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Sport Talent of Pupils in the Split-Dalmatia County

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Abstract

The study was conducted with the purpose of determining the level and the differences of sport talents in boys and girls attending primary schools in the Split-Dalmatia County. Using the ''TALENT" expert system we established potential talent in 93 randomly selected male and female primary school pupils in 14 different sports and sport disciplines based on the level of their motor and functional abilities evaluated by 7 measuring instruments. The results of the study show that particularly female pupils are, with regard to their motor and functional abilities, most talented for running athletic disciplines and kicking martial arts. We also revealed a high level of talent for sport games in male pupils, primarily tennis and football; while female pupils have talent for water sports in addition to some sport games and all kinds of martial arts. A similar distribution of sport talent in male and female pupils most likely leads to the similar structure of anthropological features in both sexes, and generally to a slightly higher level of potential sport talent in girls compared to the boys from this region.

Key words: *expert system; school; sport; talent.*

Introduction

Sport is an activity people perform according to an established set of rules with the purpose of competing with an opponent or a team and by applying a set system of points based on which the winner is determined. Basically, sports are divided into team sports and individual sports. A characteristic of all sports activities is that they differ in structure and content. The research conducted by Katić et al. (2005) has shown that the efficiency of an individual in a certain sport activity mostly depends on the compatibility of their anthropological features, the so-called anthropological model for

a certain sport. Peltola (1992) thinks that a well constructed system of early discovery of sport talents is the first step in creating a top athlete. Crespo and McInerney (2006, p. 2) describe talent as an "extremely complex attribute; genetically determined, of a complex structure and subjected to the conditions of the environment". More precisely, we can say that talent is a level to which a certain person owns particular physical, physiological or mental attributes that significantly contribute to efficiency in a certain sport. The identification of talent where a child is directed towards a certain sport or a sport activity is a complex, long-lasting and multidimensional process (Poppleton & Salmoni, 1991; Williams & Reilly, 2000). An early identification of talents is one of the most important problems of contemporary sport (Harre, 1982; Bompa, 1985, 1990). The methods of talent identification can be divided in two groups, and these are natural and scientific selection (Boostani, Boostani, & Razaei, 2011). Natural selection of children in sport is defined by environmental factors such as tradition, school or parental preferences, thus children, unfortunately, frequently choose a sport randomly or follow other people's desires, and not according to their own predispositions.

Rezaee (2008) stresses that the development of young athletes in this way is slow since most frequently they do not choose a sports activity enabling their optimal development. Boostani et al. (2011) explain that only by selecting sports through a scientific method one can enable the fastest development of a young athlete. The primary phase of the identification of talents is recommended by observing harmonic physical development of children (Bompa, 1999). Studies conducted by Gallahau (1987), Bailey and Morley (2005), Kukolj (2006) and Sturza-Milić (2009, 2014) have shown that the time period from the age of eight to the age of twelve is the most important for the motor development of children and that during this period they undergo intrinsic motivation necessary for displaying their talent. If we take into account that one needs at least ten years of systematic training to achieve the top level of efficiency in sport (Ericsson, Krampe, & Tesch-Romer, 1993), an early identification of talent in sport becomes a more and more dominant idea.

Bouchard and Bar-Or (2004), and Malina, Bouchard, and Bar-Or (2004) claim that systems of talent identification can be grouped into three categories: state systems, non-government systematic approaches and non-systematic approaches. State systems appear in countries with a high GDP such as Australia, China and Great Britain. Great financial investments and logistics normally appear when these countries host major international competitions such as the Olympics. This kind of approach has proven correct since all of the countries with such a system of talent identification have marked a constant increase of the number of medals. The Croatian system called TALENT implemented in this research is a non-government systematic approach. These approaches include encouraging the development of the system for identification and improvement of talent through the system of various education or scientific institutions. The most frequent non-systematic approach group in the Republic of Croatia is where talents are discovered by chance when a child joins a club. Research conducted by Williams and

Reilly (2000) showed that the road to reaching top results may be divided into four key phases: detection, identification, development and selection, with the identification being considered by the authors the key phase in the overall success.

Unfortunately, the selection of children into sports has still not been systemized and has no clear criteria, with a low technological and methodological level, and is most frequently based on subjective rather than scientifically based assessment. However, fast development of new scientific knowledge and contemporary information technologies such as expert systems enables an approach to sport selection in a systematic and scientifically based way.

Thus we developed TALENT – an expert system for discovering talents in sport as part of the scientific project entitled "Discovering talents in sport" at the Faculty of Kinesiology and Polytechnics Institute at the Faculty of Science and Mathematics (Rogulj, Papić, & Pleština, 2006; Papić, Rogulj, & Pleština, 2009) (Figure 1). The system is primarily intended for physical education teachers as support to their demanding role in detecting sports talents in the education system. The system's knowledge base involves normative orientation values of school children in the Republic of Croatia. Normative values include the results for 11 variables to assess anthropological characteristics of school children, 6 out of which are tests for the assessment of basic motor abilities, 4 to assess morphological characteristics and 1 to assess functional abilities. The second part of the knowledge base presents marks which kinesiology experts used for the assessment of the importance of anthropological features for the efficiency in a certain sports activity and which were measured by the given tests (Figure 2).

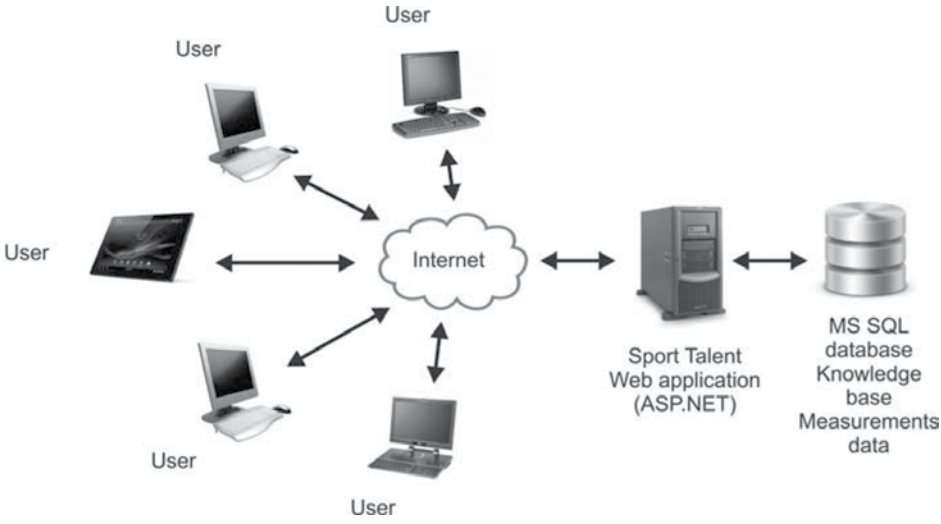

Figure 1. Sports Talent system overview

Following the instructions after registering and entering a password, the authorised kinesiologist fills in the data, i.e. the measured results for his/her pupils. Following the defined rules, the system evaluates the given data and offers quantitative assessment of

