VARIABLES WHICH DISTINGUISH BETWEEN TALENTED AND LESS TALENTED PARTICIPANTS IN YOUTH SPORT - A COMPARATIVE STUDY

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Abstract:

The identification of talented youth sportsmen and sportswomen has drawn the attention of many researchers over the past two decades. A need for research on team sports has been highlighted. The aim of this comparative study is firstly to investigate the variables which distinguish between talented and less talented participants in youth sport with reference to four team sports and secondly to identify the prediction functions for each of the four team sports that can be used to identify talented sportspersons. The five studies that were used in this study that has been done over the past six years, are: 11-year-old rugby players (N=218), 16-year-old rugby players (N=84), 16-year-old soccer players (N=37), 15-year-old field hockey-players (N=52) and 12-year-old netball players (N=41). According to the results the prediction functions were developed according to those variables that distinguish best between talented and less talented players.

Key words: talent identification, rugby, soccer, field-hockey, netball

DIE TALENTIERTEN VON DEN WENIGER TALENTIERTEN TEILNEHMERN IM JUGENDSPORT UNTERSCHEIDENDE VARIABLEN – EINE VERGLEICHENDE STUDIE

Zusammensetzung:

Die Identifikation von talentierten jungen Sportlern und Sportlerinnen hat die Aufmerksamkeit der Forscher seit mehr als zwanzig Jahren erregt. Es ergab sich als notwendig, Mannschaftssport zu erforschen. Das Ziel dieser vergleichenden Studie war, vor allem, die Variablen, die die talentierten Teilnehmern im Jugendsport von denjenigen, die weniger talentiert sind, unterscheiden, zu analysieren im Bezug auf vier Mannschaftsportarten. Das zweite Ziel bestand darin, die Erwartungsfunktionen, die für die Identifikation von talentierten Sportlern verwendet werden können, für jede von den vier Mannschaftssportarten zu identifizieren. Fünf Studien, die in dieser sehchsjährigen Forschung verwendet wurden, umfassten: 11jährige Rugbyspieler (N=218), 16jährige Rugbyspieler (N=84), 16jährige Fußballspieler (N=37), 15jährige Feldhockeyspieler (N=52) und 12jährige Netball-spieler (N=41). Den Ergebnissen zufolge wurden die Erwartungsfunktionen laut denjenigen Variablen entwickelt, die am besten die talentierten von den weniger talentierten Sportlern unterscheiden.

Schlüsselwörter: Talentidentifikation, Rugby, Fußball, Feldhockey, Netball

Introduction

For the past two decades researchers have become increasingly involved in the field of talent identification. Singer et al. (1993) are of the opinion that all the methods used in the identification of talent in sport have as their aim the prediction of future achievements based on the sportperson's present abilities and the environment within which these abilities manifest themselves. Heilbrun (1966) supports the above statement: "Talent identification actually evaluates that which exists in actuality, not in possibility".

The identification of talent at a young age is supported by literature as it does have certain advantages. The talented child will receive the correct training and this is again economically

advantageous for parents and the country. Children are also guided to sports for which they are physically best suited. The search for potential champions among young participants has thus become an increasingly meaningful practice in peak sport-achievements, especially when it is generally accepted that young players want to achieve success in a certain sport. The early identification of talent can also result in better achievement because the techniques developed in young potentially talented sportspersons enable them to reach a top level of achievement when they take part in high-level competitions (Woodman. 1985).

Some researchers believe that talent is inherited and that this plays a role in achievement. Others are of the opinion that training is the principal determinant of success. The opinion of Howe et al. (1998) is that talent is important for the achievement of success in sport and that it has the following characteristics:

- it comes from the genetic structure and is parti- ally inborn;
- the effect of achievement in sport is initially not so evident. but certain early signs of achievement can be seen and these can be used by trainers;
- a base can be formed from the early signs of talent by which scientific identification or obser- vations can be done.

Ericsson and Charness (1995) believe that success in sporting achievement is primarily the result of training. In addition they believe that specific physiological hereditary characteristics can aid different achievements positively, provided that they are practised thoroughly. These researchers maintain that training is the primary determinant of success. From the literature referred to it has become clear that scientific studies in talent identification must measure up to certain basic principles.

The principles according to which research on talent identification can be done are compre- hensively described by Du Randt and Headley (1993). Consequently it suffices to conclude with the principal sections suggested by the researchers.

- The identification of talent must be an on-going process because test results are valid only for 2 to 4 years before new norms are required.
- National and regional programmes with the primary emphasis on general fitness must be encouraged.
- Research models must emphasise the following: they must be complementary to the trainer and take into consideration that requirements must be met according to age. Provision must be made for late developers to catch up, involve as many participants as possible from the co- mmunity and be of a multi-disciplinary nature.
- The battery of tests for initial selections must be simple and practical. easily administered and always scientifically based.
- Trainers and national sporting bodies must be trained and be a part of the process of talent identification.
- The conceptual model as suggested by Régnier (1987) is recommended. The Russian model (Jarven. 1981) can be put to good use.

The demands for top honours in achievement in sport which necessitate the identification for team sport have only been developed recently and are still in a developmental phase. Several studies have been conducted in an attempt to determine which variables discriminate between the performance of successful and less successful participants in youth sport (Pienaar & Spamer, 1998; Spamer, 2000; Hare, 1997; Nieuwenhuis, 2000; Baden- horst, 1998). The variables that discriminate can be used in a prediction function to identify talent.

The purpose of this study is firstly to investigate the variables which distinguish between talented and less talented participants in youth sport with reference to four team sports and secondly to identify the prediction functions for each of the four team sports that can be used to identify talented youth sportspersons.

