The use of individual sports profiles of child athletes and nonathletes in recommending sports to be practiced

Robert Kandrac[1ABDE] iD , Tomas Peric[2AC], Dalibor Dzugas[2BD], Peter Kacur[2BD], Petra Tomkova[3BD], Marek Kokinda[1BD], Milan Turek[4BD]

[1]Department of Sports Kinanthropology, University of Presov, Slovakia
[2]Department of Sports Educology and Humanistics, University of Presov, Slovakia
[3]Department of Educology of Sports University of Presov, Slovakia
[4]Faculty of Sports, University of Presov, Slovakia

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Abstract

Introduction: The issue of talent selection and identification has been addressed by a variety of authors. However, few studies focus on sports recommended to be practiced by children on the basis of evaluating their performance or sports profiles. *Material and Methods:* The purpose of the study was to determine individual sports profiles of child athletes and nonathletes and recommend sports to be practiced. The participants were children aged 6 and 7 years who were first graders at elementary schools. Child athletes were children who participated in organized sports practice in soccer (n = 16), ice hockey (n = 29), and artistic gymnastics (n = 10). Child nonathletes (n = 26) did not participate in any organized sports practice within extracurricular activities or in sports clubs. Children performed a battery of 9 tests: sit-and-reach test, flexed arm hang (overhand grip), repeated routine with a stick, sit-ups, standing long jump, 4 x 10-meter shuttle run, rolling of three balls, 20-meter sprint and endurance shuttle run. To assess decision-making processes, children played a chasing game called "pull-the-flag" game. *Results:* As for the match between the sports practiced and the sports recommended to be practiced by child athletes, 20 children practiced the sports that were also recommended to be practiced on the basis of their individual sports profiles. According to their sports profiles, child nonathletes were recommended to do, in particular, rhythmic gymnastics, cycling, volleyball, tennis, and floorball. *Conclusions:* We may conclude that low number of children practice sports that match children's motor dispositions. Therefore, individual sports profiles need to be devised to provide children with recommendations concerning sports that match their talent.

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Address for correspondence: Robert Kandrac, Department of Sports Kinanthropology, Faculty of Sports, University of Presov, Slovakia, email: robert.kandrac@unipo.sk

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INTRODUCTION

Performance in sports is a multifactorial concept that requires a variety of abilities and skills, which may form the so-called talent for sports [1]. The factor of sports talent is understood as a set of inherent prerequisites for sports that manifests itself in course of the long-term development of an athlete. There are a lot of approaches to talent identification or selection differing in criteria and procedures applied. Some of the approaches are based on the genetic factors underlying talent while other accentuate a more practical talent assessment based on the administration of motor ability and motor skill tests. In terms of the talent selection and identification among school-aged children, the practical assessment of their abilities and skills seems to be less demanding and time-consuming. The teachers of physical education administer these tests to identify and subsequently select children with the levels of abilities and skills higher than those shown by their age-matched counterparts. The desire to excel in sports requires a comprehensive assessment of all factors that have to be taken into consideration. Therefore, coaches, trainers, and teachers should have good knowledge of the structure of performance in their particular sports. Having this type of information enables them to select the appropriate methods of assessment of children's talent. The methods selected must meet specific criteria and provide reliable and valid data about athletic giftedness from a variety of perspectives. The factors most frequently assessed include anthropometric profiles, body build, levels of motor coordination and physical conditioning. The importance of talent selection is becoming important in those ports that place high demands on the material conditions. Therefore, great emphasis is placed on the efficiency of selection and preparation of athletes in particular sports. The process of identification and selection carried out by the sports associations cannot be intuitive but rather scientific and precise. The main purpose of talent identification is the earliest possible selection of promising athletes with the aim of systematically maximizing their potential. The selection is achieved through talent identification programs based on specific criteria. These specific criteria are designed to reflect crucial skills that project the potential of a child on athletic performance in adulthood [2]. New studies are addressing the enduring need for large-scale studies that employ multidisciplinary approaches and test batteries to prospectively test young athletes [3]. The findings of many reaserchers forcefully encourage the diversification of sport pursuits [4-8]. The researches suggests that participation in a variety of sports may assist in skills development rather than slow down development, revealing a common myth. In football, talent identification has been shown to be dynamical process, with certain anthropometric and physical qualities considered more favorably at different developmental stages [9]. Bergkamp et al. [10] admit that searching for variables that predict sports talent through different sports is very interesting from both a theoretical and practical perspective. For example, sprinting abilities distinguished between selected and non-selected players in invasive, team sports games like football, rugby, Australian Football and handball. Although some overlap is assumed through different sports (varied from gymnastics to soccer, handball and rugby), there is significant variability in the content of the criteria, as reflected by the differences in the load, responsibilities, rules, activities and required motor abilities that are unthinkable to the different sports that were studied and examined [11]. The question "what are valid predictors for a particular type of athletic performance" cannot be answered for many sports these days [10]. The main aim of the coaches, sport experts, researchers and expert staff in elite-level sports teams is to find out the best process for a particular team to select the most suitable player for a concrete position and role in game [12].