the user's general predisposition for engagement in sports activities in addition to the hypothetical quantitative assessment for the predisposition for each of the 14 different sports. In this way, the user obtains a fairly reliable prediction for potential efficiency in a certain sport. Papić et al. (2009) discuss the calculation of the personal total ability for a certain sport in 14 given sports. In addition to the cumulative calculation of each respondent's contribution, the importance factor has also been deduced. The suggested procedure introduces "fuzzy logic" consideration for some specific morphological testing. The final goal is a web-page containing HTML marking which is forwarded to the client, and can be found on the menu.

The reliability of the prognosis has been conditioned by the reference of normative values from the knowledge base and the expert knowledge quality which define the weight-load of the tests. However, the actual efficiency of the respondents in a certain sport is not the same as the potential one since it depends on a number of factors not included in this system, such as quantity and quality of training, organization, material-technical and financial conditions of training, motivation, etc. Thus, the assessment of the potential respondents' efficiency in a sports activity is exclusively hypothetical. Large numbers of system users ensures constant upgrading of the knowledge base which permanently generates new referential values. The plasticity of the system enables its constant extension by a greater number of sports, experts and anthropological variables.

Focusing on the importance of the professional and the scientific knowledge integration into the processes of selecting talented athletes, the purpose of this study is to establish the level and sex differences of sports talent in children from Split-Dalmatia County using the TALENT expert system.

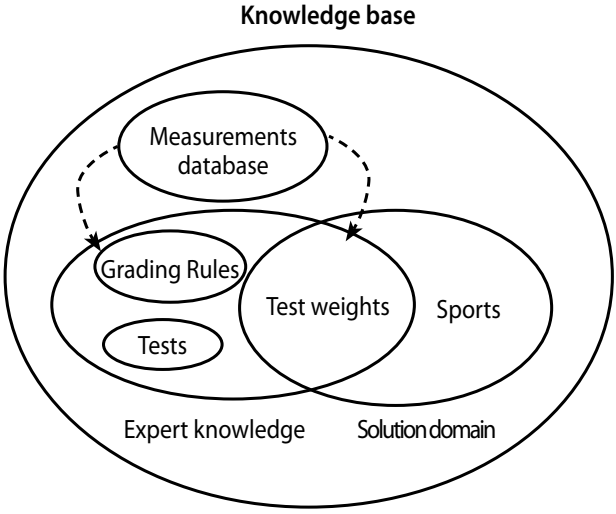

Figure 2. Structure of the expert system

Methods

The Analysis of the Study

The research was conducted in 2012 using the previously described TALENT expert system, which was implemented in the school system in 2008. The testing and the data input into the knowledge base were done by authorised kinesiology teachers in accordance with the standard procedure determined by the system. For the purpose of this study, the authorised administrator and the chief researcher have isolated, at random, a sample from the total database.

The system evaluated the input data and, as a final product, offered quantitative assessment of the hypothetical predisposition of the respondents for 14 different sports (Figure 3). Finally, the research results were sent to home addresses of the pupils' parents in written form.

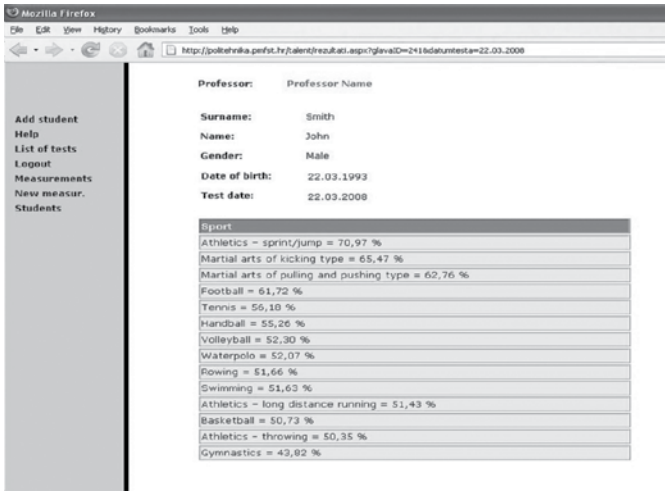

Figure 3. Example of the final results obtained by the TALENT expert system

Entity Sample

The entity sample involved the population of randomly selected male and female pupils aged 7-10 from several primary schools in the Split-Dalmatia County. The testing included 93 entities, i.e. 54 male pupils and 39 female pupils. The sample was formed by randomly selecting 10% respondents from the total number of respondents in the system base in accordance with the statistical sampling standards. All the pupils were healthy and medically fit to participate in the testing and they also had a written permission from their parents to be voluntarily involved in the study.

Sample of Variables

The sample of the variables has been defined on the basis of 14 sports and sport disciplines which are the basic part of TALENT expert system and for which

we calculated the quantitative percentage assessment of sports talent: volleyball (VOLLEY), basketball (BASKET), athletics – throwing (ATHTHROW), handball (HANDB), athletics – sprint (ATHSPRI), water-polo (WATERP), swimming (SWIMM), rowing (ROWI), tennis (TENNIS), martial arts – kicking (MARTKICK), athletics – running (ATHRUN), football (FOOTB), gymnastics (GYMNA), martial arts – pulling (MARARTS). Variables are expressed with standardised points obtained as a linear combination of test significance ponders and result value marking.

Data Processing Methods

Data processing involved the calculation of basic descriptive and distribution parameters for all the analysed variables: arithmetic means (M), standard deviation (SD), minimum and maximum result (MIN and MAX) in addition to asymmetry and distribution curve (SKEW and KURT). Distribution normality testing was done using the Kolmogorov-Smirnov test. The differences in sports talent among male and female pupils were calculated by multivariant (MANOVA) and univariant variance analysis (ANOVA). Variance homogeneity testing in both subsamples was done using the Levene test. Effect size was established by the Eta-square parameter. The results were processed by Statistica ver. 10 statistics software package.

