and 36 boys and 44 girls from Latvia. The sample was selected from three schools in Poland and two schools in Latvia. Parental consent was obtained prior to data collection, and the study design and testing protocol were approved by an institutional Research Ethics Committee.

FMS assessment tool

The students were assessed using the FUS (Fundamental Motor Skills in Sport) test [17]. The FUS test is a qualitative, criterion-referenced assessment tool that uses a process-oriented approach to evaluate FMS. The FUS test includes six movement tasks (skills): hurdles, jumping rope, forward roll, ball bouncing, ball throwing and catching, as well as kicking and stopping a ball. These skills have high transferability to a wide variety of popular sports around the world and everyday activities. Each skill is composed of five behavioral components that are assessed to determine mastery of the skill.

Each criterion of the test was assigned a score of '1' when met or '0' when not met. Points were awarded only when the criterion was clearly satisfied. Two attempts were made for each skill, and the attempt with the higher score was used for further analysis. Each skill involved four levels of mastery: 'full mastery' (all components performed correctly, 5 points scored), 'near mastery' (all but one component executed correctly, 4 points scored), 'some mastery' (three components performed correctly, 3 points scored), and 'poor' (two or fewer components executed correctly).

Overall FMS proficiency was assessed at four levels using a total score including scores for all six FUS skills. To achieve 'excellent FMS proficiency', a student had to fully master all six assessed skills, with each skill scoring 5 points or master all but one skill, which had to be at the 'near mastery' level with a score of 4 points. If a student attained at least 'near mastery' for each FUS skill (at least 4 points scored) but did not meet the requirements for 'excellent FMS proficiency', they were considered to have 'good FMS proficiency'. A student who achieved at least 'some mastery' level for each skill (at least 3 points scored) but did not meet the requirements for 'excellent FMS proficiency' or 'good FMS proficiency' was classified as having 'elementary FMS proficiency'. Conversely, 'insufficient FMS proficiency' was assigned to a student who did not fulfill the criteria for any of the other three proficiency levels. For example, for one of the FUS skills they scored 2 points or less.

Testing and data collection

Data collection took place in Poland in May 2022 and in Latvia in November 2022. A skilled research team carried out the assessments during regular PE classes, employing the FUS test. At the beginning of each class, students participated in a dynamic warm-up routine before being divided into four groups. Each group was assigned to one of four testing stations: Station 1 assessed hurdles, Station 2 evaluated jumping rope and forward roll, Station 3 focused on ball bouncing, and Station 4 examined throwing and catching, as well as kicking and stopping a ball. Prior to testing each skill, participants received a brief explana-

tion of its importance, instructions on how to perform the task, and an outline of the skill components to be assessed. Students completed one familiarization trial for each task, followed by two testing trials without receiving any augmented feedback. Each testing session lasted 45-50 minutes and involved 14 to 22 students.

The testing sessions were conducted in indoor settings. To ensure anonymity and facilitate subsequent video analysis, all participants were assigned numerical codes. A single researcher demonstrated, administered, and recorded all tasks to guarantee consistency in data collection. Each trial was captured using a tripod-mounted video camera (Lamax W 9.1, Poland) with MP4 video format and a 1920 × 1080 resolution. Specific recording methods, distances, and camera angles were determined for each task. For a comprehensive guide on the FUS testing procedure, please refer to the "Test of Fundamental Motor Skills in Sport" manual for teachers [18]. To guarantee data quality and consistency, 95% inter- and intra-observer agreement was required on the pre-coded data set.

Data analysis

Descriptive statistics and proportions for the overall FMS proficiency were reported in numbers and percentages across nations and sex. Since the data distribution was non-normal, a Mann-Whitney U test was employed to test for differences in each FMS separately between children from Poland and Latvia. The level of statistical significance was set at an alpha of 0.05. Cohen's r effect size for the Mann-Whitney U test was calculated using the formula r = = z/√n [19]. The coefficient was interpreted using thresholds of 0.1, 0.3, and 0.5 for small, medium, and large effect sizes, respectively. The statistical analysis was conducted using the Statistica 13.3 software package (Poland).

Results

Table 1 shows that the majority of students in both countries had 'insufficient FMS proficiency', with 93.3% falling into this category. Only a small percentage of students had 'good' or 'excellent FMS proficiency', with 0.6% falling into each of these categories. Although the comparison of sex was not a primary focus of the study, it is noteworthy that female students demonstrated inferior performance in the category denoted as 'none of FMS exceeded 1 point'.