Method

To investigate the variables that distinguish between talented and less talented participation in youth sports, the results of five studies were composed. These five studies have been conducted over the past six years in the following sports: rugby (11- and 16-year-olds), field-hockey (15-year- olds), soccer (16-year-olds) and netball (12-year- olds). Talented players were regarded to be those who were at least provincial league winners and less talented those youth players who were elected to play for their schools' third or fourth team. Initially all talented and less talented children were tested on a battery of tests.

Tendencies regarding game-specific variables, physical and motor abilities, anthropometric and psychological variables were composed (psycho- logical variables were not tested in all sports). The descriptive statistics (means, standard deviations) and significant differences are reported in tables 1-5. After composing these results stepwise discriminant analysis was used to extract a subset of variables which discriminate maximally between talented (successful) and less talented (less

successful) groups (Thomas & Nelson, 1985). Prediction functions were established which enable researchers to classify a youth sportsman/sportswoman as a potential or a non-potential player. Subsequently, a short discussion will be given of the research protocol of the five studies that are involved in this discussion. The complete methodology of the different studies can be found in the references.

Rugby (11-year-olds)

This study was done by Pienaar and Spamer (1996). The results of a number of talented (N=45) and a number of less talented (N=173) players were compared. A battery of tests consisting of 35 tests was used (see table 1 for different tests). The battery of tests was divided as follows: game-

specific: 6, physical and motor: 8 and anthropometric variables: 21. No psychological tests were included for these groups. Experience has proved that children do not really understand these variables at a young age.

Rugby (16-year-olds)

This study was done by Hare (1997). The results of a number of talented rugby players (N=43) were compared with a less talented group (N=41). A battery of tests consisting of 62 different tests was used (see table 2 or the different tests). The battery of tests was divided as follows: game-specific tests: 16, physical and motor tests: 13, anthropometric variables: 26 and psychological variables: 7.

Table 1. Descriptive statistics and the significance of rugby skills, physical and motor abilities and anthropometric variables (11-year-olds) for talented and less talented rugby players.

Variables	Talented (n = 45)		Less talented (n =173)		Statistical Significance
Rugby skills	$\bar{x}$	s	$\bar{x}$	s	p
Passing for distance (m)	12.00	2.16	9.16	1.93	0.0000*
Passing for accuracy – 7m (score)	15.80	7.04	4.09	4.79	0.0000*
Passing for accuracy – 4m (score)	4.86	2.06	3.74	2.09	0.0000*
Running and catching (n)	14.88	3.98	9.54	5.31	0.0000*
Kick for distance (m)	22.99	4.14	16.13	5.42	0.0000*
Kick-off for distance (m)	18.82	4.93	14.08	4.08	0.0000*
Motor/Physical abilities					
Sprint time (s)	7.45	0.71	8.40	0.79	0.0000*
Agility run (s)	8.94	0.74	9.79	1.04	0.0000*
500m endurance (s)	110.64	12.74	136.36	36.98	0.0000*
Sit and reach (cm)	2.71	3.69	1.82	6.84	0.01642
Flexed armhang (s)	35.63	17.63	13.59	8.73	0.0000*
Pull-ups(number)	5.06	4.40	2.76	2.78	0.0001*
Vertical jump (cm)	30.40	5.99	25.42	6.08	0.0001*
Speed endurance (% decrease)	5.38	2.50	6.70	3.40	0.0026*
Anthropometric variables					
Body mass (kg)	36.35	5.56	31.85	6.66	0.0000*
Stature (cm)	146.56	5.82	137.78	7.35	0.0000*
Triceps sk (mm)	11.42	5.12	9.74	4.70	0.2350
Subscapular sk (mm)	7.25	4.16	6.93	4.71	0.4398
Midaxillary sk (mm)	6.81	4.75	6.29	4.24	0.8221
Supraspinale sk (mm)	6.36	4.26	6.29	4.49	0.7871
Pectoralis sk (mm)	6.22	3.86	5.84	3.89	0.6425
Abdominal sk (mm)	8.66	6.53	9.00	7.21	0.8511
Front thigh sk (mm)	15.57	5.97	15.47	8.24	0.3890
Calf sk (mm)	11.35	5.44	9.81	4.12	0.3741
Fat percentage (%)	15.29	6.30	14.85	5.35	0.5794
Flexed arm girth (cm)	23.25	2.42	20.70	2.23	0.0000*
Calf girth (cm)	28.86	2.38	26.48	2.51	0.0000*
Humerus diameter (cm)	5.91	0.50	5.67	0.48	0.0001*
Femur diameter (cm)	8.95	0.50	8.13	0.62	0.0001*
Endomorphic	2.63	1.34	2.75	1.30	0.5061
Mesomorphic	4.51	0.98	4.02	0.89	0.0000*
Ectomorphic	3.64	1.43	3.42	1.26	0.2276
Upper arm correction	22.43	2.52	19.73	1.89	0.0000*
Calf correction	27.20	2.48	25.50	2.32	0.0000*
Stature/$\sqrt[3]{}$mass	44.02	1.96	43.71	1.72	0.2272

Somatotype of less talented group = 2.8-4.0-3.4; Talented group = 2.6-4.5-3.
P=≤0.05

Soccer (16-year-olds)

This study was done by Badenhorst (1998). The results of a number of talented soccer players (N=20) were compared to those of a less talented group (N=17). A battery of tests consisting of 58 tests was used (see table 3 for the different tests). The battery of tests was divided as follows: game-specific tests: 6, physical and motor tests: 12, anthropometric variables: 34 and psychological variables: 5.