The purpose of the study was to determine individual sports profiles of child athletes and nonathletes and recommend sports to be practiced on the basis of their individual sports profiles.

MATERIAL AND METHODS

The participants were children aged 6 and 7 years who were first graders at elementary schools. The children were divided into two groups: child athletes and nonathletes. Child athletes were children who participated in organized sports practice in soccer (n = 16), ice hockey (n = 29), and artistic gymnastics (n = 10). Child nonathletes (n = 26) did not participate in any organized sports practice within extracurricular activities or in sports clubs. To determine the individual profiles of

sports preconditions, Children performed a battery of 9 tests: sit-and-reach test, flexed arm hang (overhand grip), repeated routine with a stick, sit-ups, standing long jump, 4 x 10-meter shuttle run, rolling of three balls, 20-meter sprint, and endurance shuttle run [13,14]. To assess decision-making processes, children played a chasing game called "pull-the-flag" game.

To determine methods for the assessment of children's motor preconditions, we decided to address the issue in two stages:

1. To determine variables that form the criterion of "preconditions for sports" – structure of talent,
2. To establish individual sports profiles and recommend sports to be practiced.

During the first stage, an expert commission was set up to propose factors and variables in order to define the criterion of "sports preconditions". The commission comprised five experts, i.e. professional coaches with the highest coaching license in their particular sports, in talent identification whose knowledge was based on individual and group interviews. The group interviews provided the definitions of basic areas of motor preconditions. When assessing particular options of evaluating motor preconditions, the commission decided to focus on four factors that included physical conditioning, technique, tactics, and body build. Specific domains included the assessment of object control skills and decision-making processes. The administered tests were selected according to their degree of reliability and validity in relation to the assessed criterion. Testing yielded data about the levels of particular motor abilities.

During the second research stage individual sports profiles were established. These profiles had to correspond with the demands related to the structure of sports performance in particular sports. The profiles were established by using two relevant indicators. When assessing the structure of individual sports profiles for particular sports, we took into account the structure of sports performance as defined by individual sports associations and federations.

As regards the data processing, raw scores were converted to a 10-point scale. The 10-point rating scale was used to establish individual profiles for particular sports. Subsequently, the test score achieved by a concrete child was compared with the deviations from the particular scales for each type of sport. These deviations were squared and summed to calculate the absolute values. The results included also highly relevant variables (multiplied by coefficient). On the other hand, two non-relevant indicators were excluded from the results. The lowest sum was used to establish order in individual sports and sports games. Each child was recommended three individual sports and three sports games for which the child has the best sports preconditions. We also determined whether there was a match between sports practiced and recommend sports to be practiced or not.

According to the assessment of normality of the data distribution using the Shapiro-Wilk test, we used median as the measure of central tendency and quartile deviation as the measure of variability.

