Improving the Physical Education and Sport Faculty students' speed manifestation indices by means of the practical activities from the first year of study curriculum – bachelor's degree studies

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Abstract. Part of motor fitness, speed is an extremely important motor skill, which ensures the success and efficiency of the performed activities, being nevertheless dependent on the genetic component. Thus, this skill is difficult to train as compared to other motor skills. The experimental study included 31 girls and 59 boys, first year students at the Faculty of Physical Education and Sport from Galați, who were involved in the practical activities corresponding to the curriculum, comprising 7 subjects per semester and a number of 196 hours during 2015 – 2016 university year.
The difference between the averages obtained in the initial and final tests and the statistical processing of these results allowed us to determine both those speed manifestation forms for which progress is achievable and the situations in which the statistically significant progress is limited, regardless of the effort put in the activities and of the diversity of the stimuli used. The practical activities in which students were involved were varied and focused on different types of speed and its combination with other skills, the level of student involvement being high. The fact that the two groups obtained significant progress and similar correlation indices in most tests allowed us to draw some general conclusions. Nonetheless, for the studied groups, there were also some situations in which certain specific features had to be taken into account such as the sex or the level of motor skills, which influenced the final results. Students' progress in most tests highlight the optimization possibilities of the fitness level regarding speed and its combinations at a biological and chronological age for which the effort potential and the motor performance should be at an extremely high level.

Keywords: physical fitness, types of speed, sport branches, rapid motor structures

1 Introduction

Preparing specialists within the Faculty of Physical Education and Sport requires a rational combination of theoretical subjects – playing an extremely important part in understanding the domain-specific notions, in making the cause-effect connections regarding physical

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effort, in planning and coordinating training plans for different sport branches in a scientific manner – with practical activities – whose goal is to consolidate or improve known skills, to get students familiar with the specific techniques of some sport branches, which haven't been practised previously but which are useful in shaping the motor skills of future domain-specialists. In addition to these practical activities, which focus mainly on the knowledge of sports technique and tactics or on the methodical method of practising them, the physical effort that characterizes these activities also influences the students' fitness level, ensuring, by means of their variety, certain effects on the coordinative and conditional motor skills - speed, strength and resistance. (1, 7)

Since the involvement in motor activities represents a normal aspect for the students from the Faculty of Physical Education and Sport (FPES), as compared to the students from other faculties – where the intellectual effort prevails and the physical effort is performed only occasionally – we may ask the question if, for the FPES students these practical activities, in which they must participate – according to the methodology in force – can contribute to some visible progress regarding their motor potential. If in the case of strength and resistance, the domain-specific literature confirms the chance of obvious qualitative leaps, in the case of speed, most specialists are more reserved because of the large number of factors which are difficult to perfect: analyser fineness and integrity, the rapidity of the nervous inflows transmitted via motor and sensitive ways, the type of innervation at motor level, the typology of muscle fibres, which is genetically determined, the alternation of excitatory and inhibitory processes in the brain, the energy sources such as phosphocreatine or the adenosine triphosphoric acid etc.

The progress rates are lower than in the case of other motor skills and are only possible by acting on those factors that are easier to improve: improving the quality of the execution technique through superior coordination, improving muscle contraction capacity/strength, improving flexibility and concentration (3, 4, 8).

Irrespective of the form of manifestation - simple reaction speed to visual, auditory or tactile, stimuli, complex reaction or decision speed, upper or lower limb execution speed, acceleration or deceleration speed, repetition speed, uniform or non-uniform speed, coordination speed, strength or resistance speed - these are not necessarily equally well developed in an individual, and there are cases in which even for performance athletes, the very good reaction speed is not accompanied by a higher repetition rate or cases in which the very good movement speed does not correspond to a very high execution speed (2, 3, 4).

The study aims to verify whether these ideas are valid, by studying the correlation coefficients between the various tests used, specific to various forms of speed manifestation.

Speed development methodology is extremely restrictive in terms of rules to be followed in order to install the desired progress and avoid possible injuries due to short but demanding efforts and these have been taken into account during all the practical activities in which the students have been involved : high-intensity exercises with few repetitions and long breaks to allow the body to rest and avoid fatigue, adapting distances to student possibilities, scheduling efforts in the first part of the class, often in combination with coordination –an exception from this rule may be considered the speed-resistance combination, the use of only those simple and well-known skills of the students, which do not pose risks in technical execution, efforts of 3-20 seconds, depending on the form of manifestation and the combination desired to be developed, diversified exercises to avoid monotony etc. (3, 5, 6).