Field hockey (15-year-olds)

This study was done by Nieuwenhuis (2000). The results of a number of female talented field hockey players (N=25) were compared with a less talented group (N=27). A battery of tests consisting of 43 different tests was used (see table 4) for the different tests. The battery of tests was divided as follows: game-specific tests: 9, physical and motor tests; 17, anthropometric variables:18 and psychological variables: 9.

Netball (12-year-olds)

This study was done by Karstens (2001). The results of a number of talented (N=21) and less talented (N=20) were composed. A battery of tests consisting of 28 tests was used (see table 5 for the different tests). The battery of tests was divided as follows: game-specific tests: 6, physical and motor tests: 12, anthropometric variables: 11. Experience has proved that the psychological tests are not of great value at such an early age.

Results

The descriptive statistics for the five different sports are presented in the different tables. The main characteristics of these data, for each sport, are to be briefly discussed.

Thereafter the prediction function of each sport will be presented with a brief discussion of the variables that distinguish best between talented and less talented participants.

Rugby (11-year-olds)

Of the six rugby skills (Table 1), the talented or successful group performed better in all the tests. All the differences were also significant. The results of the physical and motor abilities showed that the talented group performed better in all of the eight tests. All the differences, except for sit and reach, were significant (Table 1). Table 1 also refers to the results of the anthropmetric data. Of the 21 tests, a significant difference was found in nine of the variables. The results proved that the talented group were bigger, taller and more mesomorphic.

In conclusion, Table 1 indicates that the talented 11-year-old rugby players performed better than the less talented.

Rugby (16-year-olds)

Table 2 indicates that the talented group performed better in all the rugby specific skills. Five of these tests (ground skills, air and ground kicks, passing for distance and accuracy passing over 4m and 7m) showed significant differences between the two groups. The same tendency was found in the physical and motor abilities, except for the sit and reach test where the less talented group performed better (Table 2). Of the thirteen physical and motor tests, nine showed a significant difference. The only tests that proved not to be significant are shoulder flexibility, speed endurance, agility and sit and reach.

From the results of the anthropometric data (Table 2), significant differences were found in all twenty-four tests. This proves a definitive difference in the body composition of the talented and less talented groups.

Referring to the results of the psychological variables (Table 2), the talented group showed the best results in all the different variables. Only one variable, self-confidence, showed a significant difference.

Soccer (16-year-olds)

Of the seven game-specific skills, a significant difference was found in three of the tests, viz. goal-kicking with the dominant and non-dominant leg and accuracy with the non-dominant leg (Table 3). The talented group also performed best in all seven tests. In one of the physical and motor tests, viz. sit and reach, the less talented group performed better than the talented group. This difference is not significant (Table 3). Of the twelve physical and motor abilities tests, the talented group performed significantly better in seven tests. Of the thirty-two anthropometric variables, a significant difference was recorded in six of the tests. It proves that the two groups did not differ very much from each other. No significant difference referring to the psychological variables was found between the groups (Table 3).

Field hockey (15-year-old)

Table 4 indicates that the talented group performed better in all the game specific skills and that four of the tests also show a significant difference in performance. The results of Table 4 also show that the less talented group obtained a better result in the suppleness test for physical and motor abilities. Two tests, viz. speed over 40m

Table 2. Descriptive statistics and significance for motor and physical abilities, rugby skills, anthropometric and psychological variables (16-year-olds) between talented and less talented groups.

Variables	Talented n= 43		Less talented n= 41		Statistical Significance
Motor/physical abilities	$\bar{x}$	s	$\bar{x}$	s	p
Sit and reach (cm)	2.36	2.30	2.50	2.71	0.740
Shoulder flexibility (cm)	44.99	17.40	41.60	15.56	0.117
Vertical jump (cm)	47.16	6.11	38.95	8.68	0.000*
Speed endurance (%)	6.37	3.15	7.83	7.05	0.074
Agility (s)	13.65	0.82	14.83	1.26	0.085
Agility run (s)	7.16	0.48	7.94	0.66	0.001*
Speed (s) 15 m	1.99	0.12	2.23	0.21	0.010*
Speed (s) 45.7 m	6.61	0.34	7.03	0.82	0.029*
Back strength (kg)	101.51	3.45	74.10	29.89	0.000*
Leg strength	265.75	63.75	197.39	17.55	0.000*
Arm strength	80.10	28.42	64.80	26.50	0.000*
Grip strength - left (kg)	49.76	6.66	38.19	10.48	0.000*
Grip strength - right(kg)	52.42	6.03	39.72	10.18	0.000*
Rugby skills					
Ground skills(sec)	5.68	0.36	6.36	0.73	0.0090*
Side steps	4.46	1.35	3.39	1.44	0.0890
Air and ground kick	4.60	1.90	2.95	1.64	0.010*
Passing for distance(m)	19.95	3.27	13.87	2.87	0.0080*
Passing for accuracy (-4m)	4.23	2.36	3.24	1.75	0.0030*
Passing for accuracy (-7m)	25.69	2.57	19.95	7.08	0.0000*
Kick for distance(m)	38.02	6.56	25.96	6.56	0.4390
Kick-off for distance(m)	36.07	7.80	26.07	8.80	0.2800
Running and catching	18.74	1.63	17.70	2.21	0.0550
Anthropometric variables					
Mass (kg)	72.82	9.63	56.18	13.45	0.000*
Length (cm)	177.63	5.64	167.49	10.71	0.000*
Triceps skin-fold (mm)	12.68	5.56	9.63	5.66	0.001*
Sub-scapular skin-fold (mm)	10.99	4.41	8.59	4.92	0.002*
Midaxillary skin-fold (mm)	9.63	4.49	7.53	5.68	0.002*
Supra-spinal skin-fold (mm)	11.91	5.54	8.28	7.53	0.000*
Pectoral skin-fold (mm)	6.80	2.75	6.04	4.75	0.023*
Abdominal skin-fold (mm)	15.60	8.92	10.97	8.00	0.008*
Thigh skin-fold (mm)	15.45	5.18	13.88	6.65	0.046*
Calf skin-fold (mm)	10.95	4.44	10.66	6.12	0.026*
Flexed upper arm circumference (cm)	32.05	2.33	27.22	4.20	0.000*
Forearm circumference (cm)	27.45	1.66	24.41	2.98	0.000*
Ankle circumference (cm)	23.89	1.71	22.09	2.46	0.000*
Calf circumference (cm)	36.97	3.68	33.82	4.42	0.000*
Thigh circumference (cm)	56.02	4.36	48.66	5.95	0.000*
Humerus circumference (cm)	6.91	0.42	6.53	0.52	0.018*
Femur-circumference (cm)	9.72	0.62	9.08	0.62	0.001*
Wrist circumference (cm)	5.64	0.39	5.15	0.46	0.011*
Upper arm correction	30.78	2.03	26.26	3.90	0.000*
Calf correction	35.87	3.44	32.76	4.00	0.000*
Length-mass proportion	42.66	1.57	44.12	2.30	0.000*
Fat percentage (%)	18.77	6.44	13.97	6.41	0.000*
Muscle Mass (kg)	11.27	1.70	7.98	2.80	0.000*
Muscle percentage (%)	15.47		14.29		0.000*
Skeleton mass (kg)	20.95	2.86	17.22	3.59	0.000*
Skeleton percentage (%)	28.77		30.65		0.000*
Psychological variables					
Self-confidence	25.06	3.36	20.09	3.84	0.005*
Arousal	19.97	2.82	19.41	3.13	0.141
Attention control	21.25	2.99	19.63	3.29	0.211
Visualizing	22.00	4.19	20.07	4.62	0.113
Motivation	25.81	3.25	22.26	4.20	0.552
Positive energy	24.60	2.82	21.48	4.21	0.794
Attitude	24.37	2.97	20.58	3.82	0.265