RESULTS

Table 1 contain average scores in motor, manipulation-based, and decision-making tests achieved by boys and girls from the experimental group. According to the mean test scores recorded for children practicing ice hockey, football, and gymnastics, the most beneficial effect of practice is experienced by children doing gymnastics. The results show that gymnastics positively affects motor coordination, speed, strength, endurance, flexibility, and decision-making skills. The children who played football achieved higher mean scores in 6 out of 10 tests than children who played ice hockey. Therefore, doing gymnastics seems to be an appropriate tool for performance development in other sports practiced by children at this age.

Tables 1 and 2 contain scores achieved by boys and girls from the experimental group in the motor, manipulation-based and decision-making tests and the recommended sports to be practiced according to their individual sports profiles. According to the scores in individual motor tests achieved and the subsequently devised individual sports profiles, which represent models of future athletes, 12 out of 29 children who practice ice hockey have necessary disposition for the sport of ice hockey. Only 3 out of 16 children practicing football have the essential dispositions. In the group of children practicing artistic gymnastics, 5 out of 10 children had talent for gymnastics.

Table 1. Motor, manipulation-based and decision-making tests – experimental group

Sport	DS	20m	RTB	RRS	SAR	FAH	SLJ	SRA	SUs	ESR	PTF
Ice hockey	*Mdn*	4.90	31.83	30.9	4.00	5.47	116.00	14.38	23.00	164.00	7.00
	QD	2.95	26.35	19.15	7.5	4.86	71.00	8.13	18.5	126.00	7.00
Football	*Mdn*	4.57	36.61	30.45	9.75	8.59	115.5	14.01	25.5	157	6.5
	QD	2.59	28.01	27.94	8.38	8.14	77.63	8.14	19.88	141.75	6.25
Gymnastics	*Mdn*	4.47	28.56	24.23	14.25	17.28	138.5	12.79	42	222.5	8
	QD	2.44	18.23	15.35	9.63	15.33	82.88	7.19	27.13	179.00	8.00

Note. 20m Sprint; RTB - rolling three balls; RRS - repeated routine with a stick; SAR - sit-and-reach; FAH - flexed arm hang; SLJ - standing long jump; SRA - shuttle run agility test; SUs - sit ups in 1 minute; ESR - endurance shuttle run; PTF - pull the flag

Table 2. Recommended sports according to children's individual sports profiles

Current sport	1st sport	2nd sport	3rd sport	1st game	2nd game	3rd game
Ice Hockey	Floorball *n* = 15	Figure skating *n* = 8	Cycling *n* = 7	Volleyball *n* = 16	Tennis *n* = 9	Ice hockey *n* = 9
Football	Modern gymnastics *n* = 12	Cycling *n* = 3; Figure skating *n* = 3	Cycling *n* = 6	Volleyball *n* = 7	Ice hockey *n* = 7	Handball *n* = 4; Football *n* = 3
Gymnastics	Cycling *n* = 3	Artistic gymnastics *n* = 3	Figure skating *n* = 5	Handball *n* = 9	Ice hockey *n* = 8	Volleyball *n* = 5

Table 3. Recommended sports and sports games: boys

1st sport	2nd sport	3rd sport	1st game	2nd game	3rd game
rhythmic gymnastics	track cycling	swimming	**floorball**	tennis	volleyball
rhythmic gymnastics	ski jumping	mountain biking	**tennis**	volleyball	floorball
rhythmic gymnastics	track cycling	ski jumping	**volleyball**	tennis	floorball
rhythmic gymnastics	ski jumping	cross-country skiing	**football**	handball	ice hockey
cross-country skiing	athletics	rhythmic gymnastics	**football**	tennis	volleyball
rhythmic gymnastics	track cycling	ski jumping	**volleyball**	tennis	floorball
cross-country skiing	athletics	mountain biking	**tennis**	volleyball	floorball
rhythmic gymnastics	ski jumping	figure skating	**handball**	volleyball	ice hockey
rhythmic gymnastics	figure skating	athletics	**tennis**	floorball	volleyball
track cycling	cross-country skiing	athletics	**handball**	volleyball	ice hockey
rhythmic gymnastics	alpine skiing	swimming	**football**	ice hockey	volleyball

Tables 3 and 4 contain recommended sports to be practiced by boys and girls from the control group according to their individual sports profiles based on the scores achieved in the motor, manipulation-based and decision-making tests. In the control group, boys and girls were recommended to practice in particular the sports of rhythmic gymnastics and cycling. The most recommended games included volleyball, tennis, and floorball.