Results

By analysing Tables 1 and 2 which show basic statistical parameters, it is evident that all the variables are normally distributed without any extreme dispersion of the data and without deviation from the normal distribution criterion at the level p=.01, which means they are appropriate for the following multivariant parameter statistical processing.

Table 1
Basic descriptive and distribution parameters for male pupils (n=54)

Variable	M	MIN	MAX	SD	SKEW	KURT	MAXD
VOLLEY	39.62	14.03	76.46	15.02	0.19	-0.63	.08
BASKET	38.83	11.05	80.84	17.33	0.32	-0.75	.12
ATHTROW	35.72	16.65	63.22	11.63	0.26	-0.48	.07
HANDB	40.63	15.73	78.13	13.60	0.42	0.02	.07
ATHSPRI	49.19	30.17	72.75	11.39	0.19	-0.87	.10
WATERP	40.73	12.58	76.24	14.51	0.39	-0.52	.13
SWIMM	40.95	12.62	78.68	15.27	0.28	-0.50	.09
ROWI	38.54	10.06	77.31	15.06	0.43	-0.45	.14
TENNIS	43.10	13.23	84.16	14.79	0.33	-0.04	.07
MARTKICK	48.04	21.96	79.34	13.03	-0.09	-0.40	.08
ATHRUN	50.54	3.54	85.69	19.58	-0.58	-0.21	.13
FOOTB	44.84	15.67	77.98	13.73	-0.11	-0.02	.06
GIMNA	38.38	11.07	65.74	13.82	0.05	-0.69	.07
MARARTS	39.67	12.67	67.45	12.99	-0.03	-0.51	.07

Testing value of KS test for MaxD at the level p<.01=.18

Among male pupils (Table 1), the biggest hypothetical predisposition was found in running athletic disciplines for middle and long running - 50.54%, as well as in sprint disciplines – 49.19%. The predisposition is rather high in kicking martial arts

– 48.08%, and in sports games in football – 44.84% and tennis - 43.10%. On the other hand, the lowest predisposition in pupils was found for throwing athletic disciplines – 35.72% and in sports gymnastics - 38.38%. The average predisposition for sport in male pupils is 42.05%.

Table 2
Basic descriptive and distribution parameters for female pupils (n=39)

Variable	M	MIN	MAX	SD	SKEW	KURT	MAXD
VOLLEY	39.69	17.24	74.15	15.40	0.65	-0.25	.11
BASKET	39.59	15.27	79.51	17.94	0.56	-0.61	.13
ATHTROW	38.13	21.40	68.52	12.30	0.76	0.01	.09
HANDB	42.93	20.32	77.68	14.73	0.61	-0.06	.09
ATHSPRI	53.79	35.80	79.71	11.50	0.40	-0.61	.12
WATERP	44.08	19.22	83.55	15.65	0.53	-0.23	.09
SWIMM	43.23	16.84	82.44	16.64	0.54	-0.30	.09
ROWI	41.19	15.77	82.66	16.69	0.56	-0.27	.11
TENNIS	45.86	17.96	84.72	17.11	0.46	-0.16	.08
MARTKICK	53.89	23.84	87.10	14.96	0.27	-0.28	.09
ATHRUN	58.38	20.15	95.01	17.38	-0.25	-0.01	.08
FOOTB	48.00	17.27	84.11	15.95	0.14	-0.31	.06
GIMNA	43.10	15.98	82.60	15.62	0.40	-0.33	.13
MARARTS	43.41	13.98	82.49	16.23	0.39	-0.01	.11

Testing value of KS test for MaxD at the level p<.01= .22

Table 3
Results of the multivariant and univariant analyses between the sexes

MANOVA						
			Wilks' Lambda .756	F 1.802		p-level .053
ANOVA						
Variable	M boys	M girls	p - Levene's	η^2	F	P
VOLLEY	39.62	39.69	0.96	.00	0.00	.984
BASKET	38.83	39.59	1.00	.00	0.04	.836
ATHTROW	35.72	38.13	0.79	.01	0.92	.340
HANDB	40.63	42.93	0.65	.01	0.60	.439
ATHSPRI	49.19	53.79	0.95	.04	3.66	.059
WATERP	40.73	44.08	0.76	.01	1.13	.290
SWIMM	40.95	43.23	0.63	.01	0.47	.496
ROWI	38.54	41.19	0.61	.01	0.64	.425
TENNIS	43.10	45.86	0.45	.01	0.69	.408
MARTKICK	48.04	53.89	0.56	.04	4.02	.048
ATHRUN	50.54	58.38	0.46	.04	3.98	.049
FOOTB	44.84	48.00	0.39	.01	1.05	.308
GIMNA	38.38	43.10	0.35	.03	2.37	.127
MARARTS	39.67	43.41	0.32	.02	1.52	.220

p- Levene's = significant Levene's Test for Homogeneity of Variances

η^2 - Eta-squere (effect size)

As can be seen in Table 2, which shows the basic statistical parameters for female pupils, there is a similar predisposition structure as in male pupils. Girls also have the highest predisposition for running athletic disciplines, middle or long running – 58.38%, followed by kicking martial arts – 53.89%. A very high predisposition is present in athletic sprint disciplines – 53.79%, and, as with boys, in football and tennis

as well. The lowest predisposition among female pupils was marked in throwing athletic disciplines – 38.13% and in basketball – 39.59%. The average predisposition for sport among female pupils is slightly higher and amounts to 45.37%.

By inspecting Table 3, which displays the results of the multivariant and univariant variance analysis, we can observe that the homogeneity of subsample variances does not differ, so variance analyses can be fully conducted. We observed the difference close to statistical significance (p=.053) in favour of girls in total sport predisposition between boys and girls. The same Table presents univariant variance analysis results which reveal that, among these sports, the greatest and statistically most significant difference between boys and girls is present in kicking martial arts (p=.048) as well as in running athletic disciplines in middle and long running (p=.049). We also found a difference close to the statistical significance limit in athletic sprint disciplines (p=.059). All of the mentioned differences are in favour of girls. Effect size analysis marked as the relation of square sums among groups and the total square sum (Eta-square) reveals that the marked differences are not sufficiently substantial.

Discussion

Despite the fact that Bompa (2000) considers the best period for the selection of children into a sport between the ages of 6 and 10, selection procedures are rarely applied in Croatian primary schools. To date, Croatia has not adopted a referential government system for talent selection in the way other countries, such as Slovenia (Šturm & Strel, 1996) have. Systems for discovering sports talent, such as e.g. the Australian national system which has periodically been upgraded, have led to the fact that Australia has accomplished significant sports achievements which was evident in the Olympics in Sydney in 2010 (Baker, Cobley, & Schorer, 2012).