P=≤0.05

and the Beep tests also showed a significant difference in performance. The anthropometric results of the two groups are nearly even. That is proved by the fact that a significant difference was reported in only one test, viz. the frontal thigh skin-fold. The self-evaluation questionnaire showed no

Table 3. Descriptive statistics and significance for soccer skills, and motor and physical abilities anthropometric and psychological variables (16-year-olds) between talented and less talented soccer players.

Variables	Talented (n=20)		Less Talented (n=17)		Statistical significance
Soccer skills	$\bar{x}$	s	$\bar{x}$	s	p
Goal kick-D(n)	10.10	0.73	7.94	0.51	0.026*
Goal-kick-ND(n)	7.50	0.88	4.76	0.92	0.041*
Accuracy - D (n)	7.15	0.53	5.82	0.53	0.091
Accuracy - ND(n)	4.50	0.63	2.76	0.55	0.050*
Slalom dribble (sec)	15.76	0.85	16.32	0.70	0.628
Ball control -simple	36.35	7.23	23.70	5.02	0.174
Ball control -complex	13.55	2.72	10.58	1.98	0.400
Motor/Physical abilities					
Vertical jump (cm)	38.37	1.32	32.20	1.42	0.003*
Standing long-jump(m)	2.01	0.05	1.83	0.05	0.260
Medicine-ball throw(m)	4.02	0.21	3.23	0.19	0.010*
Grip strength-left (kg)	36.90	2.11	35.52	1.72	0.627
Grip strength – right (kg)	37.20	1.91	36.55	1.89	0.814
Yo-Yo (level)	15.29	0.18	12.39	0.14	0.000*
Medley-run(level)	9.79	0.42	5.96	0.50	0.000*
Sit and reach(cm)	42.74	1.29	42.94	1.65	0.925
Speed 10m(sec)	2.74	0.04	3.08	0.06	0.000*
Speed 30m (sec)	4.86	0.08	5.53	0.13	0.057
Agility – 505(sec)	2.07	0.05	2.21	0.03	0.000*
Illinois Agility test(sec)	18.17	0.15	20.70	0.38	0.000*
Anthropometric variables					
Mass (kg)	52.57	9.17	51.76	8.38	0.782
Length (cm)	165.5	7.70	162.70	8.42	0.293
Triceps-sf(mm)	8.45	2.68	7.47	2.15	0.235
Sub-scapular sf(mm)	7.95	1.53	6.58	1.69	0.015*
Biceps-sf(mm)	4.07	1.05	3.88	0.85	0.551
Iliumrand-sf(mm)	5.77	2.94	5.00	1.00	0.309
Super-spinal sf(mm)	5.87	1.79	5.00	1.76	0.45
Abdominal sf(mm)	10.40	4.47	8.29	3.21	0.115
Thigh sf(mm)	12.30	4.24	12.76	4.64	0.752
Calf sf(mm)	7.85	2.49	8.29	2.71	0.607
Troganterion length (cm)	89.86	4.84	85.61	6.33	0.027*
Tibia length (cm)	49.20	2.88	48.44	4.96	0.564
Arm circumference(cm)	26.50	2.63	25.82	1.71	0.371
Forearm circumference (cm)	23.67	1.87	23.41	1.47	0.643
Chest circumference (cm)	77.50	5.85	75.41	3.62	0.210
Abdomen circumference (cm)	67.25	4.75	66.64	3.20	0.660
Hip circumference (cm)	83.52	5.67	85.05	4.08	0.360
Thigh circumference (cm)	49.22	4.19	45.97	2.45	0.008*
Calf circumference (cm)	32.10	2.47	32.17	1.75	0.916
Ankle circumference (cm)	20.52	1.64	21.14	1.32	0.218
Biachromial cf(cm)	35.70	2.45	35.50	2.69	0.578
Bi-iliocrystals cf(cm)	23.74	1.40	21.60	1.43	0.000*
Humerus-cf(cm)	6.47	0.45	6.48	0.36	0.894
Femur-cf(cm)	9.29	0.56	9.25	0.41	0.492
Ankle-cf(cm)	6.85	0.59	6.98	0.68	0.531
Sum of six skin-folds	52.82	14.16	48.41	13.67	0.344
Sum of four skin-folds	22.27	5.12	19.05	4.70	
Ectomorphic component	3.52	1.22.	3.95	1.25	0.294
Mesomorphic component	4.07	1.05	3.69	0.90	0.244
Endomorphic component	2.17	0.71	2.59	0.69	0.079
Corrective arm circumference	25.65	2.49	25.07	1.63	0.418
Corrective calf circumference	31.31	2.35	31.34	1.66	0.963
Muscle mass	30.73	6.56	27.07	3.81	0.033*
Muscle percentage	58.23	3.56	52.76	5.91	0.037*
Psychological variables					
Extrinsic motivation	10.00	2.69	10.24	1.82	0.762
Intrinsic motivation	12.65	2.81	12.06	1.52	0.413
Cognitive anxiety	22.40	2.54	21.00	4.66	0.255
Somatic anxiety	19.15	3.23	18.23	4.46	0.475
Self-confidence	25.33	4.18	25.59	5.79	0.973