DISCUSSION

The results of the study show a high degree of variability. We have found that dispositions of children who do rhythmic gymnastics (5 of 10) and ice hockey (12 of 29) match the sports practiced. On the other hand, only 5 out of 16 children showed appropriate levels of talent for football. The basic question is why only a small number of children has dispositions for the sport of soccer as the percentage of children with talent for gymnastics is considerably higher. We assume that this may be attributed to:

- **specific features of sport.** In Slovakia, soccer is perceived as a mass sport played by all children during their childhood irrespective of their social status, age and gender. The sport of soccer is widely promoted and supported through mass media. Therefore, most children view soccer as their choice when considering which sport to do actively. Soccer attracts a large number of children who have little talent for the sport. On the contrary, rhythmic gymnastics is considered a highly specific sport for girls only. The sport of gymnastics requires a variety of skills acquired since early childhood. Therefore, the children tested (rhythmic gymnastics) have completed 2 to 3 years of practice and the girls who did not have appropriate dispositions for the sport have already given up their careers in the sport. Only girls with sufficient levels of talent still do gymnastics. In ice hockey, both variants are possible, similar to soccer in great popularity and to gymnastics in the experience and potential fluctuation of children.
- **family and social environment.** Soccer is probably the most available sport for children. Thanks to high degree of penetration (with soccer teams in even the smallest villages), children have a relatively easy access to soccer. Also, soccer is a sport showing high likelihood that one of the children's relatives played the sport for a short period of time. On the contrary, rhythmic gymnastics is a minority sport affected by the experience of female relatives and members of family. In case a child's mother did rhythmic gymnastics, it is highly probable that the mother had some degree of talent that her daughter may have inherited. From the social and family points of view, ice hockey is similar to soccer in being a mass sport and requiring experience and tradition in the family.
- **financial requirements.** Soccer is an economically demanding sport in terms of equipment, travelling expenses, and expenses for the maintenance of sports facilities. Also, training equipment is easily available in stores, and children may train individually. As far as financial requirements are concerned, rhythmic gymnastics is an expensive sport, especially in terms of sports facilities, and the gymnastics training equipment is not as available as the equipment for soccer. Therefore, families may decide more about continuing to pursue a particular sport, and if there are little prospects for success in gymnastics, children may be allowed to give up the sport and start doing another one, which is less financially and logistically demanding. Ice hockey is a highly economically demanding sport in terms of equipment, facilities, and logistics. Therefore, ice hockey may be pursued by children with considerable talent for sport and whose parents are willing to meet the financial requirements of the sport, seeing the prospects of their children. However, ice hockey is played also by children who show little talent for the sport, but their parents perceive ice hockey as a form of economic prestige, showing that the family may afford to finance the child.

The results concerning the control group show that there are some types of sports that do not require a great deal of specific dispositions. We may refer to those sports as "average". These sports include cycling, rhythmic gymnastics, figure skating, and sports games such as volleyball, floorball, and tennis. These sports do not, in most cases, require significant motor or somatic parameters (for instance, body height, or high physical fitness levels). On the other hand, the average character of these sports found in the children from the control group causes lower percentage utilization of necessary parameters.

Only 36% of all assessed children have necessary disposition for the potential success in sport in which they participate. Rather negative results indicate that regular assessment of individual sport profiles should be inevitable part of talent identification and development at early childhood. On the other hand, it is important to say that lots of survey findings on elite athletes reveal that they played on an average three sports per year until the age of 14, and only began to focus on a single sport after