An optimal selection of pupils for a certain sports activity is important for any rules-governed society. Sport and kinesiology diagnostics are inseparable parts of a wider anthropological diagnostics with the purpose of choosing a future profession, job, school or university. Kinesiology diagnostics partly belongs to educational diagnostics whose primary aim is to ensure information on the level of motor knowledge of a subject in the domain of education, sport and sports recreation (Findak, 2011). Furthermore, educational diagnostics is necessary since usability of subjects' other potentials, such as motor abilities, depend on the level of their motor knowledge (Schmidt & Wrisberg, 2000). Thus, a society concerned with its prosperity should primarily be focused on appropriate direction of gifted and talented young people, and none of the consequences are more destructive than the loss of these (Gardner, 1993).

Physical education lessons are taught by primary education teachers who, unlike kinesiologists, frequently have no relevant education on implementing diagnostics procedures and specific characteristics of a certain sport. Thus, the selection of sport within school education is rather a random or an uncontrolled process, the result of either attracting children in sample lessons during physical education classes

organized by certain sports clubs, or the result of parents' or children's preferences. This kind of an approach is neither sufficient nor reliable and it does not guarantee the selection of a sport appropriate for a certain child. Teachers in primary education must evaluate children's condition and progress within the school curriculum through a standard battery of tests for the assessment of anthropological features and must be immediately involved in the process of kinesiological direction and the selection of sport. In order to avoid the risk of choosing an "inappropriate" sport, a teacher must work together with a kinesiology expert who is familiar with the structure and specific characteristics of a certain sport, and who can assess whether the abilities, personality features and characteristics of a certain child match a certain sports activity. However, the decision on choosing the best sport for each child should, to a largest extent, be left to kinesiology scientists dealing with kinesiology diagnostics. The right choice enables a child to purposefully fulfil his/her potential in a sport which fully matches his/her specific anthropological characteristics. Directing children into the most appropriate kinesiological activity enables them to achieve sports efficiency, and increases the level of quality and sports results in sports to which the athletes were appropriately directed. In this way, we indirectly influence health preservation and avoid negative implications on medical condition, which may appear in individuals engaged in inappropriate physical activities. A child can enjoy a physical activity only when he/she is engaged in an appropriate sport. A young athlete engaged in a "wrong" sport is frustrated, easily gives up sports activities, is subjected to sports injuries, over-training, personality disorders, and quite frequently neglects school.

The results of the research reveal a similar structure of sports predispositions in male and female pupils in the Split-Dalmatia County. Boys and girls are mostly equally talented for the same sports, primarily athletic running disciplines and kicking martial arts, and are least talented for throwing athletic disciplines. We can logically assume that the basic reason for these equal potentials is the similarity in structure and the level of development of anthropological features of boys and girls from this region. The reasons may be found in genetics, but also in the environment where the children live. Sports talent is definitely a combination of both factors; however, sports efficiency is partially based even on multilateral development and later specialization. Multilateral sports development in preschool and younger school age may be enabled only by universal sports schools. They best fulfil the children's biotic need to move; they stimulate biological growth and development and multilaterally improve motor, functional, psychological and other parts of the anthropological system. They are primarily based on basic forms of moving, basic sports, a wide range of motor knowledge and skills, and programmes for purposeful improvement of specific motor abilities such as coordination, equilibrium or precision.

Early specialization and early involvement in training may result in only short-term and plausible efficiency in younger categories, but, in the end, it is trivial. However, early specialization unfortunately brings a lot of uncertainty, frustration, injuries,

childhood deprivation, neglecting school and the inability to achieve results in a senior age when it actually matters. Previous knowledge reveals that a large number of world's top athletes had foundations in multilateral development. Bompa (2000) considers these are the best ages to become engaged in a certain sport: gymnastics at ages 6-8, swimming at ages 7-9, judo at ages 8-10, tennis at ages 7-8, basketball at ages 10-12, water-polo at ages 10-12, volleyball at ages 10-12, football at ages 12-14, handball at ages 12-14 and throwing at ages 14-15. At the same time, many researchers stress the more and more frequent trend of premature engagement of children in the training and competition process for which they are not mature enough or appropriately prepared (Bodin et al., 2007; Baker et al., 2009; Sturza-Milić, 2011).

Since the quantitative indicators of hypothetical talent were actually obtained as a linear combination of compatibility of results between the respondents' anthropological features and the referential values from the knowledge base and expertly defined ponders of the importance of a certain anthropological efficiency feature for a certain sport, based on this research we may assume that girls have a slightly higher level of anthropological potential than boys. This particularly refers to the morphological status where girls, due to earlier puberty, are frequently more dimensioned than boys, which enables a higher potential efficiency in a greater number of sports.

The scientific contribution of the results of this research is displayed in the analysis of the level and the type of sports talent in children from the Split-Dalmatia County. The knowledge obtained may largely contribute to sports efficiency so the focus of the local community should primarily be organization, infrastructure and financing of sports for which children from this region show most talent. This will directly improve sports results, while financial means will be rationally and purposefully spent.

Conclusion

It is known for a fact that countries such as the USA, China, Germany, the UK and other rich countries invest enormous finances in technologies for discovering sports talents. For them, top sport is the national marketing resource presenting their country, while amateur sport enables the nation to remain healthy and offers socialization of young people. So far, in Croatia, based on long-term studies, we developed the only system for sports talent scouting called TALENT. The instrument was implemented in this study as well. The results of this research revealed a higher level of sports talent among girls compared to boys in Split and its surrounding area which may be explained primarily by factors of earlier and faster biological growth and development of girls than of boys at this age. In certain sports, the results mostly depend on good technique, in others on morphological and anthropological features. Regarding the complexity of factors, characteristics and abilities determining efficiency in each separate sport, appropriate detection of sports talents can be rather demanding for a primary education teacher or the physical education infrastructure, and requires

systematic and scientifically based approach to this issue. In addition to the usefulness of the introduction of the presented expert system into the Croatian education system, sport for children should be reinstated in schools by implementing the programme of additional universal kinesiology education. Within such programmes and in cooperation with kinesiology diagnostics experts, a planned cooperation would be established with clubs as well as permanent diagnostics of all school children and their direction towards the most appropriate sports.

