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Fundamental motor skills in identifying differences in performance level between students and athletes ages 10-12 years

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Abstract

Fundamental motor skills that are developed during childhood are considered to be the building blocks for sport-specific movement patterns and are typically the focus of physical development programs for children, to develop gross motor skills from early childhood. Specifically, it has been shown that within a sport-specific environment, fundamental motor skills can separate children with potential for sport success. This is because gross motor skills underpin the development of the more specific sport skills that will likely be required for future sport success.
The study aimed to assess fundamental motor skills in identifying differences in performance levels between students and athletes aged 10-12 years living in Albania, and further examine the indicators obtained in order to study how these two groups of children compare to each other. The data gathered through this study are indispensable in revealing the level of obesity, physical and technical capacities and identifying talented athletes. 641 students coming from the primary and secondary school systems and 410 athletes were subjected to standard anthropometric measurements (weight/height/BMI), standard physical fitness tests (push-up, abdominal press high jump, long jump, horizontal stretch, 30m dash, shuttle run 112 m) and technical measurements (Bridling, passing boll, Moving in defence and shooting) Based on BMI standards for students and athletes of this age group, it can be observed that athletes demonstrate a growth in body mass, even the physical fitness and technical indicators tested speak for a bigger development of athletes . Therefore, testing procedures should be expanded from only subjective measures of players' abilities and objective tests of specific conditioning capacities to the objective assessments of technical capacities connected to the motor skills of individuals. This could then be used to select children at an age when the goal is to identify those talented in basketball.

Keywords: motor development, physical abilities, students, youth athletes, basketball, talent identification

Intoduction

Traditionally, the process of identifying talents has been based upon observing an athlete in a trial game or in training session environment, where the players want to impress coaches (Larkin, O'Connor, 2017). In this process, coaches tend to rely on their intuitive knowledge based on socially constructed "images" of the perfect player and talent, which they subjectively find logical (Meylan, Cronin, Oliver, Hughes, 2010; Bergeron, et al., 2015). This implies that the selection process depends on personal taste, knowledge, and expertise. However, research has revealed that this approach can lead to repetitive

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misjudgments in talent identification. Fundamental motor skills (FMS) that are developed during childhood are considered to be the building blocks for sport-specific movement patterns and are typically the focus of physical development programs for children, to develop gross motor skills from early childhood. Specifically, it has been shown that within a sport-specific environment, fundamental motor skills can separate children with a potential for success in sport. This is because gross motor skills underpin the development of the more specific sport skills that will likely be required for future sport success (Beamer, Cote, Ericsson, 1999; Oliver, Lloyd, Meyers, 2011). Some authors even suggest that, unless fundamental motor skills are developed during childhood, future sport-specific success at high levels may not be attainable (Moore, Collins, Burwitz, 1998; Lloyd, et al., 2016; Moharram, 2013). Based on this reasoning, it seems rational to implement fundamental motor skill tests in the selection process of very young athletes with the aim of identifying at-risk players who might need to further develop their fundamental motor skills. Given the importance of fundamental motor skills and the scarcity of information about the objectiveness of the selection process in very young age groups (i.e., 9 to 10 years old), it would be of a great value to address this gap in the literature. In addition, little is known about what coaches perceive as important qualities for a player at this very young age. To the best of our knowledge, no previous study has simultaneously observed the FMSs, specific conditioning capacities (SCCs) and specific sport skills of basketball players at a very young age and also examined the differences between the performance levels of very young basketball players in these batteries of tests. Therefore, this study aimed to investigate whether FMSs, sports SCCs and specific sport skills could determine the differences in performance levels between students and basketball players, within a sport-specific environment; and thus identify children with strong potential for sport success. We found that junior athletes who were trained three times a week for 60 minutes longer than their peers appeared superior in all FMS and Sport specific skills tests, indicating that the coach's perception of their competence would be based largely on their technical skills.

Methodology

The research surveyed six hundred forty-one students and 410 basketball players between the ages of 10-12, which consists of different cities located in urban and rural areas. Respectively, 505 of the participants were female and 546 were male. The instrument used for the survey was a questionnaire containing different open and multiply choice questions.

Based on Euro fit-Test Battery Indicator, this study is focused on the measurement of six sub indicators that cover flexibility, speed, agility, endurance and strength. Euro fit Test Battery is a standardized test battery designed by the Council of Europe (1983)[3] for school children, applied in many European schools since 1988. It is designed in a way that allows tests to be carried out within 35-40 minutes, using very simple equipment. Tests items used for this study are: 1. Height (L), 2. Weight (W), 3. Body Mass Index (BMI) 4. Sit-Ups –Abdominals (SUP), 5. Sit and Reach (SAR), 6. Standing Broad Jump (SBJ).