D = dominant
ND = non-dominant

Table 4. *Descriptive statistics and significance for hockey skills, motor and physical abilities, anthropometric and psychological variables (15-year-olds) between talented and less talented hockey players.*

Variables	Talented (n=25)		Less talented (n=27)		Statistical significance
Hockey skills	$\bar{x}$	s	$\bar{x}$	s	p
Mobility (Illinois Agility) sec	25.89	3.37	29.89	5.03	0.0014*
Metre measuring stick	77.28	10.10	47.93	8.67	0.1619
Push (from the right foot)	0.50	1.06	0.44	0.80	0.8929
Push (for accuracy)	1.72	1.86	0.93	1.14	0.0721*
Strike (of rolling ball)	2.52	1.58	2.15	1.66	0.3970
Tap shot	2.68	1.70	1.30	1.14	0.0012*
Reversed stick shot	2.28	1.59	1.70	1.61	0.2337
Slalom (sec)	40.06	6.76	46.00	8.27	0.0045*
Drive shot for distance and accuracy	1.00	0.91	0.63	0.69	0.5927
Motor/Physical Abilities					
Beep	6.40	1.55	5.19	1.18	0.0025*
Sargent-jump (cm)	30.80	5.85	28.98	4.77	0.2306
Stomach sit-ups	48.40	9.43	44.44	8.92	0.1081
Suppleness (mm)	46.02	5.01	46.34	5.61	0.9310
Speed 40m (sec)	6.51	0.33	6.86	0.44	0.0020*
Nimbleness-left (sec)	2.80	0.15	2.88	0.26	0.1520
Nimbleness –right (sec)	2.82	0.17	2.90	0.22	0.1276
Anthropometric variables					
Weight (kg)	56.06	6.83	56.76	9.22	0.9265
Length (cm)	163.26	5.47	162.72	5.37	0.6277
Arm spread (cm)	164.16	6.24	163.67	5.84	0.7672
Triceps sf (mm)	16.89	5.94	17.78	4.95	0.6019
Sub-scapular sf (mm)	13.55	4.94	14.22	5.51	0.6255
Supra-spinal sf (mm)	20.25	8.22	22.00	9.25	0.5324
Abdominal sf (mm)	16.08	6.45	18.11	7.84	0.3585
Frontal thigh sf (mm)	27.32	12.88	35.17	12.33	0.0286*
Medial calf sf (mm)	18.03	8.76	22.11	8.75	0.1341
Circumference in cm					
Arm (bent and flexed)	25.88	2.27	25.59	2.47	0.5542
Thigh – (cm)	50.72	4.51	51.02	4.72	0.9987
Calf (maximum) – (mm)	33.44	2.29	34.17	3.03	0.4389
Humerus diameter (cm)	6.44	0.29	6.40	0.30	0.5561
Wrist diameter (cm)	5.30	0.21	5.40	0.25	0.1332
Femur diameter (cm)	9.17	0.38	9.16	0.47	0.7635
Ankle diameter (cm)	6.82	0.28	6.88	0.41	0.6179

Psychological variables CSAI-2-					
Cognitive	18.05	4.20	17.18	4.93	0.5355
Somatic	18.45	5.13	16.73	4.84	0.2575
Self-concept	25.59	4.74	25.27	4.12	0.8133
AMSSE- variables					
MS	17.24	3.60	20.22	4.72	0.0128*
MF	46.05	6.69	44.22	5.88	0.3299
MST	13.29	2.76	15.37	3.85	0.0289*
MFT	27.24	3.73	26.63	4.05	0.5935
MSC	13.10	2.76	15.81	3.78	0.0045*
MFC	33.90	5.26	31.93	4.35	0.1672

significant differences between the talented and less talented groups, but when the achievement motivation scale for sporting environments was applied to these two groups, significant differences were reported with three tests (Table 4).