2 Methods

The study was carried out during 2015 – 2016 university year and included only first year students majoring in Physical Education and Sport from Galați. The study focused on the students' constant involvement during the 7 practical activities included in the curriculum (athletics, gymnastics, football, volleyball, skating, swimming, and practice in mountain tourism). Each activity was allocated a number of 28 hours, the content having a diversified approach regarding the fitness level and a definite influence on the different forms of manifestations and combinations of speed as exemplified in fig. 1. The equipment belonging to the faculty, the Research centre within the faculty and the locations, where the practical activities took place, ensured optimal conditions for each activity. The practical activities were distributed in a balanced manner during the university year, 3 on each semester, and the internship in mountain tourism was carried out after the summer exams. Therefore, favourable conditions for a constant and systematic influence of speed were ensured by means of varied and attractive methods for students, fact which excludes the monotony or the boredom that may be generated by the constant use of the same methods.

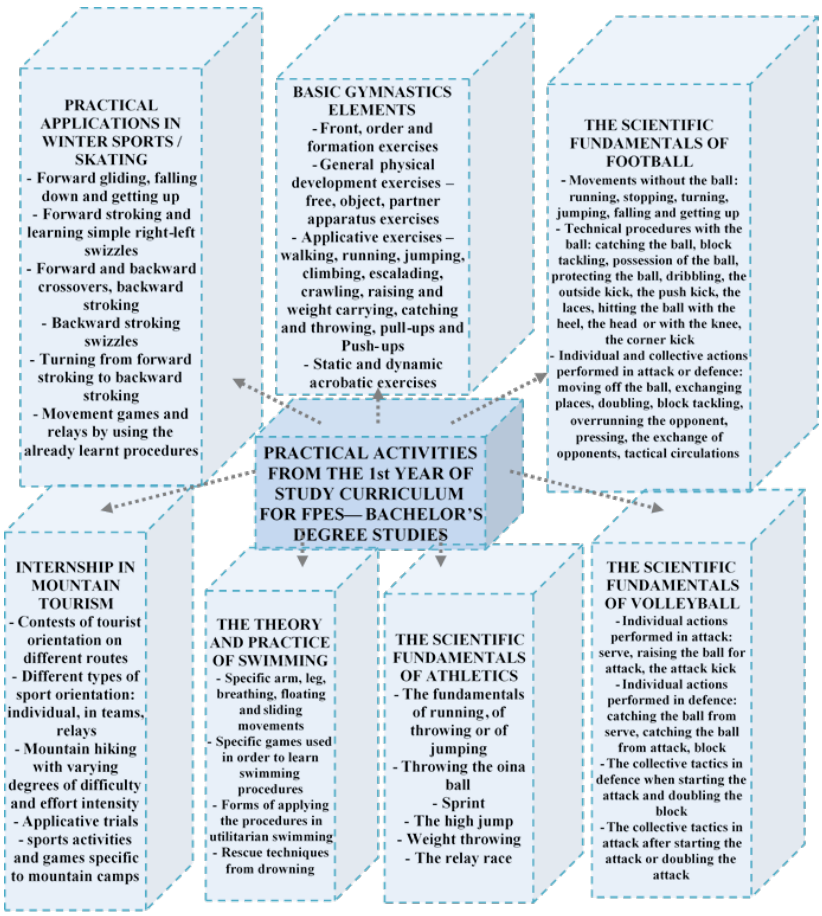

Fig 1. Practical activities from the 1st year of study curriculum for FPES – Bachelor's Degree studies

2.1 The subjects

The subjects of the research were represented by 59 boys and 31 girls, first-year students at the Faculty of Physical Education and Sport, majoring in Physical Education and Sport, who constantly participated in the previously mentioned 7 practical activities. The average age of the boys was of 21.9 and that of the girls of 21.6. The students who frequently missed classes during the university year were eliminated from the study in order not to influence the validity of the averages obtained by each group in the final tests and to be sure that the final results are primarily a consequence of the practical activities from the curriculum. Nevertheless, there is a stimulus variable, which couldn't be eliminated or controlled, represented by the performance sport physical activities or leisure activities, in which approximately a quarter of the tested students were constantly involved and which could influence the results of the final tests. The research activity was started only after obtaining the agreement of the management of the educational institution and after we described the objectives, the tests used and the working methodology to students.