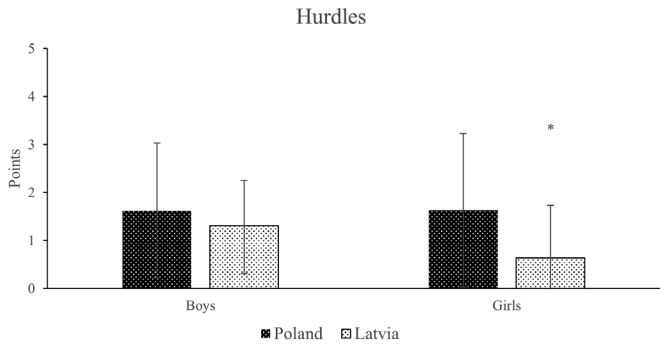
Table 1. Number of primary school students at each level of FMS proficiency by sex in Poland and Latvia (n = 163)

Level of FMS proficiency	Percentage of all students (%)	Number of boys by nation (n)		Number of girls by nation (n)	
		Poland	Latvia	Poland	Latvia
Excellent FMS proficiency	0.6	0	0	1	0
Good FMS proficiency	0.6	1	0	0	0
Elementary FMS proficiency	5.5	2	3	2	2
Insufficient FMS proficiency	93.3	38	33	34	37
None of FMS exceeded 1 point	6.1	1	0	4	5

Figures 1-6 present a comparison of FUS test skill mastery between Polish and Latvian boys and girls. The Mann-Whitney *U* test showed that boys from Latvia outperformed boys from Poland in jumping rope and forward roll ($U = 493$, $p < 0.05$, r = 0.31, and $U = 385$, $p < 0.05$, r = 0.43, respectively), while boys from Poland had better results in kicking and stopping a ball ($U = 468.5$, $p < 0.05$, r = 0.33). In contrast, girls from Poland had significantly higher scores for hurdles and kicking and stopping a ball ($U = 671.5$, $p < 0.05$, r = 0.32, and $U = 284$, $p < 0.05$, r = 0.61 respectively) than girls from Latvia, while girls from Latvia achieved higher scores in jumping rope ($U = 543$, $p < 0.05$, r = 0.40).

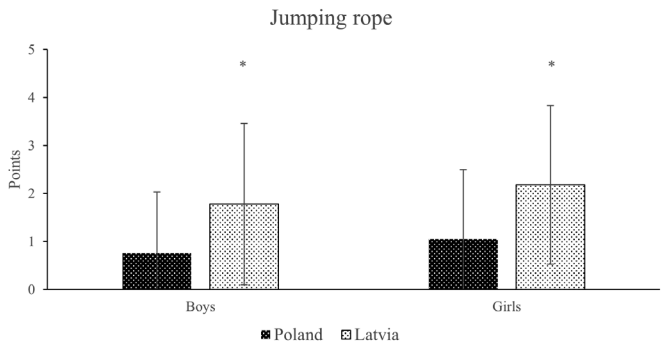
Discussion

The results of our study revealed alarmingly low levels of FMS proficiency among 7-9-year-old children in both Poland and Latvia, which is consistent with the global trend reported in recent research [8]. Specifically, our findings indicate that the vast majority of students in both countries have 'insufficient FMS proficiency', with only a minimal percentage of students demonstrating 'good' or 'excellent FMS proficiency'. These results suggest that there is an urgent need for effective interventions to enhance motor competence of children in both countries. Additionally, our study sheds light on potential factors that may be contributing to the low FMS proficiency levels



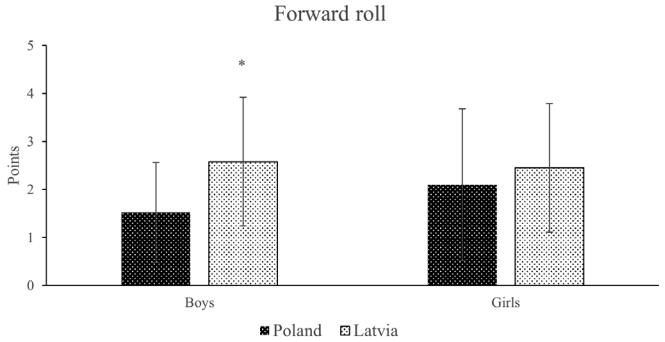
The bars indicate the mean values, and the error bars represent SD; * – significant difference (p < 0.05) between Polish and Latvian children.

