APPLICATION OF EXPERT-SYSTEM FOR TALENT SCOUTING IN DANCING

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Abstract

Selection of athletes is most frequently done without any clear criteria, on a low methodological level and by subjective and not scientifically based assessments. Being aware of the importance of taking a correct direction in sports, a new expert system for talent scouting in sport – Talent, has been developed at the Faculty of Kinesiology in Split and the Polytechnics Institute of the Faculty of Natural Sciences and Mathematics in Split, formed in a way to integrate into the existing system of following and evaluating anthropological characteristics of children in primary or secondary schools. Since the existing knowledge base, involving 14 different kinesiological activities, did not involve dance activities, the aim of this research was to determine quantitative contributions of certain motor abilities to the potential dance efficiency through expert knowledge. Good metrical characteristics of the expert knowledge were determined, and after the implementation of the results of research into the system, we established its fine prognostic efficiency in recognizing individuals engaged in dance activities. The obtained results will be used in further improvement of the expert system with the purpose of its more reliable use in the processes of selection and detecting talents in sports.

Key words: *system, dance, expert, scouting, talent*

Introduction and problem

The correct selection of children in the appropriate sport is the most demanding and the most responsible task for kinesiologists and sport trainers. Sport activities considerably differ in structure and content. Different sports are characterised by authentic kinesiological structures and specific anthropological features (Srhoj, Lj. et al., 2006). The efficiency of an individual in a certain sport activity depends greatly on the compatibility of his anthropological features, the so-called anthropological model for the sport (Viskić-Štalec et al., 2007). Therefore, it is crucial to select athletes whose anthropological features match the characteristics of a certain sport activity as much as possible. Occasionally, and more frequently in sports with greater commercial effects, the selection is based on some other rather than sports criteria. However, rapid development of the new scientific discoveries and modern information technologies enables to approach the selection in sport in a systematic and scientifically based manner. Taking the importance of the correct selection of children in sport as a starting point, a new expert system for sport talent scouting (Rogulj, Papić & Pleština, 2006; Papić, Rogulj & Pleština, 2009), called *Talent*, has been developing within the scientific project *Talent scouting in sport* at the Faculty of Kinesiology in Split and the Polytechnics Institute of the Faculty of Natural Sciences and Mathematics in Split. Knowledge base on which the system is founded consists of normative orienting values of school children in the Republic of Croatia obtained by a comprehensive research conducted in 1992 by Findak, Metikoš & Mraković within the project of methodology of following and evaluating the domain of physical education in the school system.

Normative values comprise the results of 11 variables to evaluate anthropological characteristics in school children, 6 out of which were to assess basic motor abilities, 4 to assess morphological characteristics and 1 to assess functional abilities. The second part of the knowledge base represents grades by which the kinesiological experts evaluate the relevance of the anthropological features measured by the stated tests for efficiency in a certain activity.

The actual efficiency of the respondents in a specific sport is not the same as the potential one since it depends on a large number of factors not included in this system such as quantity and quality of training, organisation, material, technical and financial conditions of training, motivation etc. (Roos, 1991). Therefore, the evaluation of the potential efficiency of the respondents in kinesiological activities is merely hypothetical since it is determined by other infrastructural factors of sport training. However, the use of system will enable simultaneous supplementation of the knowledge base, its expansion and correction, which is by all means possible to achieve only by its implementation in the actual conditions.

Improvment and further advancement of the system in its following versions is possible by its more detailed differentiation and by involving a larger number of kinesiological activities, by engaging a larger number of experts, by including more kinesiological variables (tests), and by using results of the former scientific researches in creating weight parametres in addition to more recent normative values obtained on a relevant sample of respondents.

Since the existing knowledge base containing 14 different kinesiological activities did not involve dance structures, which the following version comprising a larger number of sports definitely should, the purpose of this paper would be to, through kinesiological experts, establish quantitative significance loads of anthropological features measured by given tests (Findak et al., 1996) for efficiency in dance structures.