2.2 The tests

The tapping Test determined the speed of the upper limbs while drawing some dots on paper, for 6 seconds. The falling baton test assessed the reaction time by catching a graded baton, which was left to fall. The Edgren Speed Test assessed the repetition speed of the lower limbs and involved the execution of lateral jumps for 10 seconds, on 3 parallel lines, situated at a distance of 1.2 metres. The 20-m agility test assessed the acceleration and change-of-direction ability by going along a route delimited by 3 lines, at a distance of 5m. one from the other. The Adams Speed Test assessed the repetition speed of the lower limbs, the orientation in space and the accuracy of movements through successive jumps on 4 numbers, separated by marks, which must not be stepped on. The 50-m movement speed test involved a race, which started from a standing position at an auditory signal. The visual-stimulus reaction time required an Internet connection and it involved touching the keyboard every time a square changed its colour. The speed test was used to assess acceleration, deceleration, agility, dynamic balance and orientation in space by dodging 8 cones, placed on both sides of a 14-metre line. The race was repeated twice. The acceleration capacity test involved an accelerated-speed sprint on a distance of 30 m. and then maintaining the speed achieved by running another 30-60 metres. The difference in point of time obtained between the 2 races expressed the acceleration capacity. The determination of the maximum running speed is given by the percentage between the 30 metre-sprint and the time obtained for the respective part. The 9-3-6-3-9 test assessed the speed of movement, the acceleration and deceleration capacity in running forwards or backwards, and the orientation in space on the volleyball court marks. The great marathon test assessed resistance running and agility while successively touching all the volleyball court marks and coming back to the first line, the race having a total of 90 metres.
The statistical calculation was performed with the help of the SPSS program.

3 Results and Discussion

The results of the average of the data, the values of t, the correlation coefficients and the significance limits obtained are included in tables 1 and 2.

In the tapping test – right, the group of girls obtained a difference of the average values corresponding to t=-2.466, result which corresponds to a limit t=-2.466, $p < .05$, significant only for the minimum possible limit.

The group of boys recorded a value of t=-.457, corresponding to a limit of p=.649, the result was > .05, which was insignificant form a statistical point of view.

In the tapping test – left, both groups recorded progress and insignificant limits: for the girl's t= -0.226, with a corresponding limit p=.823, p >.05, whereas for the boys' t=-0.460, with a limit p=.647, p >.05. We noticed that the fine and repeated movements, performed with the help of hands, are not frequently encountered in physical education and sport activities, fact which explains the lack of significant progress in these tests, in most situations the large segmental muscle groups being involved in the effort.

Testing the reaction time of the upper limbs by means of the trial The falling baton also recorded poor progress, which were insignificant from a statistical point of view for both sexes: the difference between the girls' averages records a t=0.183, value associated to a limit p=.856, result > .05, whereas the difference between the boys' averages corresponds to a t=0.570, value associated to a p=.571, result > .05. These results prove the difficulty in training the reaction time, the progress being thus limited by genetics and by the fact that the students from the FPES already reach at this age the superior values of motor reactions, which do not allow significant leaps in this direction.

In the Edgren test, both groups obtained a statistically significant difference: the girls recorded t=-7.439, associated to a limit of p=.000, p <.001, which is highly significant, whereas boys obtained a t=-3.020, associated to a limit p=.004, p <.01. The same situation was encountered in the agility test: the girls obtained a t=10.266, value which also corresponds to p=.000, p <.001, which is also highly significant from a statistic point of view. The improvement in the results is explained by the fact that these tests involve jumping, rapid changes of direction, accelerations, precise actions and orientation in space, the movements being already known, simple and frequently used in sports activity. A special situation was encountered in the two Adams tests - the correct jumps and incorrect jumps, where the girls obtained a superior average value of the correct number of jumps as compared to the boys, and an average of the incorrect jumps lower than the boys' average, the results being explained by the girls' better coordination and more accurate moves. The boys' mistakes were caused by imprecise movements and by not following the succession of numbers written on the ground.

Nevertheless, both sexes recorded significant progress: the girls scored in the correct Adams test a t = -8.778 and the boys a t = -4.461, the girls obtained in the wrong Adams test a t = 5.637 and the boys a t = 6.107, all of these values being associated with a limit p = .000, results <.001, which are significant from a statistical point of view. The same evolution is recorded by the differences in the averages for the 50-metre speed test: the group of girls obtained a t = 9.075 and the boys a t = 6.096, both values correspond to a limit p = .000, p <.001, which is statistically significant.

The reaction to visual stimuli test indicates a slight regression for girls, which statistically insignificant, the difference between the averages corresponds to a t = -0.283, a limit value p = .779, a result> .05, which is statistically insignificant. The boys recorded little progress, corresponding to a t = 2.315, a value corresponding to a limit p = .024, result <.05, which is significant only for the minimum limit. The fact that the test involved connecting to the Internet and making a quick movement whenever colours changed, which was unfamiliar to physical activities is an argument for the weaker results obtained in this situation. In the speed route test, both groups achieved a significant improvement in the results: the girls recorded a t = 7.461 and the boys t = 8.579, the results corresponding to a limit p = .000, p <.001, these qualitative leaps being explained by the fact that the agility movements, accelerations and decelerations specific to sporting game structures, are frequently performed by students.