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Sportska darovitost učenika i učenica Splitsko-dalmatinske županije

Sažetak

Istraživanje je provedeno s ciljem utvrđivanja razine i razlika u sportskoj darovitosti između učenika i učenica osnovnih škola u Splitsko-dalmatinskoj županiji. Putem ekspertnog sustava «TALENT» utvrđena je potencijalna darovitost 93 slučajno odabrana učenika i učenica u 14 različitih sportova i sportskih disciplina, na temelju razine njihovih motoričkih i funkcionalnih sposobnosti koje su procijenjene sa 7 mjernih instrumenata. Rezultati istraživanja ukazuju na to da su učenici, a posebno učenice, prema svojim motoričkim i funkcionalnim sposobnostima najdarovitiji za lake atletske trkačke discipline i borilačke sportove u vidu udaranja. Visoka razina darovitosti kod učenika postoji i za sportske igre, osobito za tenis i nogomet, a kod učenica osim za pojedine sportske igre i za sportove u vodi, kao i za sve vrste borilačkih sportova. Slična raspodjela sportske darovitosti kod učenika i učenika vjerojatno ukazuje i na sličnu strukturu antropoloških značajki kod oba spola, ali i generalno na nešto veću razinu potencijalne sportske darovitosti djevojčica u odnosu na dječake u navedenom području.

Ključne riječi: *darovitost; ekspertni sustav; sport; škola.*

Uvod

Sport je aktivnost koju čovjek izvodi po utvrđenom skupu pravila, a kojoj je cilj natjecanja s protivnikom ili protivničkim timom, uz primjenu propisanog sustava bodovanja na temelju kojeg se utvrđuje pobjednik. Osnovna podjela među sportovima je u tome da postoje grupni sportovi i samostalni sportovi. Karakteristika svih sportskih aktivnosti je da se strukturalno i sadržajno razlikuju. Istraživanje koje su proveli Katić i sur. (2005) pokazalo je da uspješnost pojedinca u određenoj sportskoj aktivnosti najviše ovisi o kompatibilnosti njegovih antropoloških značajki tzv. antropološkom modelu za neki sport. Peltola (1992) smatra da je dobro konstruiran sustav ranog otkrivanja talenata u sportu prvi korak u postizanju vrhunskog sportaša. Crespo i McInerney (2006, str. 2) talent opisuju kao „ekstremno složen atribut; genski determiniran, složene strukture i podložan uvjetima sredine". Preciznije se može reći da je talent stupanj u kome neka osoba posjeduje određene fizičke, fiziološke ili mentalne atribute

koji značajno doprinose uspjehu u nekom sportu. Identifikacija talenata pri kojoj se dijete usmjerava u određeni sport ili sportsku aktivnost kompleksan je, dugotrajan i multidimenzionalni proces (Williams i Reilly 2000; Poppleton i Salmoni, 1991). Rana identifikacija talenata jedan je od najvažnijih problema suvremenog sporta (Harre 1982; Bompa 1985; i Bompa, 1990). Metode identifikacije talenata mogu se podijeliti u dvije skupine, a to su prirodna i znanstvena selekcija (Boostani, Boostani i Razaei, 2011). Prirodna selekcija djece u sportu definirana je okolinskim čimbenicima kao što su tradicija, škola ili afiniteti roditelja, pa djeca nažalost često odabiru sport slučajno ili u skladu sa željom drugih, a ne u skladu sa svojim predispozicijama.

Rezaee (2008) naglašava da je razvoj mladih sportaša na takav način spor jer najčešće nisu odabrali sportsku aktivnost koja im osigurava optimalan razvoj. Boostani i sur. (2011) objašnjavaju da samo odabir sporta znanstvenim pristupom omogućava najbrži razvoj mladog sportaša.

Primarna faza identifikacije talenata preporuča se sagledavanjem harmoničkog fizičkog razvoja djece (Bompa 1999). Istraživanja koja su proveli Gallahau (1987), Bailey i Morley (2005), Kukolj (2006) i Sturza-Milić (2009, 2014) pokazala su da je razdoblje od osme do dvanaeste godine života najvažnije u motoričkom razvoju djeteta i da u tom razdoblju dolazi do intrinsičke motivacija koja je nužna za ispoljavanje darovitosti. Ako se u obzir uzme da je za dostizanje vrhunskog nivoa vještine u sportu potrebno najmanje deset godina sustavnog treninga (Ericsson, Krampe i Tesch-Romer, 1993), rana identifikacija talenata u suvremenom vrhunskom sportu postaje sve dominantnija.

Malina, Bouchard i Bar-Or (2004) smatraju da se sustavi identifikacije talenata mogu svrstati u tri kategorije: državni sustavi, sustavni nevladini pristupi i nesustavni pristupi. Državni sustavi pojavljuju se u zemljama s visokim BDP-om kao što su Australija, Kina i Velika Britanija. Velika novčana ulaganja i logistika obično se pojavljuju kada su te zemlje domaćini velikim međunarodnim natjecanjima poput OI. Takav se pristup pokazao ispravnim jer su sve zemlje koje su imale takav sustav identifikacije talenata bilježile stalan porast broja medalja. Hrvatski sustav TALENT, kojim je provedeno ovo istraživanje, ubraja se u drugu grupu – sustavni nevladini pristupi. Takvi pristupi podrazumijevaju poticanje razvoja sustava za identifikaciju i unapređenje talenata putem programa raznih obrazovnih ili znanstvenih institucija. Postoji i treća skupina nesustavnih pristupa koja je najčešća u Republici Hrvatskoj u kojoj se talenti otkrivaju slučajnim dolaskom djeteta u klub. Istraživanje koje su proveli Williams i Reilly (2000) pokazalo je da se put prema vrhunskom rezultatu može podijeliti u četiri ključne faze, a to su: detekcija, identifikacija, razvoj i selekcija, pri čemu autori smatraju da je identifikacija ključna faza u konačnici cijelog uspjeha.

Odabir djece za sportove nažalost u našoj se zemlji još uvijek provodi nesustavno, bez jasnih kriterija, na niskoj tehnološkoj i metodološkoj razini, te najčešće na osnovi subjektivnih i znanstveno neutemeljenih procjena. Međutim, ubrzani razvoj novih znanstvenih spoznaja i suvremenih informacijskih tehnologija poput ekspertnih

sustava omogućuje da se selekciji u sportu pristupi na sustavan i znanstveno utemeljen način.