[3] “Testing physical fitness - EUROFIT experimental battery: provisional handbook,” Council of Europe, Strasbourg, 1983.

For the purpose of this study, in addition to the six tests mentioned above, a number of alternative tests were also used: 7. Vertical jump (VJ), 8. Push-ups (PU), 9. 30-Meter Speed Test (30mST), 10. Shuttle Run 112 meters (SHR), 11. Lower limb, 12. Upper limb, 13. Chest measurement-pause, 14. Chest measurement – respire difference, 15. Throwing compact ball, 16. Moving in defense, 17. Dribbles between stands, 18. Dribbles straight, 19. Passing, 20. Loops made by dribbling 21. Shooting-while-moving time, 22. Shooting-while-moving number, 23. Shooting-while-moving coefficient, 24. Shooting from place, 25. Free throws. The tests mentioned above are estimated based on anthropometry parameters, the level of obesity, physical fitness, technical preparation and identification of talented athletes.

Weight was assessed to the nearest 0.1 kg using an electronic scale (TANITA Segmental Body Composition BC-545N). To measure the heights of the students, a Harpenden portable Stadiometer with 1 cm sensitivity was used. Body Mass Index was calculated as kg/m.

The Standing Broad Jump (SBJ) and Vertical Jump Tests are estimated based on the implementation of an application, used to determine the heights of the student's jumps (Fernández, Glaister, Lockey, 2015).

Data analysis

Data were codified and statistical analysis was computed through SPSS 22 Program in the whole population and subgroups. Basic descriptive statistics such as percentages, means, and standard deviation for physical and motor values were calculated to describe the sample used in the study. Tests for the difference of two proportions were applied to control a significant difference in the observed percentages in the population of the sample and its subgroups. A p-value (< 0.005) was determined as significant. The observed data are considered with normal distribution. The relative stability of the sample enabled the estimation of 95% confidence intervals.

Based on the standard methodology of BMI, determined by AASHP (American Public Health Agency), when the students have a BMI value (in percentage) above the standard norm of 25 units are considered overweight. Otherwise when the students have a BMI value (in percentage) above the standard norm of 30 unit are considered obese.

According to the results, some substantial differences ($p<0,05$) between the players, regarding to height (cm), weight (kg), flexibility (cm), standing broad jumping and vertical jump (cm), 112-meter-shuttle run test (ml/kg/min), 30-meter-sprint were observed. From the other side, no crucial difference ($p>0,05$) was found regarding parameters such as BMI (%), sit-ups and push-up.[4]

Results

IBM SPSS Statistics 22 software was used to perform statistical analyses. The sampling for this research consisted of 1051 students (n=1051), (641 students and 410 athlete students). Five hundred and five were female of whom 165 were 10 years old, 206 were 11 years old and 134 were 12 years old. The remaining 546 were male, of whom 165 were

[4] (sit-ups and push-up are measured with the number of push – up and sit - up executed in (30 s)

10 years old, 220 were 11 years old and 161 were 12 years old. Tables 1-4 demonstrate the results achieved.

Table 1: Age groups & gender of participants

				AGE							
				10		11		12		Total	
				Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %
Student/Athletes	Athlete	Gender	Boy	53	26.1	76	37.4	74	36.5	203	100
			Girl	57	27.5	80	38.6	70	33.8	207	100
	Student	Gender	Boy	112	32.7	144	42.0	87	25.4	343	100
			Girl	108	36.2	126	42.3	64	21.5	298	100
	Total	Gender	Boy	165	30.2	220	40.3	161	29.5	546	100
			Girl	165	32.7	206	40.8	134	26.5	505	100

Source: Author's own calculations

Table 2: Case Summaries – BMI & Lower Limb & Pull-up & Chest Measurement Test[5]

Case Summaries – BMI & Lower Limb & Pull-up & Chest Measurement Test									
	Athlete			Student			Total		
	N	Mean	Std. Dev	N	Mean	Std. Dev	N	Mean	Std. Dev
BMI Test 1	410	17.76	3.446	641	17.80	2.93	1051	17.78	3.25
BMI Test 2	410	18.94	3.529	641	19.36	2.59	1051	19.11	3.20
Lower limb Test 1	410	90.24	3.44	641	85.69	7.217	1051	87.47	6.43
Lower limb Test 2	410	91.22	3.59	641	86.28	7.891	1051	88.21	6.99
Upper limb Test 1	410	68.32	4.73	641	61.56	8.703	1051	64.20	8.11
Upper limb Test 2	410	69.37	5.97	641	70.35	205.12	1051	69.97	160.19
Pull-up Test 1	410	15.38	4.87	641	9.41	5.68	1051	11.74	6.11
Pull-up Test 2	410	16.59	4.82	640	10.12	5.36	1050	12.64	6.05
Chest measurement pause Test 1	410	77.72	8.26	641	77.00	8.23	1051	77.28	8.25
Chest measurement pause Test 2	410	78.37	9.60	641	77.91	7.80	1051	78.09	8.55
Chest measurement-respire difference Test 1	410	82.05	8.13	641	81.07	7.72	1051	81.46	7.89
Chest measurement–respire difference Test 2	410	82.96	8.17	641	81.89	7.92	1051	82.31	8.03