Aim

The aim of this research is to define, through expert knowledge, which quantitative contributions are relevant for certain anthropological, in this case, motor features for the potential efficiency in dancing. Within the given aim of the research, certain basic metrical characteristics of the evaluators will be analysed as well. The obtained results will be used to expand the expert system and to evaluate efficiency in detecting talents in dancing through this system.

Research methods

The sample of respondents
The research of expert knowledge was conducted on the sample of 10 kinesiological experts specialised in polystructural aesthetic kinesiological activities. The experts had to fulfil the criterion of having a university degree, a master`s degree or a doctor`s degree in kinesiology and to own professional references in the aspect of long-time practising or training polystructural aesthetic kinesiological activities in addition to formal professional and scientific competence. The evaluation was done on the five point Likert scale. The results of the research of expert knowledge were built in the algorithm of the expert system which was evaluated as well. With this purpose we tested the ability to recognise respondents engaged in dancing activities. Two subsamples of the same age groups involving senior high school female students were tested, aged 17,5 in average. The first subsample consisted of 74 students who had never been engaged in any sport activities, while the other one comprised 19 respondents, students who were engaged in dancing organised by sport associations for at least three years.

The sample of variables
The sample represents six variables to evaluate basic motor abilities of coordination (MKRPOLN), movement frequency (MBTAP), flexibility (MFLPRR), explosive power of legs (MFESDM), static power of arms (MFSVIS) and repetitive power of trunk (MRCMPT) as well as the one to evaluate functional ability in the form of aerobic endurance (T6M).

The methods of data processing
Basic descriptive and distribution parameters of the experts` grades were determined: arithmetic means (AS), standard deviation (SD), minimal and maximal result value (MIN, MAX), asymmetry coefficient (Skewness) and the coefficient of distribution distortion (Kurtosis).

The testing of distribution normality was done according to Kolmogorov-Smirnov procedure (Max D). To evaluate basic metric parameters of the experts` grades, we determined Pearson`s rank correlation coefficient among evaluators, Cronbach`s Alpha reliability coefficient, the average correlation inside particles (inter-item correlation) and the evaluators` homogenisation coefficient (according to Rogulj et al., 2009). With the purpose of evaluating the system, non-parametric Hi-square test (x^2) was determined to establish the dependence of selecting sport on the system. Within this procedure, the value of Hi square (x^2) was determined and its statistical significance (p), contingency coefficient (C) and the correspondent degrees of freedom (DF).

Results and discussion

Table 1 displays descriptive statistics for the tests. The variables have satisfactory distribution of flatness and symmetry parameters, and through Kolmogorov – Smirnov test it has been discovered that only astride touch-toe variable has minimal deviations from normal distribution on the level of statistic significance $p<0,5$. This variable is markedly negatively asymmetrical; therefore it tends towards higher values (Skewness) and has a sharp peak (Kurtosis). It is evident how evaluators awarded high grade the relevance of flexibility for efficiency in dancing. Average grades range from 2,30 for hanging endurance to 4,80 for astride touch-toe. By inspecting arithmetic means, one can get an insight into the experts` attitude towards the significance of specific motor abilities for potential efficiency in dancing. The experts consider flexibility, coordination and movement frequency to be the most significant motor abilities. The experts assessed the static power of arms and shoulder belt, the repetitive power of the front side of the trunk and the explosive power of the lower extremities as the least significant motor abilities for efficiency in dancing. The significance of functional ability in the aspect of aerobic endurance was awarded an average mark.

Table 2 displays the descriptive statistics of the evaluators. The range of average experts` assessments on the significance of the suggested motor abilities for efficiency in dancing varies from 2,71 (EV1) to 4,43 (EV2). It is assumed certain experts consider other motor abilities not included in this research, and most likely other anthropological characteristics as well, equally relevant for efficiency in dance activities.

With the purpose of checking objectivity and homogeneity of the experts while evaluating the significance of motor abilities for efficiency in dancing, intercorrelation matrix of the evaluators has been calculated based on Pearson`s correlation coefficients. In the matrix (table 3) high and relatively high correlation coefficients are dominant. It is evident evaluators EV6 and EV7 have lower correlations with other evaluators, unlike evaluators EV1 and EV9.