Netball (12-year-olds)

Of the six game-specific skills the talented group performed better in all the tests and significantly better in two tests, viz. passing to the right and catch and throw (Table 5). In total, twelve physical and motor ability tests were conducted on the players and the talented group performed significantly better in five of the tests viz. speed, agility run, shoulder strength, jumps and foot-eye co-ordination (left). The anthropometric data shows that the talented and less talented group were very even. The only significant difference was found in length (talented group: $(\bar{X}) = 158.3$ cm; less talented: $(\bar{X}) = 154.3$). From a summary of

Table 5. Descriptive statistics and significance for motor and physical abilities, netball skills, and anthopometric variables (12-year-olds) between talented and less talented netball players.

Variables	Talented (n=22)		Less talented (n=21)		Statistical Significance
Motor /physical abilities	$\bar{x}$	s	$\bar{x}$	s	p
Speed (sec)	2.240	1.79	2.550	2.56	0.0133*
Agility run (sec)	5.91	0.65	6.28	0.46	0.0406*
Sit and reach (cm)	6.10	5.01	5.76	3.99	0.8133
Shoulder flexibility (cm)	80.85	20.59	90.29	22.50	0.1689
Shoulder strength(m)	3.66	5.04	3.19	4.67	0.0031*
Balance jumps (sec)	5.05	0.75	5.15	0.83	0.6793
Vertical Jumps(cm)	29.60	3.44	25.05	4.93	0.0015*
Hand-eye right (m/sec)	4.47	0.67	4.90	0.66	0.0428
Hand-eye left (m/sec)	4.70	0.54	4.97	0.66	0.1580
Foot-eye right (m/sec)	5.76	0.81	6.29	0.98	0.0654
Foot-eye left (m/sec)	5.56	0.97	3.38	0.97	0.0101*
Speed endurance (sec)	5.91	3.26	6.00	2.04	0.9172
Netball skills					
Pass 2 (n)	7.30	2.52	6.48	1.72	0.2317
Pass right (n)	6.80	1.91	5.33	1.91	0.0184*
Pass left (n)	3.85	2.39	2.48	2.18	0.0624
Dribble right (n)	7.60	1.73	6.48	1.89	0.0537
Dribble left (n)	5.85	1.73	4.86	1.71	0.0720
Catch-throw (n)	34.55	5.31	29.29	3.24	0.0006*
Mass (kg)	50.2	10.8	46.6	6.6	0.2127
Length	158.3	6.20	154.39	5.1	0.0337*
Anthropometric variables					
Triceps sf(mm)	13.95	5.87	12.76	4.35	0.4683
Sub-scapular sf(mm)	12.03	8.02	11.09	4.89	0.6591
Upper-arm circumference (cm)	25.97	6.55	23.67	2.17	0.1481
Forearm circumference (cm)	22.12	2.25	21.50	1.58	0.3163
Thigh circumference (cm)	48.18	8.48	48.35	4.67	0.9349
Humerus diameter (cm)	6.06	0.38	6.05	0.28	0.8685
Femur diameter (cm)	8.91	0.45	8.73	0.41	0.1978
Shoulder circumference cm)	38.73	2.06	38.12	2.07	0.3493

n = number

tables 1-5 it can be said that the biggest differences between the talented and less talented groups for all five sports, were recorded in game-specific and physical and motor abilities. In both components the talented groups performed better. Fewer differences were recorded in anthropometric data. Skill, with its supporting aspects like co-ordination, balance, speed, power and flexibility, seems to be more important for talented youth sportsmen and sportswomen, in comparison to anthropometric variables.

The next step in the process of identifying variables which distinguish between talented and less talented participants in youth sport is to develop prediction functions for the different sports. That was done by using stepwise discriminant analysis (Thomas & Nelson, 1990). According to this process the following prediction functions were established for the different sports.

Predicition function for 11-year-old rugby players (Pienaar & Spamer, 1996)

Potential player = − 1093.005 − 0.5402 (passing accuracy - 7m) 22.7710 (sprinting time + 0.2550 (flexed armhang) − 0.1828 (vertical jump) + 23.8231 (femur width) + 17.0499 (arm correction) + 0.9681 (calf correction) + 31.6947 (length / weight ratio).

Non-potential player = − 1042.091 − 0.7907 / (passing accuracy - 7m) + 24.0101 (sprint time) + 0.0961 (flexed armhang) − 0.0840 (vertical jump) + 21.5277 (femur width) + 15.3119 (arm correction) + 1.3784 (calf correction) + 31.1805 (length/weight ratio).

Predicition function for 16-year-old rugby players (Hare, 1997)

Potential player = – 2.593 – 0.7115 (passing for distance) + 1.05876 (kicking distance) – 4.98133 (agility) + 40.02184 (upper leg girth) – 0.18003 (shoulder suppleness) – 15.8749 (wrist diameter) + 9.33172 (ground skills) + 72.69555 (stature / mass ratio) – 2.93923 (arousal) – 2.72406 (ankle girth) + 50.88478 (speed 45.7m) – 8.02972 (zig zag run) – 0.70641 (arm power) + 5.94519 (catching and running) – 29.27119 (muscle mass) + 8.47379 (air and ground kick).

Non-potential player = – 2.520 - 0.86571 (passing for distance) + 0.71997 (kicking distance) – 3.51379 (agility) + 38.48890 (upper leg girth) – 0.28589 (shoulder suppleness) – 8.94983 (wrist diameter) + 13.39695 (ground skills) + 70.94459 (stature / mass ratio) – 2.29854 (arousal) – 0.32714 (ankle girth) + 46.80686 (speed - 45.7m) – 6.04848 (agility run) – 0.62211 (arm power) + 5.19630 (catching and running) – 31.12557 (muscle mass) + 7.57275 (air and ground kick).