Source: Author's own calculations

[5] *Note:* Descriptive statistics results (Mean ± Standard Deviation) and comparison between the two measurements for the variables: BMI, Lower limb, Upper limb, Pull-up, and Chest measurement are presented in the following table.

Table 3: Case Summaries - Test 1 & Test 2[6]

	Athlete			Student			Total		
	N	Mean	Std. Dev	N	Mean	Std. Dev	N	Mean	Std. Dev
Sit and Reach Test 1	410	18.36	5.18	641	11.32	7.97	1051	14.06	7.82
Sit and Reach Test 2	410	19.41	5.10	641	12.29	7.53	1051	15.07	7.54
msprint30 Test 1	410	5.73	.54	641	6.09	2.04	1051	5.95	1.66
msprint30 Test 2	409	5.68	.58	640	6.00	2.07	1049	5.87	1.67
Shuttle run112m Test 1	410	21.44	1.36	641	32.70	146.28	1051	28.31	114.34
Shuttle run 112m Test 2	410	21.24	1.56	641	26.08	84.73	1051	24.20	66.21
Height Jump Test 1	410	27.21	3.43	641	22.97	5.78	1051	24.63	5.41
Height Jump Test 2	410	28.29	3.71	641	23.85	5.61	1051	25.58	5.41
Long Jump Test 1	410	158.72	7.33	641	141.76	17.63	1051	148.38	16.70
Long Jump Test 2	410	160.93	10.35	641	143.36	18.78	1051	150.21	18.18
Throwing compact ball Test 1	410	337.87	33.84	641	281.47	59.07	1051	303.48	57.71
Throwing compact ball Test 2	410	341.28	35.60	641	286.49	142.49	1051	307.86	116.55
Moving in defence Test 1	410	19.71	1.83	641	27.55	122.14	1051	24.49	95.45
Moving in defence Test 2	410	19.64	1.83	640	26.18	120.08	1050	20.33	1.85
Abdominal press Test 1	410	19.02	4.33	641	11.31	5.420	1051	14.32	6.27
Abdominal press Test 2	410	20.14	4.23	641	12.60	7.975	1051	15.55	7.70
Dribble between stands Test 1	410	19.88	1.75	641	22.37	3.362	1051	21.40	3.09
Dribble between stands Test 2	410	19.78	1.84	640	22.43	3.373	1050	22.48	3.391
Dribble straight Test 1	410	16.85	2.75	641	16.95	2.25	1051	16.89	2.57
Dribble straight Test 2	410	16.83	2.85	641	16.85	2.16	1051	16.84	2.60
Passing Test 1	410	19.69	4.57	641	4.90	3.62	1051	10.67	8.26
Passing Test 2	410	20.83	4.43	641	6.11	3.23	1051	11.85	8.10
Loops made by dribble Test 1	410	21.58	2.85	641	27.84	3.32	1051	25.40	4.38
Loops made by dribble Test 2	410	21.49	2.80	641	27.86	4.10	1051	25.37	4.79
Shooting while moving time Test 1	410	22.87	3.92	641	25.51	5.24	1051	24.48	4.94
Shooting while moving time Test 2	410	22.51	2.65	639	25.74	7.90	1049	24.48	6.57
Shooting while moving number Test 1	410	13.20	2.78	641	9.28	2.83	1051	10.81	3.40
Shooting while moving number Test 2	410	14.33	2.68	641	9.71	2.67	1051	11.51	3.50
Shooting while moving coefficient Test 1	410	5.39	1.96	641	2.86	1.98	1051	3.84	2.33
Shooting while moving coefficient Test 2	410	6.49	1.86	639	3.62	1.70	1049	4.74	2.25
Shooting from place Test 1	410	4.59	1.45	641	2.41	1.84	1051	3.26	2.00
Shooting from place Test 2	410	5.74	1.39	641	3.26	1.64	1051	4.23	1.97
Free throws Test 1	410	5.52	1.67	641	2.36	1.80	1051	3.59	2.33
Free throws Test 2	410	6.55	1.64	582	3.03	1.94	992	4.49	2.52

Source: Author's own calculations

[6] Descriptive statistics results (Mean ± Standard Deviation) and comparison between the two measurements for tests: Sit and Reach, sprint 30 m, shuttle run, long jump, etc. are presented in the following table.