Significant progress was achieved by both sexes for the 0-30m acceleration test: the girls recorded a t = 6.274 and the boys a t = 5.942, values associated with a limit p = .000,

result <.001. The same situation is encountered for the 30-60m sprint test: the group of girls obtained a t = 7.050 and the boys a t = 6.207, both results corresponding to a limit p <.001, fact which demonstrates a strong and significant progress. However, the acceleration difference between the averages of the two tests is significant only for the group of boys with a t = 2.061, a value associated with a limit p = .044, a result <.05, which is significant only for the minimum limit accepted by statistics.

The girls record a t = -.0514, value associated with a p = .609, result> .05, which is statistically insignificant. A possible explanation for these differences is that boys have a better ability to maintain the maximum speed achieved over a range of 30-60 meters, while girls get tired more easily on the same distance, aspect which has generated more reduced values in the acceleration difference. However, the calculation of the maximum running speed revealed improvements for both groups, the girls obtaining a difference between the mean values corresponding to t = -8.109 and the boys to t = -6.553, results associated with a limit p <.001.

In the 9-3-6-3-9 test, significant progress was recorded for both genders: the girls obtained a t = 11.904 and the boys a t = 4.977, results corresponding to a limit p <.001. And for the great marathon test the same situation is reported, the group of girls obtained a t = 7.564, whereas the boys obtained a t = 9.763, both results being associated with a limit p <.001, which is strongly significant. Improvement in the results in these two tests is related to the fact that they involve the alternation of the acceleration and deceleration capacity, the adjustment of the frequency of the steps according to the length of the routes, the manifestation of the orientation in space and the agility abilities, the speed of the movement under resistance conditions etc., all of these elements being often addressed in the practical sports disciplines of the 1st year bachelor's degree studies curriculum.

Table 1. The significance of the difference in averages between the initial and final tests for the pair samples

GROUPS	**PAIR SAMPLES – GROUPS FROM FPES**							
	GILRS (N=31)				**BOYS (N=59)**			
TRIALS	T.I. $\overline{x} \pm m$	T.F. $\overline{x} \pm m$	**t**	**P**	T.I. $\overline{x} \pm m$	T.F. $\overline{x} \pm m$	**t**	**P**
TTR /points	50.0±1.514	50.6±1.434	-2.46	.020*	47.8±.82	48.0±.81	-.457	.649
TTL /points	44.4±1.201	44.4±1.192	-.22	.823	44.1±.66	44.2±.62	-.460	.647
FBT /cm	26.7±1.176	26.7±1.144	.18	.856	27.4±1.11	27.2±1.06	.570	.571
ET /points	14.0±.608	15.8±.465	-7.43	.000***	16.3±.26	16.6±.24	-3.020	.004**
AT /sec	5.9±.084	5.7±.080	10.26	.000***	5.3±.05	5.3±.05	4.155	.000***
ATC /no. of jumps	26.4±1.183	27.9±1.146	-8.77	.000***	23.7±.68	24.3±.62	-4.461	.000***
ATI/no. of jumps	3.0±.296	1.7±.158	5.67	.000***	5.2±.32	4.2±.26	6.107	.000***
50ST /sec	7.6±.078	7.5±.077	9.07	.000***	6.6±.06	6.6±.06	6.096	.000***
VSRT /sec	0.3±.011	0.3±.010	-.28	.779	0.36±.00	0.3±.00	2.315	.024*
SRT /sec	19.0±.420	18.7±.401	7.46	.000***	16.1±.15	16.1±.15	8.579	,000***
30AT /sec	5.0±.069	5.0±.070	6.27	.000***	4.5±.04	4.4±.04	5.942	.000***
ST /sec	4.5±.073	4.4±.071	7.05	.000***	3.9±.05	3.9±.05	6.207	.000***
ADT /sec	0.5±.049	0.5±.047	-.51	.609	0.5±.02	0.5±.03	2.061	.044*
MRS /m/sec	6.7±.107	6.7±.106	-8.10	.000***	7.7±.10	7.7±.10	-6.553	.000***
93639T /sec	8.8±.113	8.6±.110	11.90	.000***	8.1±.06	8.1±.06	4.977	.000***
GMT /sec	22.5±.246	22.1±.230	7.56	.000***	21.1±.15	21.0±.15	9.763	.000***

* P< 0.05, ** P< 0.01, *** P <0.001

In order to determine the association between the normal distribution tests, the Pearson correlation coefficient (r) was used; for all the other types of associations, the Spearman correlation coefficient (ρ) was used, the results being presented in Table 2. The correlation sign is determined by the type of the associated tests: for the typical ones, the increase in results implies an increase in performance (e.g. The Edgren test), for the atypical tests, an increase in results indicate a decrease in performance and vice versa (e.g. the 50-metre speed test).