Predicition function for 16-year-old hockey players (Nieuwenhuis, 2000)

Potential player = – 704.323 – 1.235 (agility) + 36.671 - (speed - 40m) + 87.653 (humerus diameter) + 9.068 (approach - success in competition) 2.120 (hitting of the ball) – 4.862 (approach-success) + 2.646 (suppleness) + 50.571 (femur diameter).

Non-potential player = – 704.091 – 700 (agility) + 42.494 (40m speed) + 80.277 (humerus) + 10.979 (approach-success) + 2.846 (suppleness) + 48.592 (femur diameter).

Classification function for 16-year-old soccer players (Badenhorst, 1998)

Potential player = – 624.813 + 21.865 (yo-yo tests) + 13.660 (Illionois - Agility test) – 1,251 (goal kicking - non dominant) + 0,221 (complex ball control) + 3.754 (accuracy - dominant) + 19.440 (speed - 30m) + 12.677 (correction-arm circum-ference) – 7.144 (muscle mass) + 14.629 (correction – calf circumference) – 0.257 (add of six skin folds).

Non-potential player = 648.04 + 12.936 (yo-yo tests) + 15.772 (Illinois-Agility tests) – 2.172 (goal kicking – non dominant) + 0.494 (complex ball control) + 3.121(accuracy dominant) + 24.731 (speed - 30m) + 15.774 (correction-arm circum-ference) – 8.466 (muscle mass) +16,348 (correction-calf circumference) – 0.438 (add of six skin folds).

Prediction function for 12-year-old netball players (Karstens, 2001)

Potential player = – 309.899 + 1.1074 (catching and throwing) + 9.732 (agility run) + 0.013 (shoulder strength) – 3.765 (passing) + 5.009 (speed) + 39.620 (humerus diameter) + 20.447 (femur diameter).

Non-potential player = –320.067 + 0.768 (catching and throwing) + 12.366 (agility run) – 0.003 (shoulder strength) – 4.478 (passing) + 5.573 (speed) + 44.721 (humerus diameter) + 16.811 (femur diameter).

Conclusion

Table 6 is a summary of the different variables that were used in the different sports to distinguish best between talented and less talented players.

Table 6. Game-specific, physical and/or motor abilities, anthropometric and psychological variables that distinguish between talented and less talented players.

Components	Rugby (11 years)	Rugby (16 years)	Hockey (15 years)	Soccer (16 years)	Netball (12 years)
Game specific	1	6	2	5	3
Physical/motor	3	2	2	1	1
Anthropometric	4	7	2	4	3
Psychological	-	1	2	-	-
Total	8	16	8	10	7

The results of the 11-year-old rugby players indicated that anthropometric variables and physical and motor abilities were the best discriminators between talented and less talented players. At this young age skills are not as important as body composition. At the age of 16 the body composition of the rugby player is still important, but rugby skills are also important to perform high quality. For the hockey player the components in the prediction function are representative of game-specific, physical and motor antropometric and psychological variables. For the talented soccer player to be distinguished from the less talented, it seems that game-specific and anthropometric variables are the most important. As for 11-year-old rugby players, anthropometric variables are also a good discriminator for 12-year-old netball players. Game-specific variables are also important in netball which is not the case for young rugby players. To summarise, it seems that different variables are used to distinguish between talented and less talented players for different sports and different ages.

The different prediction functions can be used by coaches to distinguish talented sportsmen and women from the masses. The application of a prediction function is described in the different references that were used. It is recommended that more research, according to talented and less talented sportspersons, be done on more kinds of sport at different ages. The above-mentioned research concentrates on game-specific, physical and modern anthropometric and psychological variables. Other components of talent identification like decision-making, family history, etc. should also be included in a battery of tests.

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VARIJABLE KOJE RAZLIKUJU TALENTIRANE OD MANJE TALENTIRANIH MLADIH SPORTAŠA – KOMPARATIVNA STUDIJA

Sažetak

Uvod

U posljednja dva desetljeća broj istraživanja o prepoznavanju talenata u području sporta raste. Singer i suradnici (1993) smatraju da je svim metodama koje se koriste za prepoznavanje talenata u području sporta cilj predvidjeti buduća postignuća na temelju sportaševih trenutačnih sposobnosti i na temelju okolinskih uvjeta u kojima se te sposobnosti manifestiraju. Heilburn (1966) podržava sljedeću tvrdnju: "Prepoznavanje talenata ustvari vrednuje aktualno, a ne moguće."

Literatura navodi brojne prednosti prepoznavanja talenata u mlađoj dobi. Talentiranom djetetu omogućit će se primjeren trenažni program što je istodobno i ekonomska pogodnost i za roditelje i za zemlju. Djecu se također usmjerava u onaj sport koji im najbolje odgovara. Potraga za potencijalnim prvacima među mladim sportašima je gotovo svakodnevna i nezaobilazna praksa u vrhunskom sportu, osobito nakon što je postalo općenito poznato da i mladi sportaši žele postići uspjeh u određenoj sportskoj disciplini. Rano prepoznavanje talenata također može rezultirati boljim postignućima, višom razinom tehničke i taktičke pripremljenosti potencijalno nadarenoga sportaša, što mu, s druge strane, omogućuje postizanje vrhunskog rezultata kada se uključi u sustav vrhunskog natjecanja (Woodman, 1985).

Postupci za identifikaciju talentiranih sportaša za ekipne sportove tek su nedavno razvijeni i još su u fazi razvoja. Provedeno je nekoliko istraživanja u kojima se pokušalo odrediti koje varijable diskriminiraju uspješne i manje uspješne mlade sportaše (Hare, 1997; Pienaar i Spamer, 1998; Spamer, 2000; Nieuwenhuis i Badenhorst, 2000). Te se varijable mogu koristiti za identifikaciju nadarenosti i za predikciju uspješnosti budućih sportaša.