Table 4: Paired Samples Test

V		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	BMITest1 - BMITest2	-1.333	2.118	.065	-1.461	-1.205	-20.401	1050	.000
Pair 2	LowerlimbTest1 - LowerlimbTest2	-.739	3.035	.094	-.923	-.556	-7.896	1050	.000
Pair 3	UpperlimbTest1 - UpperlimbTest2	-5.769	160.396	4.948	-15.477	3.939	-1.166	1050	.244
Pair 4	Pull-upTest1 – Pull-upTest2	-.901	1.279	.039	-.978	-.824	-22.828	1049	.000
Pair 5	Chestmeasurement-pauseTest1 - Chestmeasurement-pauseTest2	-.803	4.243	.131	-1.060	-.546	-6.136	1050	.000
Pair 6	Chestmeasur-respirdifferenceTest1 - Chestmeasur-respirdifferenceTest2	-.853	2.001	.062	-.974	-.731	-13.815	1050	.000

Source: Author's own calculations

Table 1 illustrates the distribution of units according to age and gender for two sub groups athletes and students. The tests for the difference of two proportions gave significant difference within the variable age and status. The evidence did show the variable of gender to be significantly associated with BMI.

Table 2 crossed four sub indicators (Lower limb, Upper limb, Pull-up, and Chest measurement) through the measure of BMI. The percentages of BMI according to the two tests is lower than the standard norm of (25) for both of students and athletes, with a slightly difference between them (BMI TEST 1/TEST 2 for Athletes < BMI TEST 1/TEST 2 for students - 17.76/18.94 < 17.80/19.36).

Data obtained from the estimation of other sub indicators such as Sit and Reach, sprint 30 m, shuttle run, long jump, etc (Table 3) demonstrated a significant result ($P<0.05$) , concluding that there were differences in all the components included in the test between students and athletes. It is clearly noted the advantage of athletes in technical elements, and the enhancement of their skills from the first test to the second test. A significant association was observed between the frequency of training, exercise time and the performance of athletes.

Table 4 illustrates the Paired Samples t Test which consists on comparing two means of different indicators and sub indicators mentioned and computed in table 2 and 3. The Paired Samples t Test is a parametric test and its purpose is to determine whether there is statistical evidence that the mean difference between paired observations on a particular outcome is significantly different from zero[7]. There is six pair tests computed in the table, according to six indices.

(i) Data regarding BMI Pair tests obtained in table 4 demonstrates:

[7] Paired samples t test, Kent State University

- Positive correlation between BMI Test 1 and BMI Test 2 scores ($p < 0.001$);
- There was a significant average difference BMITest1 - BMITest2 scores ($t_{1050} = 20.401$, $p < 0.001$);
- On average, MBI Test 1 scores were 1.3 points lower than BMI Test 2 scores (95% CI [-1.461, -1.205]).

Data regarding Pair 2 demonstrates:

- There is an average difference LowerlimbTest1 – LowerlimbTest2 scores ($t_{1050} = 7.896$, $p < 0.001$);
- On average, UpperlimbTest1 scores were 0.739 points lower than UpperlimbTest2 scores (95% CI [-0.923, -0.556]).

Information about Pair 4, 5, 6 set out the same tendency accompanied with a significant association among all the variables which were observed, ($p<0,001$), while the case of Pair 3 constitutes an exception. Data regarding Pair 3 demonstrates:

- There is an insignificant average difference UpperlimbTest1 – UpperlimbTest2 scores ($t_{1050} = 1.166$, $p > 0.001$);
- On average, UpperlimbTest1 scores were 5.7 points lower than UpperlimbTest2 scores (95% CI [-15.477, -3.939]).

Limitations

Results achieved in this study are characterized by their own limitations. Therefore they cannot be considered exhaustive, moreover if the purpose is focused for long term effectiveness. Other factors, not taken into consideration in this paper, may be favorable for improving the results; reported data can be influenced by different obstacles or need appropriate interventions. However, we strongly believe that this study may offer useful information and statistics data for planning better the selection and identification process of new talents.