Strong and significant associations are recorded between the tapping test right and the tapping test left, both assessing the repetition speed of the upper limbs, for girls ρ=.599 and for boys r=0.715, the results corresponding to a limit P <.01. Significant correlations are encountered only in the case of girls between the tapping test right and the agility test, with ρ=-.452 and P <.05, between the tapping test right and the 9-3-6-3-9 test, with ρ=-.358 and P < .05. Both sexes obtain significant correlations between the tapping test right and the Great marathon test, the girls with ρ=-.544 and P <.01, the boys with ρ=-.286 and P <.05.

The tapping test left records significant correlations with two tests, for both sexes: the Edgren test, in which the girls obtained a ρ=.394, with a limit P <.05, and the boys obtained a ρ=.433, with a P <.01, and the Great Marathon test, in which the girls obtained a ρ=-.378 and the boys obtained a ρ=-.286, both correlations having a P < .05.

The rest of the significant correlations of the tapping test left with other tests are different for the group of boys and girls, fact which proves that the sex particularities and the level of motor abilities influence the results of the tests. For the group of girls there are significant correlations between the tapping test left with the agility test (ρ=-.456 and P <.01) and with the Adams test – incorrect jumps (ρ=-.459 and P <.01), whereas for the group of boys there are significant correlations between the tapping test left and the Adams test – correct jumps (r=.405 and P <.01), with the 50-m. sprint test (ρ=-.280 and P <.05) and with the 9-3-6-3-9 test (ρ =-.350 and P <.01).

The falling baton test records few statistically significant correlations probably because the movement performed to catch the object is not frequently used in the usual sports activities, which often presuppose reactions towards objects, teammates or opponents in movement. This test has only one significant correlation with the Adams test – incorrect jumps (ρ =.454 and P < .05) for the group of girls and two significant correlations for the group of boys, one with the visual stimulus reaction test, which assesses the reaction time, but my means of another action n(ρ =.462 and P <.01), and the other one with the acceleration difference test, where the rapid reaction is associated with an increase in the difference between the two sprint routes (ρ=-.335 and P <.01).

The Edgren test records highly significant correlations for both sexes, with the following tests, which involve rapid movement, thus highlighting a correlation between the increase in the number of jumps and the decrease in the time obtained in the respective tests: The 50-metre sprint test (r =-.487 for girls and ρ=-.558 for boys, values corresponding to P <.01), the speed route test (r =-.735 for girls and ρ=-.456 for boys, values corresponding to P <.01), the 9-3-6-3-9 test (ρ =-.494 for girls and ρ=-.489 for boys, values corresponding to a P <.01).

For girls, a highly significant correlation is obtained with the agility test (r =-.847 and a P <.01), whereas for the boys, the correlation is weaker, but still statistically significant (ρ =-.275 and a P <.05).

Table 2. Pearson (r) and Spearman (ρ) Correlations – group of girls / N=31, group of boys / N=59