Table 1. Descriptive statistics for the tests

Test	Mean	Min	Max	SD	Skew	Kurt	MaxD
RUNNING	3,60	3,00	4,00	,52	-,48	-2,28	,38
ASTRIDE TT	4,80	3,00	5,00	,63	-3,16	10,00	,52
LONG JUMP	3,40	2,00	5,00	,84	,39	,37	,28
TAPPING	4,40	2,00	5,00	,97	-1,96	4,19	,33
HANGING E.	2,30	1,00	3,00	,67	-,43	-,28	,27
SIT-UPS	3,20	2,00	5,00	,79	1,29	2,98	40
POLYGON	4,70	4,00	5,00	,48	-1,04	-1,22	,43

TEST=0,43 p<0,1; 0,51 p<0,5

Table 2. Descriptive statistics of the evaluators

Eval.	Mean	Min	Max	S.Dev.
EV1	3,71	2,00	5,00	1,25
EV2	3,43	1,00	5,00	1,51
EV3	4,14	3,00	5,00	,69
EV4	3,86	3,00	5,00	,90
EV5	4,00	3,00	5,00	,82
EV6	2,71	2,00	4,00	,76
EV7	4,43	3,00	5,00	,98
EV8	4,00	2,00	5,00	1,15
EV9	3,71	2,00	5,00	1,25
EV10	3,71	2,00	5,00	1,11

Slight distortion of a small number of evaluators is completely understandable considering the experts did not have an easy task to subjectively evaluate the relevance of different motor abilities for dance efficiency. This type of assessment asks for sublimation not only in personal, professional and scientific experience, but in a large number of previous scientific notions on motor abilities which, despite efforts of numerous scientists, still have not been fully defined, explained and profiled.

Table 3. Correlation matrix of the evaluators (Pearson)

	EV1	EV2	EV3	EV4	EV5	EV6	EV7	EV8	EV9	EV10
EV1	1,00	,87	,83	,84	,81	,43	,66	,92	1,00	,89
EV2		1,00	,73	,91	,95	,56	,42	,95	,87	,88
EV3			1,00	,58	,59	,09	,64	,84	,83	,93
EV4				1,00	,91	,67	,27	,80	,84	,78
EV5					1,00	,54	,42	,88	,81	,73
EV6						1,00	,19	,38	,43	,28
EV7							1,00	,59	,66	,44
EV8								1,00	,92	,91
EV9									1,00	,89
EV10										1,00

Table 4 presents coefficients of reliance and homogeneity. They are absolutely satisfactory, so we can draw a conclusion that experts, despite this demanding and ungrateful task, in a relatively reliable and coordinated manner evaluated the relevance of motor abilities for efficiency in dancing. The equality analysis of the evaluators for a certain test shows the experts showed the greatest homogeneity in evaluating the relevance of coordination and flexibility, and the smallest one at the explosive power of jump and the arms frequency speed. The results are in accordance with the results of descriptive statistics to a great extent and show the experts were mostly in agreement. Meaning, when evaluating those abilities considered to be most significant to predict efficiency in dancing, such as flexibility and coordination. Subliming the analysis of metrical characteristics, it is evident the obtained results can safely be used to improve the algorithm of the *Talent* expert system in its following versions.

Table 4. Testing of significance

Cronbach`s alpha coefficient	,96
Average inter-item correlation	,81
Equality evaluation coefficient for a certain test (kH)	
Running	0,87
Flexibility	0,90
Long jump from a spot	0,77
Tapping	0,78
Hanging endurance	0,83
Lifting trunk	0,81
Polygon	0,91

With the purpose of checking the system and determining significance loads of certain motor abilities for efficiency in dancing (coefficient ranging 0-1), which are a component of the expert system algorithm, the standardisation of the arithmetic means of the evaluators` grades was done in the aspect of proportion with relation to the maximum grade (Table 5).