Tako je na Kineziološkom fakultetu u Splitu i na Zavodu za politehniku Prirodoslovno-matematičkog fakulteta u okviru znanstvenog projekta «Otkrivanje talenata u sportu« razvijen ekspertni sustav za otkrivanje talenata u sportu – TALENT (Rogulj, Papic i Plestina, 2006; Papic, Rogulj i Pleština, 2009), (Slika 1). Sustav je ponajprije namijenjen profesorima tjelesne i zdravstvene kulture u školama, kao potpora njihovoj zahtjevnoj ulozi detekcije sportskih talenata u sustavu odgoja i obrazovanja. Baza znanja na kojem se sustav zasniva sastoji se od normativnih orijentacijskih vrijednosti školske djece u Republici Hrvatskoj. Normativne vrijednosti sadrže rezultate 11 varijabli za procjenu antropoloških karakteristika školske djece, od čega 6 testova za procjenu bazičnih motoričkih sposobnosti, 4 za procjenu morfoloških karakteristika i jedan za procjenu funkcionalne sposobnosti. Drugi dio baze znanja predstavljaju ocjene kojima su kineziološki eksperti procijenili važnost antropoloških značajki koje se mjere navedenim testovima za uspjeh u pojedinoj sportskoj aktivnosti (Slika 2)**.**

Slijedeći upute nakon registracije i dodjele zaporke, ovlašteni kineziolog upisuje podatke, odnosno rezultate mjerenja za svoje učenike. U skladu s definiranim pravilima odlučivanja sustav evaluira unesene podatke te daje kvantitativnu procjenu opće predisponiranosti korisnika za bavljenje sportskim aktivnostima, kao i hipotetsku kvantitativnu procjenu predisponiranosti za svaki od 14 različitih sportova. Na taj način korisnik dobiva relativno pouzdanu prognozu potencijalne uspješnosti u određenom sportu. Papić i sur. (2009) objašnjavaju izračun osobne ukupne sposobnosti za određeni sport od ponuđenih četrnaest raspoloživih sportova u detalje. Osim kumulativnog obračuna doprinosa svakog ispitanika izveden je faktor važnosti. Predloženi postupak uvodi „fuzzy logic" razmišljanja za neka specifična morfološka ispitivanja. Krajnji je cilj stranica koja se sastoji od HTML oznake koja se šalje do klijenta, a nalazi se na pregledniku.

Slika 1

Pouzdanost prognoze uvjetovana je referentnošću normativnih vrijednosti iz baze znanja i kakvoće ekspertnog znanja kojim su definirana težinska opterećenja testova. Naravno, stvarna uspješnost ispitanika u određenom sportu nije isto što i potencijalna jer ovisi o velikom broju faktora koji nisu obuhvaćeni ovim sustavom poput količine i kakvoće treniranja, organizacijskih, materijalno-tehničkih i financijskih uvjeta treniranja, motivacije itd. Stoga je procjena potencijalne uspješnosti ispitanika u sportskim aktivnostima isključivo hipotetska. Upotreba sustava od većeg broja korisnika osigurava stalnu nadogradnju baze znanja iz kojih se permanentno generiraju i nove referentne vrijednosti. Plastičnost sustava omogućava njegovo stalno nadopunjavanje većim brojem sportova, eksperata i antropoloških varijabli.

Polazeći od važnosti integracije stručnih i znanstvenih spoznaja u procese odabira talentiranih sportaša, intencija je ovog istraživanja putem postojećeg ekspertnog

sustava TALENT utvrditi razinu i spolne razlike u sportskoj darovitosti djece u Splitsko-dalmatinskoj županiji.

Slika 2

Metode

Opis tijeka istraživanja

Istraživanje je provedeno tijekom 2012. godine korištenjem prethodno opisanog ekspertnog sustava TALENT koji je u školski sustav implementiran od 2008. godine. Testiranja i unos podataka u bazu znanja izvršili su ovlašteni profesori kineziologije u skladu sa standardnom procedurom koju sustav propisuje. Ovlašteni administrator i glavni istraživač slučajnim su odabirom iz ukupne baze podataka izolirali uzorak za potrebe ovog istraživanja.

Sustav je evaluirao unesene podatke i kao finalni proizvod dao kvantitativnu procjenu hipotetske predisponiranosti ispitanika za 14 različitih sportova (slika 3). Na kraju su rezultati istraživanja u pisanoj formi poslani na kućne adrese roditelja svakog od učenika.

Slika 3

Uzorak entiteta

Uzorak entiteta obuhvaća populaciju slučajno odabranih učenica i učenika od 7 do 10 godina iz nekoliko osnovnih škola na području Splitsko-dalmatinske županije. Testiranjem su obuhvaćena 93 entiteta, odnosno 54 učenika i 39 učenica. Uzorak je formiran odabirom 10 % ispitanika putem tablice slučajnih brojeva od ukupnog broja ispitanika u bazi sustava, u skladu sa statističkim standardima uzorkovanja. Svi su učenici bili klinički zdravi i zdravstveno sposobni za sudjelovanje u testiranju te su imali pismeno dopuštenje svojih roditelja da dobrovoljno pristupaju istraživanju.

Uzorak varijabli

Uzorak varijabli definiran je sa 14 sportova i sportskih disciplina koje su sastavni dio baze znanja ekspertnog sustava TALENT i za koje se izračunava kvantitativna postotna procjena sportske darovitosti: odbojka (ODBOJ), košarka (KOŠAR), atletika – bacačke discipline (ATBAC), rukomet (RUKOM), atletika – sprinterske discipline (ATSPR), vaterpolo (VATER), plivanje (PLIVA), veslanje (VESLA), tenis (TENIS), borilački udarački sportovi (BOUDA), atletika – trkačke discipline (ATTRK), nogomet (NOGOM), gimnastika (GIMNA), borilačko povlačenje (BOPOV). Varijable su izražene u normiranim bodovima dobivenim kao linearna kombinacija pondera značajnosti testa i ocjene vrijednosti rezultata.

Metode obrade podataka

U okviru obrade podataka za sve analizirane varijable izračunati su osnovni deskripcijski i distribucijski parametri: aritmetička sredina (AS), standardna

devijacija (SD), minimalni i maksimalni rezultat (MIN i MAX), asimetričnost i zakrivljenost distribucije (SKEW i KURT). Testiranje normaliteta distribucije izvršeno je Kolmogorov-Smirnovljevim testom. Razlike u sportskoj darovitosti između učenika i učenica izračunate su multivarijatnom (MANOVA) i univarijatnom analizom varijance (ANOVA). Provjera homogenosti varijanci obaju subuzoraka izvršena je Levene's testom. Veličina učinka (effect size) utvrđena je Eta-squre parametrom. Rezultati su obrađeni statističkim softverskim paketom Statistica ver. 12.