the age of 19. Thus, the Olympians were multisport rather than single-sport athletes in their youth [15,16] indicate that the inherent need to win at the youth and adult levels of sport competition drives early specialization towards a singular sport [17] and it is a potential limiting factor for eventual elite-level success in adulthood [18,19] moreover, it is associated with a greater propensity for overuse injuries [20,21]. Another aspect that should be considered is the talent transfer or crossover approach. This ability to transfer skill and performance attributes is evident where successful elite performers and medallists went on to win additional medals in a different sport later in their careers [22-24]. Within talent development programs, sporting governing bodies routinely allocate youth participants, irrespective of biological age, to chronological age categories in an effort to ensure developmentally fair competition and opportunity [25]. The so-called relative age effect has been shown to be evident in various disciplines, with early-maturing athletes being preferentially selected in sports such as soccer and late-maturing athletes in gymnastics [1,26,27]. A similar approach to talent identification was used by Hicheur et al. [28] who compared scientific data converted into a 5-point scale to the judgment of expert coaches. In this study, the combination of the high-technology systems and traditional approaches to talent identification are recommended. In the study by Larkin, O'Connor [29], the findings indicated attributes and qualities not emphasised within the talent identification process including, physiological, anthropometrical, sociological and several psychological attributes. The authors suggest that talent recruiters should apply a holistic multidisciplinary approach to talent identification, with the current findings potentially providing initial evidence to suggest recruiters do consider numerous attributes when selecting and identifying youth players. James, Thake, Birch [30] report that coaches in sport would benefit from a relatively straightforward method to remove age-dependent bias, enabling identification of children who are relatively high performers for their age. The results of their study show that the usage of age residuals highlights performers that have relatively high physical fitness for their age. Such analyses may assist the talent identification and development processes as long as differential rates of physical development between players are also considered. In their study, Opstoel et al. [31] investigated to what extent 9- to 11-year-old children participating in a specific sport already exhibit a specific anthropometric, physical fitness and motor coordination profile, in line with the requirements of that particular sport. In addition, the profiles in children with a different training volume were compared and possible differences in training hours per week between children from a low, moderate, and high level of physical fitness and motor coordination were investigated. The results show that in general, children at a young age do not exhibit sport-specific characteristics, except in children with a high training volume. It is possible that on the one hand, children have not spent enough time yet in their sport to develop sport-specific qualities. On the other hand, it could be possible that they do not take individual qualities into account when choosing a sport. Wazir et al. [32] emphasize the fact that the possibility that only taking into account anthropometry, physical performance, and motor coordination in the talent identification process is limited due to the complexity of sports. A similar approach to ours was also adopted by Fenner, Iga, Unnithan [33] who used small-sided games to identify talented players in soccer. The authors conclude that multiple small-sided games could be used to identify the more talented prepubertal soccer players. Golle et al. [34] assessed physical fitness development in healthy children aged 9-12 years and to compute sex- and age-specific percentile values and found that the observed differences in physical fitness development between boys and girls illustrate that age- and sex-specific maturational processes might have an impact on the fitness status of healthy children. The results of the studies indicate that the issue of talent identification and selection is to be addressed by applying a multifaceted and complex approach based on the assessment of multiple domains of motor and sports performance. The concept of the individual sports profiles as an approach to talent identification and the recommendation of sports to be practiced is to be applied on a larger sample to test its practical utilization in the sports environment.

CONCLUSIONS

The purpose of the study was to determine individual sports profiles of child athletes and nonathletes and recommend sports to be practiced. The results of the study show that as for the match between the sports practiced and the sports recommended to be practiced by child athletes,

20 children practiced the sports that were also recommended to be practiced on the basis of their individual sports profiles. According to their sports profiles, child nonathletes were recommended to do, in particular, rhythmic gymnastics, cycling, volleyball, tennis, and floorball. We may conclude that low number of children practice sports that match children's motor dispositions. Therefore, individual sports profiles need to be devised to provide children with recommendations concerning sports that match their talent. As far as long-term development of an athlete is concerned, talent for sports may be affected by a variety of factors such as social and family background, financial requirements of the sport to be met children's parents, and specific features of the sport. Despite the fact that we have found that some children do not practice sports they have talent for, we believe that talent develops over time, and children and their parents may be advised to select a specific type of sport to be practiced. However, further research is necessary to state that the methodology use dis valid in terms of talent prediction in the long-term.

ACKNOWLEDGMENTS

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