Table 5. Loads for the tests

Test	loads
RUNNING	0,72
ASTRIDE TOUCH-TOE	0,96
LONG JUMP	0,68
TAPPING	0,88
HANGING ENDURANCE	0,46
SIT-UPS	0,64
POLYGON	0,94

The checking of the system after installing the coefficients obtained by this research has been done in a way that in the system we first entered the results of motor tests for the respondents who had never been engaged in any sport activities (n=74), followed by the results of the respondents who had longer been engaged in dancing (n=21). The system suggested appropriate sports, so it was analysed in what number of cases dancing was ranked among the first three sports suggested by the system, separately for each subsample (table 6).

Table 6. Frequencies and percentage values of the system selection

dance engagement	system selection	
	dancing not suggested among the first three ranked sports	dancing suggested among the first three ranked sports
dancers	15 (71%)	6 (29%)
non-dancers	19 (26%)	55 (74%)

Hi-square test was applied and it established the connection between system recognition and the actual engagement, i.e. non-engagement of the respondents in dancing. It is evident that out of 21 dancers, in the case of 15, i.e. in 71%, the system suggested dancing among the first three ranked sports, and out of 74 non-dancers and non-athletes, in the case of 19, i.e. in 26% of them. It is evident from table 7 which displays the results of Hi – square test that there is statistically significant connection on the level p>0,01 between the selection of dancing in the first three ranked sports by the system and the actual engagement, i.e. non-engagement of the respondents in dancing. Based on the results of the research, one can draw a conclusion that the system recognises individuals engaged in dance activities with satisfactory reliance and therefore can be purposefully used in the processes of selecting athletes for appropriate sports.

Table 7. The results of HI – square test

x^2	P	C	DF
14,90	>0,01	0,36	1

Conclusion

Being aware of the importance of taking a correct direction in sports, a new expert system for talent scouting in sport – *Talent,* has been developed at the Faculty of Kinesiology in Split and the Polytechnics Institute of the Faculty of Natural Sciences and Mathematics in Split, formed in a way to integrate into the existing system of following and evaluating anthropological characteristics of children in primary or secondary schools. Since the existing knowledge base, involving 14 different kinesiological activities, did not involve dance activities, the aim of this research was to determine quantitative contributions of certain motor abilities to the potential dance efficiency through expert knowledge. Good metrical characteristics of the expert knowledge were determined, and after the implementation of the results of research into the system, we established its fine prognostic efficiency in recognising individuals engaged in dance activities. The obtained results will be used in further improvement of the expert system with the purpose of its more reliable use in the processes of selection and detecting talents in sports.

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PRIMJENA EXPERTNOG-SUSTAVA ZA OTKRIVANJE TALENATA U PLESU

Sažetak

Selekcija u sportu često se provodi nesustavno, bez jasnih kriterija, na niskoj tehnološkoj i metodološkoj razini, te najčešće na osnovu subjektivnih i znanstveno neutemeljenih procjena. Iz tog razloga na Kineziološkom fakultetu u Splitu i Zavodu za politehniku Prirodoslovno-matematičkog fakulteta u Splitu, razvija se ekspertni sustav za otkrivanje talenata u sportu – TALENT, koncipiran tako da se može integrirati u postojeći sustav praćenja i vrednovanja antropoloških karakteristika djece u osnovnim i srednjim školama. Kako u postojećoj bazi znanja koja sadržava 14 različitih kineziološkim aktivnosti nisu bile integrirane plesne aktivnosti, cilj je ovog istraživanja bio putem ekspertnog znanja utvrditi kvantitativne doprinose pojedinih motoričkih značajki potencijalnoj uspješnosti u plesu. Utvrđene su dobre metrijske karakteristike ekspertnog znanja, a nakon implementacije rezultata istraživanja u sustav, utvrđena je i njegova dobra prognostička valjanost u prepoznavanju osoba koje se bave plesnim aktivnostima. Dobiveni rezultati koristit će se za daljnje usavršavanje ekspertnog sustava u cilju njegove što pouzdanije primjene u procesima selekcije i detektiranja talenata u sportu.

Ključne riječi: *sustav, ples, eksperti, prepoznavanje, talent*

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