Rezultati

Tablica 1

Inspekcijom tablica 1 i 2 u kojima su prezentirani osnovni statistički parametri evidentno je da su sve varijable normalno distribuirane bez ekstremnih raspršenja podataka i da ne odstupaju od kriterija normalne raspodjele na razini p=,01, što znači da su prikladne za predstojeću multivarijatnu parametrijsku statističku obradu. Kod učenika (Tablica 1) je najveća hipotetska predisponiranost zabilježena za lake atletske trkačke discipline i to srednje i duge pruge – 50,54 % i sprinterske discipline – 49,19 %. Vrlo visoka predisponiranost prisutna je i za borilačke udaračke sportove – 48,04 %, a od sportskih igara za nogomet – 44,84 % i tenis – 43,10 %. S druge strane najmanja predisponiranost kod učenika zabilježena je za atletske bacačke discipline – 35,72 % i za sportsku gimnastiku 38,38 %. Prosječna predisponiranost za sport za učenike iznosi 42,05 %.

Tablica 2.

Iz tablice 2 koja prikazuje osnovne statističke parametre za učenice razaznaje se slična struktura predisponiranosti kao i kod učenika. Učenice također imaju najveću predisponiranost za lake atletske trkačke discipline i to srednje i duže pruge – 58,38 %, zatim za borilačke udaračke sportove – 53,89 %. Vrlo visoka predisponiranost prisutna je i za lake atletske sprinterske discipline – 53,79 %, te kao i kod učenika za nogomet i tenis. Najmanja predisponiranost kod učenica zabilježena je za atletske bacačke discipline – 38,13 % i za košarku 39,59 %. Prosječna predisponiranost za sport za učenice je nešto viša nego kod učenika i iznosi 45,37 %.

Tablica 3.

Uvidom u Tablicu 3 koja prikazuje rezultate multivarijatne i univarijatne analize varijance vidljivo je da se homogenost varijanci subuzoraka ne razlikuje, te da se analiza varijance može nesmetano provesti. Evidentirana je razlika blizu statističke značajnosti (p= ,053) u ukupnoj sportskoj predisponiranosti između učenika i učenica, u korist učenica. U istoj su tablici prezentirani i rezultati univarijatne analize varijance koji ukazuju na to da je od pojedinih sportova najveća i statistički značajna razlika između učenika i učenica prisutna u borilačkim udaračkim sportovima (p= ,048) i lakim atletskim trkačkim disciplinama na srednje i duže pruge (p= ,049). Na granici

statističke značajnosti zabilježena je i razlika u atletskim sprinterskim disciplinama (p=,059). Sve navedene razlike egzistiraju u korist učenica. Analiza veličine učinka iskazana kao odnos sume kvadrata između grupa i ukupne sume kvadrata (Eta-kvadrat) upućuje na nedovoljnu snagu zabilježenih razlika.

Rasprava

Iako je poznato kako je najbolje razdoblje za provedbu postupaka odabira djece za sport od 6. do 10. godine (Bompa, 2000), selekcijski se postupci u hrvatskim osnovnim školama rijetko provode. Hrvatska još uvijek nema referentni državni sustav za selekciju talenata kao što su to imaju neke druge zemlje poput Slovenije (Šturm i Strel, 1996). Sustavi za detekciju sportskih talenata, poput npr. Australskog nacionalnog sustava koji se periodično nadograđuje doveli su do toga da ja Australija postigla značajne sportske uspjehe, što se posebno moglo vidjeti na Olimpijskim igrama u Sydneyu 2010. (Baker, Cobley i Schorer, 2012).

Optimalan odabir učenika za određenu sportsku aktivnost važan je za svako uređeno društvo. Sportska i kineziološka dijagnostika nedjeljive su sastavnice šire antropološke dijagnostike kojoj je cilj odabir profesije, radnog mjesta, škole ili fakulteta. Kineziološka dijagnostika dijelom pripada i obrazovnoj dijagnostici čiji je cilj osigurati informacije o razini motoričkih znanja subjekta u područjima edukacije, sporta i sportske rekreacije (Findak, 2011). Obrazovna dijagnostika nužna je i zbog toga što o razini motoričkih znanja subjekta ovisi i iskoristivost njegovih ostalih potencijala poput motoričkih sposobnosti (Schmidt i Wrisberg, 2000). Stoga za društvo koje se brine za svoj opstanak nijedna tema nije važnija od pravilnog usmjerenja darovitih i talentiranih mladih osoba, a nijedan ishod nije razorniji od njihova gubitka (Gardner, 1993).

Nastavu tjelesne i zdravstvene kulture u razrednoj nastavi provode učitelji primarnog obrazovanja, koji za razliku od kineziologa najčešće nisu dovoljno educirani u provedbi dijagnostičkih postupaka i specifičnostima pojedinog sporta. Odabir sporta u okviru škole stoga se uglavnom događa slučajno ili stihijski, kao posljedica animiranja djece i provedbe pokaznih treninga na satima TZK koje provode pojedini sportski klubovi ili je posljedica afiniteta roditelja ili djeteta. Takav pristup nije dostatan ni pouzdan i ne jamči da će dijete odabrati za sebe najprimjereniji sport. Učitelj primarnog obrazovanja je u okviru kurikula dužan valorizirati stanje i napredak učenika putem standardne baterije testova za procjenu antropoloških značajki i posredno sudjelovati u procesu kineziološkog usmjeravanja i odabira sporta. Da bi se smanjio rizik izbora «krivog» sporta, učitelj svakako treba surađivati sa stručnjakom kineziologom koji poznaje strukturu i specifičnost pojedinog sporta te može procijeniti odgovaraju li sposobnosti, osobine i značajke nekog djeteta toj sportskoj aktivnosti. Ipak, odluku o izboru najboljeg sporta za pojedino dijete,u najvećoj bi mjeri trebalo prepustiti kineziolozima-znanstvenicima, koji se bave kineziološkom dijagnostikom. Pravilnim odabirom omogućuje se djetetu svrhovito ispoljavanje potencijala u sportu koji je u najvećoj mjeri u skladu s njegovim antropološkim specifičnostima. Usmjeravanje djece

u za njih najpogodnije kineziološke aktivnosti omogućuje im da dostignu sportsku izvrsnost, a ujedno se podiže razina kvalitete i sportskih rezultata u sportovima u koje su sportaši ispravno selekcionirani. Na taj se način posredno utječe i na očuvanje zdravlja, jer se izbjegavaju negativne implikacije na zdravstveni status koje su moguće kod osoba koje se bave neprimjerenim kineziološkim aktivnostima. Dijete samo u za njega odgovarajućem sportu može pronaći smisao i zadovoljstvo bavljenja tjelesnom aktivnošću. Mladi sportaš koje nije u «svom» sportu podložan je frustracijama, ranom odustajanju od sportskih aktivnosti, ozljedama, pretreniranosti, poremećajima ličnosti, a nerijetko i zapostavljanju školskih obveza.