GIRLS / *BOYS*	TTR	TTL	FBT	ET	AT	ATC	ATI	50ST	VSRT	SRT	30AT	ST	ADT	MRS	93639T	GMT
TTR	**1**	*ρ .599***	*ρ .265*	*P. 470***	*ρ -.452**	*ρ .243*	*ρ .094*	*ρ .324*	*ρ .227*	*ρ .308*	*ρ .013*	*ρ .004*	*ρ .271*	*ρ .004*	*ρ .358**	*ρ .544***
TTL	**r .715****	**1**	*ρ .038*	*ρ .394**	*ρ -.456***	*ρ .337*	*ρ -.459***	*ρ .318*	*ρ .200*	*ρ .218*	*ρ .088*	*ρ .107*	*ρ-.043*	*ρ .107*	*ρ .313*	*ρ .378**
FBT	**ρ .202**	**ρ -.183**	**1**	*ρ .074*	*ρ .101*	*ρ.006*	*ρ .454**	*ρ .023*	*ρ .311*	*ρ .090*	*ρ .051*	*ρ .013*	*ρ .019*	*ρ -.013*	*ρ .055*	*ρ .223*
ET	**ρ .337****	**ρ .433****	**p .125**	**1**	*r -.847***	*ρ .373**	*r .036*	*r .487***	*ρ .010*	*r .735***	*ρ .369**	*r .386**	*r .091*	*r .428**	*ρ .494***	*ρ .145*
AT	**r .063**	**r .077**	**ρ .056**	**ρ-.275***	**1**	*ρ .374**	*r .080*	*r .544***	*ρ .097*	*r .618***	*ρ .484***	*r .459***	*r .156*	*r .492***	*ρ .685***	*ρ .244*
ATC	**r .261***	**r .405****	**ρ .178**	**ρ .428****	**r .194**	**1**	*ρ -.098*	*ρ .413**	*ρ .198*	*ρ -.510***	*ρ .082*	*ρ .376**	*ρ .072*	*ρ .376**	*ρ .369**	*ρ .566***
ATI	**ρ .091**	**ρ .136**	**ρ .084**	**ρ-.246**	**ρ -.081**	**ρ -.536****	**1**	*r .170*	*ρ -.056*	*r -.032*	*ρ .068*	*r -.045*	*r.,294*	*r .030*	*ρ .132*	*ρ .113*
50ST	**ρ .132**	**ρ .280***	**ρ .240**	**ρ .558****	**ρ .478****	**ρ .258***	**ρ .219**	**1**	*ρ .042*	*r .363**	*ρ .593***	*r .777***	*r -.210*	*r .785***	*ρ .623***	*ρ .381**
VSRT	**ρ .059**	**ρ .217**	**ρ .462****	**ρ.287***	**ρ -.054**	**ρ .387****	**ρ .200**	**ρ .148**	**1**	*ρ .324*	*ρ .506***	*ρ .349*	*ρ -.021*	*ρ .506***	*ρ .164*	*ρ .277*
SRT	**ρ .055**	**ρ .102**	**ρ .212**	**p .456****	**ρ .831****	**ρ .114**	**ρ .049**	**ρ .403****	**ρ .013**	**1**	*ρ .278*	*r .452**	*r -.095*	*r .493***	*ρ .514***	*ρ .081*
30AT	**ρ .103**	**ρ .247**	**ρ .000**	**ρ .564****	**ρ .387****	**ρ -.259***	**ρ .300***	**ρ .832****	**ρ .148**	**ρ .473****	**1**	*ρ .617***	*ρ .325*	*ρ .617***	*ρ .461***	*ρ .017*
ST	**r .035**	**r .136**	**ρ .176**	**ρ .477****	**r .334****	**r .338****	**ρ .147**	**ρ .795****	**ρ .333****	**ρ .240**	**ρ .785****	**1**	*r -.421**	*r .992***	*ρ .607***	*ρ .298*
ADT	**r .166**	**r .201**	**ρ 335****	**ρ .008**	**r ,109**	**r ,236**	**ρ .061**	**ρ .192**	**ρ .359****	**ρ .227**	**ρ .028**	**r .493****	**1**	*r..358**	*ρ .152*	*p .047*
MRS	**r .020**	**r .115**	**ρ .177**	**ρ .477****	**r -,293***	**r .367****	**ρ .146**	**ρ .795****	**ρ .333****	**ρ -.240**	**ρ .785****	**r .990****	**r .533****	**1**	*ρ .607***	*ρ .298*
93639T	**ρ .195**	**ρ .350****	**ρ .086**	**ρ -.489****	**ρ ,716****	**ρ ,089**	**ρ .067**	**ρ .654****	**ρ .034**	**ρ .728****	**ρ .642****	**ρ .94****	**ρ .227**	**ρ .394****	**1**	*ρ .311*
GMT	**ρ .286***	**ρ .293***	**ρ .174**	**ρ .607****	**ρ .560****	**ρ .215**	**ρ .025**	**ρ .751****	**ρ .168**	**ρ .638****	**ρ .727****	**ρ .674****	**ρ -.156**	**ρ .673****	**ρ .753****	**1**

***** The correlation is significant at the 0.05 level (2 tailed). ****** The correlation is significant at the 0.01 level (2 tailed).

Tapping test Right – TTR; Tapping test Left – TTL; The falling baton test – FBT; The Edgren test-ET; The agility test – AT; Adams test correct – ATC; Adams test incorrect – ATI; The 50-metre speed test – 50ST; The visual stimulus reaction test – VSRT; The speed route test – SRT; The 0-30-metre acceleration test – 30AT; The 30-60 metre sprint test – ST; The acceleration difference test – ADT; The maximum running speed – MRS; The 9-3-6-3-9 test -93639T; The great marathon test – GMT.

The boys obtained significant correlations with the0-30-metre acceleration test (ρ =-.564 and a P <.01) and with the30-60-metre sprint (ρ =-.477 and a P <.01), whereas the girls obtained weaker correlations, but which are still statistically significant, for the above mentioned tests. (ρ =-.369 and ρ =-.386, respectively, both corresponding to a P <.05). Another major gender difference is recorded in the correlation with the Great marathon test, in which only the group of boys records a highly significant correlation, fact which highlights their ability to maintain a high frequency of motion movements under resistance conditions (ρ=-.607, with a P <.01).