Cilj je ovog istraživanja, prije svega, istražiti varijable koje razlikuju nadarene od manje nadarenih mladih sportaša i to za četiri ekipna sporta, te utvrditi njihovu prediktivnu funkciju koja bi se mogla koristiti za prepoznavanje sportskih talenata u svakom od tih sportova.

Materijal i metode

Osmišljen je skup specifičnih igračkih (situacijskih) varijabli, varijabli za procjenu motoričkih sposobnosti te antropometrijskih i psiholoških osobina (psihološke varijable nisu uporabljene u svim sportovima) za razne ekipne sportove. Korišteni su parametri deskriptivne statistike (aritmetička sredina i standardna devijacija) te metode za utvrđivanje statističke značajnosti razlika. Na temelju dobivenih rezultata učinjena je koračna (*stepwise*) diskriminacijska analiza kako bi se ekstrahirao niz varijabli koje maksimalno razlikuju talentirane (uspješne) i manje talentirane (manje uspješne) skupine mladih sportaša (Thomas i Nelson, 1985). Utvrđena je prediktivna funkcija koja istraživačima omogućuje klasifikaciju mladih sportaša i sportašica kao potencijalno uspješnih i manje uspješnih sportaša. U nastavku slijedi kraće objašnjenje istraživačkog nacrta i postupka za pet istraživanja koja su uključena u raspravu.

Rezultati

Ragbi (jedanaestogodišnjaci)

Istraživanje su proveli Pienaar i Spamer (1996). Uspoređeni su rezultati talentiranih (N=45) i manje talentiranih (N=173) igrača. Korišten je sklop od 35 testova koji se sastojao od: 6 specifičnih situacijskih testova, 8 fizičkih i motoričkih testova te 21 antropometrijske varijable. Psihološko testiranje nije provedeno na ovoj skupini sportaša. Dokazano je da djeca te dobi ne razumiju potpuno varijable za procjenu konativnih i kognitivnih osobina.

Ragbi (šesnaestogodišnjaci)

Istraživanje je proveo Hare (1997). Rezultati talentiranih ragbi igrača (N= 43) uspoređeni su s rezultatima manje talentiranih (N=41). Korišten je sklop od 62 testa koji se sastojao od 16 specifičnih situacijskih testova, 13 fizičkih i motoričkih testova, 13 antropometrijskih varijabli i 26 psiholoških varijabli.

Nogomet (šesnaestogodišnjaci)

Istraživanje je proveo Badenhorst (1998). Uspoređeni su rezultati talentiranih (N=20) i manje talentiranih sportaša (N=17). Korišten je sklop od 58 testova koji je činilo 6 specifičnih situacijskih testova, 12 motoričkih testova, 34 antropometrijske varijable i 5 psiholoških varijabli.

Hokej na travi (petnaestogodišnjakinje)

Istraživanje je proveo Nieuwenhuis (2000). Rezultati talentiranih hokejašica na travi (N=25) uspoređeni su s rezultatima manje talentirane grupe (N=27). Korišten je sklop od 43 različita

testa, sastavljen od 9 specifičnih situacijskih testova, 17 motoričkih testova, 18 antropometrijskih i 9 psiholoških varijabli.

Netball (dvanaestogodišnjaci)

Istraživanje je proveo Karstens (2001). Uspoređeni su rezultati talentiranih (N=21) i manje talentiranih (N=20) sportaša. Korišten je sklop od 28 testova: 6 specifičnih situacijskih testova, 12 fizičkih i motoričkih testova, 11 antropometrijskih varijabli. Iskustvo je pokazalo da psihološki testovi nisu osobito pogodni za tu dob.

Rezultati 11-godišnjih ragbijaša pokazuju da su antropometrijske varijable te motoričke sposobnosti najbolji diskriminatori između talentiranih i manje talentiranih sportaša. U tako mladoj dobi vještine nisu toliko važne kao tjelesna građa.

U dobi od 16 godina, pak, tjelesna je građa ragbijaša još uvijek važna, ali su specifične ragbijaške vještine također važne za visoko kvalitetnu izvedbu i rezultate.

Za hokejašice na travi komponente prediktivne funkcije čine za igru specifične situacijske varijable, varijable motoričkih sposobnosti te psihološke varijable.

Pokazalo se da su za razlikovanje talentiranih od manje talentiranih nogometaša za igru specifične situacijske varijable, kao i antropometrijske varijable najvažnije. Kao i za jedanaestogodišnjake, i ovdje su antropometrijske varijable također dobar diskriminator.

Za *netball* se pokazalo, kao i kod mladih ragbijaša, da su u dobi od 12 godina također važne situacijske varijable.

Zaključak

Čini se kako različite varijable razlikuju talentirane od manje talentiranih sportaša različite dobi u različitim sportovima. Treneri se mogu koristiti različitim prediktivnim funkcijama kako bi u populaciji vršnjaka prepoznali (identificirali) talentirane mlade sportaše i sportašice. Prediktivne funkcije opisane su u odnosu na različite primjene. Preporučuju se daljnja istraživanja i to u području različitih sportova i na sportašima različite dobi. Navedena istraživanja trebala bi se koncentrirati na za sport specifične situacijske te na suvremeno koncipirane antropometrijske i psihološke varijable. Ostali faktori identifikacije talenata, kao što su sposobnost odlučivanja, obiteljska povijest i slično, također bi trebali biti uključeni u sklopove testova.

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