Discussion and conclusions

The results derived this study provide an insight into the relationship between FMS competence and physical activity (training). A review by (Lubans, Morgan, Cliff, Barnett, Okely, 2010) concluded that there is a positive relationship between general motor competence and physical activity (Lubans, Morgan, Cliff, Barnett, Okely, 2010). Stodden suggested that as FMS competence increases, physical activity participation also increases, and this increased participation contributes to further FMS competence (Stodden, Goodway, Langendorfer, Roberton, Rudisill, Garcia, 2008). Seefeldt (Seefeldt, 1980) proposed a hierarchical order of motor skill development that included four levels: reflexes, fundamental motor skills, transitional motor skills, and specific sport skills. The progression through each level occurs over time as a result of growth, maturation, and experience.

Based on the findings of the present study, it can be concluded that there were differences in all the components included in the test between students and athletes but significant differences were also found between the results of the first test and those of the second test.

The results of the study clearly show the advantage of athletes in technical elements. It is also clearly highlighted the enhancement of their skills from the first test to the second test. This advantage best proves that the frequency of training and exercise time are essential to the increased and improved performance of athletes. Specifically, this study brings into light the conclusion that within a sport-specific environment, fundamental motor skills can make the difference on children with strong potential for sport success. This outcome can be explained by the fact that gross motor skills underpin the development of more specific sport skills that will likely be required for future sport success. In addition, basketball coaches are likely to consider the technical elements associated with FMS to be an essential discriminatory tool between performance levels. Thus, the integration of objective tests into evaluation of these FMS is warranted as incorrect judgments by the coach may occur. Therefore, testing procedures should only be extended by subjective measures of players' skills and objective tests of SCCs in objective assessments of technical capabilities related to the motor skills of individuals. Further this tool can be used to select children at a certain age when the goal is to identify those talented in basketball as well as those who have defective movement patterns and may need more focus in these areas to prevent poor future results.

References

Beamer, M., Cote, J., Ericsson, K.A. (1999). A comparison between international and provincial level gymnasts in their pursuit of sport expertise. Proceedings of the 10th Annual European Congress of Sport Psychology, FEPSAC, Prague, Czech Republic, 7–12 July 1999.

Bergeron, M.F., Mountjoy, M., Armstrong, N., Chia, M., Cote, J., Emery, C.A., Faigenbaum, A., Hall, G., Kriemler, S., Leglise, M., et al. (2015). International Olympic committee consensus statement on youth athletic development. Br. J. Sports Med. 49, 843–851.

Fernández C., Glaister M., Lockey R. (2015). "The validity and reliability of an iPhone app for measuring vertical jump performance," Journal of Sports Sciences, 33(15):15741579.

Larkin, P., O'Connor, D. (2017). Talent identification and recruitment in youth soccer: Recruiter's perceptions of the key attributes for player recruitment. PLoS ONE, 12, 1–15.

Lloyd, R.S., Cronin, J.B., Faigenbaum, A.D., Haff, G.G., Howard, R., Kraemer, W.J., Micheli, L.J., Myer, G.D., Oliver, J.L. (2016). National strength and conditioning association position statement on long-term athletic development. J. Strength Cond. Res. 30, 1491–1509.

Lubans, D.R., Morgan, P.J., Cliff, D.P., Barnett, L.M., & Okely, A.D. (2010). Fundamental movement skills in children and adolescents. Sports Medicine (Auckland, N.Z.), 40, 1019–1035.

Meylan, C., Cronin, J., Oliver, J., Hughes, M. (2010). Talent identification in soccer: The role of maturity status on physical, physiological and technical characteristics. Int. J. Sports Sci. Coach, 5, 571–592.

Moharram, R. (2013). Comparative Analysis of Motor Competence & Self-Perception between Lower & Higher Skilled Male Basketball Players Ages 8–11 Years. Master's Thesis, California State University, Long Beach, CA, USA.

Moore, P.M., Collins, D., Burwitz, L. (1998). The Development of Sporting Talent: An Examination of the Current Practices for Talent Development in English Sport; English Sports Council: London, UK.

Oliver, J.L.; Lloyd, R.S.; Meyers, R.W. Training elite child athletes: Promoting welfare and well-being. Strength. Cond. J. 2011, 33, 73–79.

Seefeldt, V. (1980). Developmental motor patterns: Implications for elementary school physical education. In C.H. Nadeau, W.R. Halliwell, K.M. Newell, & G.C. Roberts (Eds.), Psychology of Motor Behavior and Sport (pp. 314–323). Champaign, IL: Human Kinetics.

Stodden, D.F., Goodway, J.D., Langendorfer, S.J., Roberton, M.A., Rudisill, M.E., Garcia, C., & Garcia, L.E. (2008). A developmental perspective on the role of motor skill competence in physical activity: An emergent relationship. Quest, 60, 290–306.