Figure 1. Comparison of hurdles skill mastery between Polish and Latvian boys and girls.



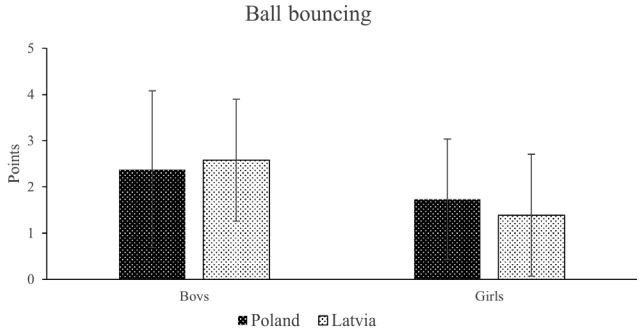
The bars indicate the mean values, and the error bars represent SD; * – significant difference (p < 0.05) between Polish and Latvian children.

Figure 2. Comparison of jumping rope skill mastery between Polish and Latvian boys and girls.



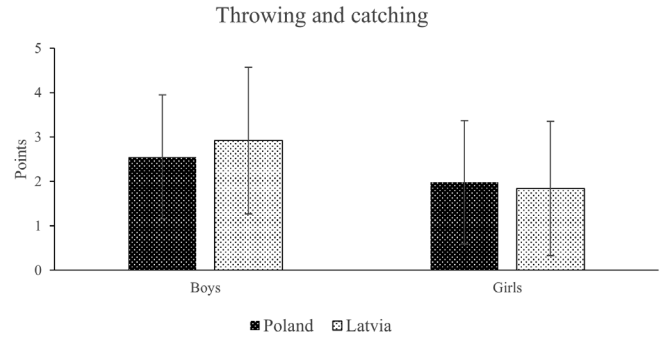
The bars indicate the mean values, and the error bars represent SD; * – significant difference ($p < 0.05$) between Polish and Latvian children.

Figure 3. Comparison of forward roll skill mastery between Polish and Latvian boys and girls.



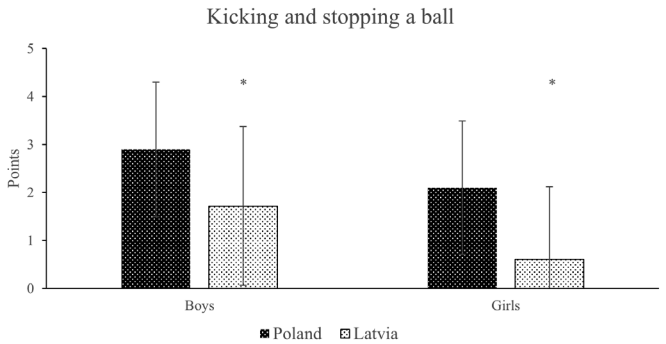
The bars indicate the mean values, and the error bars represent SD; * – significant difference ($p < 0.05$) between Polish and Latvian children.

Figure 4. Comparison of ball bouncing skill mastery between Polish and Latvian boys and girls.



The bars indicate the mean values, and the error bars represent SD; * – significant difference ($p < 0.05$) between Polish and Latvian children.

Figure 5. Comparison of throwing and catching skill mastery between Polish and Latvian boys and girls.



The bars indicate the mean values, and the error bars represent SD; * – significant difference ($p < 0.05$) between Polish and Latvian children.

Figure 6. Comparison of kicking and stopping a ball skill mastery between Polish and Latvian boys and girls.

observed, including cultural differences and environmental factors. These findings are discussed below.

Numerous studies have demonstrated a developmental association between motor competence and PA, highlighting the critical role of motor competence in the formation of active lifestyle habits [1, 3]. Hence, there is a pressing need for reference values of FMS proficiency from an early age to identify young children at risk of experiencing negative developmental spirals. However, recent research has indicated that FMS are steadily declining and remain at low levels [7], emphasizing the need to identify and address these issues promptly. To tackle this challenge, we opted to use a criterion-referenced test instead of a norm-referenced test. This approach allowed us to assess the current level of skills in the context of the desired state of mastery of FMS.