Rezultati ovog istraživanja ukazuju na sličnu strukturu sportske predisponiranosti učenika i učenica u Splitsko-dalmatinskoj županiji. I dječaci i djevojčice najveću darovitost uglavnom iskazuju za iste sportove, posebno atletske trkačke discipline i borilačke sportove u vidu udaranja, a najmanju za atletske bacačke discipline. Logično je pretpostaviti da u osnovama tako ujednačene potencijalne darovitosti vjerojatno leži vrlo slična struktura i razina razvijenosti antropoloških značajki dječaka i djevojčica na tom području. Razlozi svakako mogu biti genske prirode, ali i istih okolinskih uvjeta u kojima žive djeca u tom podneblju. Sportska je darovitost svakako kombinacija obaju faktora, međutim sportska izvrsnost dijelom je uvjetovana i višestranim razvojem i kasnijom specijalizacijom. Višestrani sportski razvoj u predškolskoj i mlađoj školskoj dobi moguće je osigurati jedino putem univerzalnih sportskih škola. One najbolje zadovoljavaju biotičku potrebu djece za kretanjem, potiču biološki rast i razvoj te višestrano unapređuju motoričke, funkcionalne, psihološke i ostale sastavnice antropološkoga sustava. Ponajprije su utemeljene na prirodnim oblicima kretanja, temeljnim sportovima, širokom spektru motoričkih znanja i vještina, kao i programima za ciljano unapređenje specifičnih motoričkih sposobnosti poput koordinacije, ravnoteže ili preciznosti.

Rana specijalizacija i rano započinjanje treniranja donosi možda samo kratkoročni i prividni uspjeh u mlađim kategorijama, koji je u konačnici trivijalan. Međutim ono što rana specijalizacija nažalost svakako donosi jest mnogo neizvjesnosti, frustracija, ozljeda, narušavanje djetinjstva, zapostavljanje školskih obveza i nemogućnost ostvarivanja rezultata u seniorskom uzrastu, kada je to jedino i važno. Dosadašnje spoznaje ukazuju na to da je velik broj vrhunskih svjetskih sportaša imao temelje u višestranom razvoju. Bompa (2000) smatra da je najbolje vrijeme za počinjanje bavljenja sportom sljedeće: gimnastika (6 – 8 god.), plivanje (7 – 9), judo (8 – 10), tenis (7 – 8), košarka (10 – 12), vaterpolo (10 – 12), odbojka (10 – 12), nogomet (12 – 14), rukomet (12 – 14) i bacanja (14 – 15). Isto tako brojni istraživači naglašavaju sve prisutniji trend ranog uključivanja djece u trenažni i natjecateljski proces za koji ona nisu dovoljno zrela, a ni na pravilan način pripremljena (Bodin i sur., 2007; Baker i sur., 2009; Sturza-Milić, 2011).

S obzirom na to da su kvantitativni pokazatelji hipotetske darovitosti ustvari dobiveni kao linearne kombinacije podudarnosti rezultata ispitanikovih antropoloških

značajki s referentnim vrijednostima iz baze znanja i ekspertno definiranih pondera važnosti pojedine antropološke značajke za uspjeh u određenom sportu, na temelju rezultata ovog istraživanja moglo bi se pretpostaviti da su djevojčice ispoljile nešto veću razinu antropološkog potencijala od dječaka. To se posebno odnosi na morfološki status. Naime djevojčice su, zbog ranijeg ulaska u pubertet, u ovom razdoblju nerijetko dimenzioniranije od dječaka, što im osigurava i veću potencijalnu uspješnost u većem broju sportova.

Znanstveni doprinos rezultata ovog istraživanja ogleda se u analizi razine i vrste sportske darovitosti djece u Splitsko-dalmatinskoj županiji. Dobivene spoznaje mogu uvelike doprinijeti sportskoj izvrsnosti tako da se lokalna zajednica prioritetno organizacijski, infrastrukturalno i financijski orijentira na sportove za koje su djeca s ovog područja najviše talentirana. Na taj se način izravno pospješuje sportski rezultat, a materijalna sredstva se racionalno i svrhovito koriste.

Zaključak

Poznato je da države poput Sjedinjenih Američkih Država, Kine, Njemačke, Engleske i ostalih bogatih zemalja ulažu golema novčana sredstva i tehnologije za otkrivanje talenata u sportu. Za njih je vrhunski sport marketinški nacionalni resurs koji omogućava prezentaciju domovine, a amaterski je sport onaj koji osigurava zdravlje nacije i socijalizaciju mlade osobe. U Hrvatskoj se na osnovi dugogodišnjih istraživanja razvio do sada jedini sustav za detekciju sportske darovitosti „TALENT" koji je svoju implementaciju dobio i u ovom istraživanju. Rezultati ovog istraživanja ukazali su na nešto veću razinu sportske talentiranosti djevojčica u odnosu na dječake na području grada Splita i okolice, što je ponajprije moguće obrazložiti faktorima ranijeg i ubrzanijeg biološkog rasta i razvoja djevojčica u odnosu na dječake u proučenoj dobi. U pojedinim sportovima rezultati više ovise o dobroj tehnici, u drugim o motoričkim ili funkcionalnim sposobnostima, u nekima o morfološkim ili drugim antropološkim značajkama. S obzirom na složenost faktora, osobina i sposobnosti koje determiniraju uspješnost u svakom sportu zasebno, zahtjevnost pravilne detekcije sportskih talenata najčešće nadilazi mogućnosti učitelja primarnog obrazovanja i infrastrukturu nastave TZK te traži sustavne i znanstveno utemeljene pristupe tom problemu. Osim korisnosti uvođenja ekspertnih sustava poput prezentiranog u hrvatski odgojno-obrazovni sustav, sport djece potrebno je vratiti u škole putem provedbe programa dodatne univerzalne kineziološke edukacije. U okviru takvih programa i u suradnji s ekspertima za kineziološku dijagnostiku uspostavila bi se planska suradnja s klubovima i vršila permanentna dijagnostika sve školske djece i njihovo usmjeravanje u najprikladnije sportove.