The agility test has strong and statistically significant correlations for both groups with the following tests, all of which presuppose acceleration and speed of movement: the 50-metre speed test (r = .544 for girls and p = .478 for boys, values corresponding to a P <.01), The speed route test (r = .618 for girls and p = .831 for boys, values corresponding to a P <.01), the 0-30 metre acceleration test (p = .484 for girls and p = .387 for boys, P =.01), the 30-60-metre sprint test (r = .459 for girls and r = .334 for boys, values corresponding to a P <.01), the 9-3-6-3-9 test (p = .685 for girls and p = .716 for boys, values corresponding to a P <.01). The girls obtained a strong correlation with the speed of movement test (p = -.492, with a P <.01), while the boys recorded a significant correlation with the Great Marathon Test (p = .560 with a P <.01), a correlation that was not achieved by the girls, confirming the boys' ability to better exploit resistance.

The correct Adams test has strong but gender-differentiated correlations with the common tests for both groups, in which the significant correlations have lower limits, with P <.05. The girls recorded significant correlations with the speed route test (p = -.510) and the great marathon test (p = -.566), both results corresponding to a limit P <.01. The boys obtained significant correlations with the wrong Adams test, which highlights the association between increasing the number of correct jumps and lowering the incorrect ones (p = -.536), with the reaction to visual stimuli test (p = -.387), the 30-60-metresprint test (r = -.338) and the maximum running speed (r = .367), all these values corresponding to a limit P <.01.

The incorrect Adams test did not record any significant correlation with the tests that haven't been analysed yet, in the case of the group of girls, and for boys there is only one positive correlation with the rest of the tests, that is the 0-30-metre acceleration test, where ρ = .300, with a P <.05, which demonstrates an increase in the time obtained in accelerated running, along with the increase in the number of incorrect jumps, as a result of poor coordination.

The 50-meter sprint test showed strong correlations for both sexes with the following tests: the 0-30-metre acceleration test (p = .593 for girls and p = .832 for boys), the 30-60-metre sprint test (r = .777 for girls and p = .795 for boys), the maximum running speed test (r = -.785 for girls and p = -.795 for boys), the 9-3-6-3-9 test (p = .623 for girls and p = .654 for boys), all these correlations being associated with a limit P <.01. The boys obtained strong correlations with the speed route test (p = .403) and the great marathon test (p = .751) with significance limits P <.01, while the correlations of girls with these 2 tests are significant only for P <.05.

The reaction to visual stimuli test showed gender differences between the tests with which they make strong correlations. Of the tests that haven't been analysed, the only one where both groups achieved strong correlations is the maximum running speed (p = -.506 for girls and p = -.333 for boys with a limit P <.01). However, girls obtained a strong association with the 0-30-metre acceleration test, where reaction time is important in obtaining a superior result (p = .506 and a P <.01), but it is surprising that boys did not get a significant correlation in this case; however, they recorded a strong correlation with the 30-60-metre sprint, where the reaction time is not relevant, the test subjects already sprinting in

this part of the route (p = .333 and a P <.01). Another significant correlation obtained by boys is the acceleration difference test (p = -.359 and a P <.01).

The speed route test correlates strongly for both groups with the 9-3-6-3-9 test (p = .514 for girls and p = .728 for boys, with a P <.01). For girls, a strong correlation was achieved with the maximum speed of movement test (r = -.493 and a P <.01), and for the boys with the 0-30-metre acceleration test (p = .473 and a P <.01) and with the great marathon test, respectively (p = .638 and a P <.01).

Another test with strong correlations for both genders is the 0-30-metre acceleration test, which reveals significant correlations with the 30-60-metre sprint test (p = .617 for girls and with p = .785 for boys at P <.01), with the maximum running speed test (p = -.617 for girls and with p = -.785 for boys at a P <.01), the 9-3-6-3-9 test (p = .461 for girls and p = .642 for boys with a P <.01). The boys obtained a strong correlation with the great marathon test (p =.727, with P <.01), whereas the girls recorded a small value in this correlation. The 30-60-metre sprint test has strong correlations with: the maximum running speed test (r = -.992 for girls and with p = -.990 for boys at P <.01), the 9-3-6-3 -9 test (p =.607 for girls and p = .394 for boys, with a P <.01). However, the boys' group also has strong correlations with the difference in acceleration test (r = -.493, with P <.01), and with the great marathon test, respectively (p = .674, with P <.01), where the girls' correlations are statistically insignificant.

Other strong correlations, explained by the similarity of movements and coordination processes, the existence of direction changes, the high intensity of effort and the energy mechanisms required are obtained between the 9-3-6-3-9 test and the maximum travel speed test (r = -.607 for girls and with p = -.394 for boys at a P <.01) or, for boys, between the great marathon test and the maximum running speed test (ρ = -.673, with P <.01) or the great marathon test and the 9-3-6-3-9 test (p = .753 with P <.01).