There are several reasons why 7-9-year-old students may have low levels of FMS in both countries. One reason is a lack of PA, which can lead to reduced opportunities to practice and develop these skills. Nowadays children are often more sedentary and engaged in screen time activities, such as playing video games, watching television or using mobile devices rather than engaging in PA [20]. The lack of PA has been associated with a decline in FMS development. Another reason may be ineffective methods and instructions used during the teaching of movement skills [21]. Teachers may not have the necessary training and knowledge to teach FMS effectively, which can result in students not mastering these skills. It is important to emphasize that even though Poland has early education teachers teaching PE and Latvia has qualified PE teachers, the levels of FMS mastery in both countries were similarly low. This suggests that simply having qualified teachers is not sufficient to ensure effective learning of FMS. Inadequate teaching methods, including the implementation of outdated practices and insufficient personalized feedback, may also contribute to the prevalence of low FMS proficiency among students [22]. Additionally, PE teachers might not consistently incorporate FMS instruction during PE lessons. Lastly, schools may not prioritize PE, which could hinder the development of FMS in students.

The suboptimal mastery of FMS is a cause for concern, particularly given that the core curricula of both countries mandate students to attain proficiency in these skills. Furthermore, the leading content identified by teachers in Poland and Latvia should ideally facilitate the learning of FMS. Therefore, it is imperative that alternative and evidence-based approaches be explored to improve children's mastery of FMS. This may entail the use of more effective methods that are tailored to the individual learning needs of children. Additionally, there may be a need to train teachers in more inclusive teaching strategies to better support children in their development of FMS. Technology could also be leveraged to provide interactive and engaging learning experiences for children, making the learning process more enjoyable and effective [23]. Parenting classes can also be

designed to include more educational components that teach parents how to support their children's motor skills development through play and other activities.

PE classes should provide a balanced combination of enjoyable PA and educational content that promotes the development of FMS [24]. To facilitate the effective development of FMS and enhance students' overall physical and cognitive growth, PE teachers should employ research-supported approaches [25]. One such approach is providing appropriate levels of difficulty in tasks, which is also known as adopting the challenge point hypothesis [26]. This approach involves identifying the optimal level of task difficulty for each student, where the task is neither too easy nor too difficult. This allows students to engage in activities that are appropriately challenging, but still achievable, which can lead to enhanced motor skill development. PE teachers can create an inclusive learning environment by using the principles of ecological dynamics and nonlinear pedagogy. Ecological dynamics is a theoretical framework that considers how individuals interact with their environment to develop movement skills [27]. Nonlinear pedagogy is an approach to teaching that considers the complexity and variability of movement tasks [28]. Together, these principles emphasize the importance of tailoring learning environments to suit individual needs of students. For example, teachers can use task constraints, such as modifying equipment or adjusting the space, to create an appropriate level of challenge for each student. This can help students to engage in activities that are both challenging and achievable, leading to enhanced motor skill development.

Our study revealed significant differences in FMS between boys and girls from Poland and Latvia. In particular, Latvian boys outperformed Polish boys in jumping rope and forward roll, while Polish boys had better results in kicking and stopping a ball. Meanwhile, girls from Poland scored higher in hurdles and kicking and stopping a ball, whereas Latvian girls achieved better scores in jumping rope. These FMS differences highlight how cultural and environmental factors can shape the development of motor skills in both boys and girls. A possible explanation for these differences could be the widespread popularity of football in Poland and strong traditions of gymnastics in Latvia. Additionally, seasonal variation in temperature can impact skill development in children. The long winter season in Latvia may encourage more indoor activities such as gymnastics due to limited outdoor activities that require locomotor skills, whereas Polish children may spend more time playing outdoor ball games like football. It seems that it is essential to consider the cultural background of students when designing PE programs to make sure they are engaging and effective for everyone [9].

Although the main purpose of this study was not to compare sex differences, it should be noted that a higher proportion of girls were found in the group designated as 'none of the FMS exceeded 1 point'. This finding suggests that females may be at a higher risk of developing developmental coordination disorder (DCD), a condition characterized by difficulties in the development of motor coordination [29]. However, further research is needed to confirm this relationship and explore potential factors that may contribute to sex differences in the development of motor skills.

Conclusion

Our study highlights the concerning low levels of FMS proficiency among 7-9-year-old children in both Poland and Latvia, emphasizing the urgent need for effective interventions to improve motor competence in these countries. Cultural and environmental factors were found to contribute to the observed differences in FMS development. The findings underline the importance of adopting evidence-based approaches and tailoring PE programs to individual students' needs while considering their cultural backgrounds. Moreover, the study calls for further investigation into the role of teacher training and education in fostering FMS proficiency. Ultimately, enhancing FMS mastery in children is crucial for establishing a foundation for lifelong healthy habits, fostering an active lifestyle, and promoting overall physical and cognitive development.

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