4 Conclusions

The above mentioned tests are completing a series of studies carried out with the FPES students in the previous years, which followed other elements of general fitness and motor fitness: muscle strength and coordination elements. The results obtained and their statistical processing partially confirm the possibilities for progress in speed motor skills, but show that the practical subjects and the number of hours allocated to them in the 1st year curriculum are sufficient in order to achieve statistically significant leaps for the groups studied. It should be noted here that these results contradict the opinion of many students who believe that there is an exaggerated number of theoretical subjects, which do not have a favourable contribution to their professional training.

Nevertheless, there is a certain reluctance in drawing some incontestable conclusions about improving students' performance, simply because approximately 25% of them are constantly involved in different sports or body fitness activities, and these physical activities certainly had an influence on the final results, without the possibility of being accurately quantified. However, the only stimuli to which all students studied were subjected throughout the academic year are the practical activities from the curriculum, so these requests are the main factors that have generated leaps in the motor performance achieved. The fact that there is significant progress in many of the tests used represents a favourable aspect, all the more so as the level of FPES students' training is higher than that of students from other faculties, and the improvement of the results is all the more difficult as the physical level of training is higher.

Significant differences between the performance of the two sexes are observed in the Tapping right and Tapping left tests, where the frequency of the upper limb executions is higher for the girls than for the boys even though the differences between the initial and the

final tests indicated significant progress recorded by the girls only in the former test (the Tapping right test). The results obtained by the girls can be explained by superior manoeuvrability, by better coordination of arm movements in speed mode. Other tests, where progress is statistically insignificant or significant for the minimum limit ($P < .05$) are those evaluating the response rate in the upper limbs (The falling baton and the Reaction to visual stimuli test).

These results demonstrate the genetic conditioning of the reaction times and the difficulty of reducing them through training, especially since the skills required in the respective tests are not familiar to the students and are not used in practical activities, in which the reactions to auditory signals in athletics, or partner, object or opponent manipulation – in the case of sports games – are the most demanded.

For the rest of the tests that have common motor structures and which involve the use of the lower limbs such as jumps, accelerations, decelerations, rapid changes in direction, maintenance of the maximum tempo etc., we may notice the fact that both groups recorded statistically significant progress. One possible explanation is the fact that most sports branches - practised in the first year of study - require the practice of already known execution techniques, with strong influences on speed and its combinations with other motor skills. These types of skills are easily transferred by students and exploited in the speed assessment tests.

From the observations made during the initial and final tests, we could notice an active involvement of the students included in the study, but also a number of distinctive characteristics depending on the gender: in tests that were based on jumping, the boys are better, but are often hasty, pursuing a large number of executions and often not following the order of the markings, without paying much attention to coordination and the accuracy of the executions, whereas the girls have superior jumping control and fewer errors.

The correlative study of the tests highlighted the strong and significant associations between them, but it also emphasized the situations where they are very weak and statistically insignificant, for each gender being particular aspects to be mentioned regarding the obtained results. Firstly, there is a poor correlation between the Big Marathon Test and the rest of the tests for the group of girls, demonstrating that their adaptation to the resistance speed efforts is deficient, whereas in the case of boys there are, in most cases, recorded strong and significant correlations between the Great Marathon Test and the rest of the tests, which indicates a good exploitation of speed in longer efforts. An interesting aspect is related to the fact that the reaction rate assessment tests record, for both sexes, but more obviously in the case of the girls, the fewest statistically significant correlations with the rest of the tests, confirming that response times are a special form of speed manifestation, which are difficult to improve, and with less influence on the other forms of speed manifestation. A situation that is difficult to explain is that the two tests for response times (The falling baton and the reaction to visual stimuli test) are significantly correlated only in the case of boys, not girls.

Both groups frequently record strong and significant correlations between tests that involve speed of movement, acceleration and deceleration, agility, jumps, speed-coordination: the Edgren test, the agility test, the Adams test, the 50-metre sprint, the speed route test, the 0-30-metre sprint test, the 30-60-metre sprint test, the 9-3-6-3-9 test. The explanation is that all these involve the rapid action of the lower limbs in different contexts and usually on short distances, with or without a combination with coordination elements, and the results in these tests are thus favourably correlated.

The assessment of the speed level development must be done by taking into account the other motor skills that can condition and exploit it, such as the level of manifestation of the strength-speed combination, which is encountered in the domain-specific literature under the name of power, with multiple manifestations: starting power, acceleration and

deceleration power, throwing power, separation power, landing power, reactive power. Studying the development level of this combination would allow a clearer overview on the motor possibilities of this age group.

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