

THE MOTOR PERFORMANCE PROGRESSION OF FUTURE UNDERGRADUATE STUDENTS OF PHYSICAL EDUCATION

Roman Cuberek, Iva Machová

Faculty of Physical Culture, Palacký University, Olomouc, Czech Republic

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BACKGROUND: In our opinion, the complex interactions between social change, growing inactivity and obesity, and further negative processes also contribute to changes in the motor performance level of future undergraduates. Therefore, long term changes to motor performance need to be considered in order to be a mirror of today's life style of the above mentioned population.

OBJECTIVE: The main aim of this study was to describe a long term trend in two chosen motor presumptions in the population entering university physical education study.

METHODS: The sample comprised 2,012 males and 1,705 females aged $Mdn = 19$ years. The subjects were future undergraduate students. The measurements took place by means of entrance exams in the time period from 1991 to 2001 and in the year 2006. Their swimming performance was assessed by means of a 100 m swim test and their dash performance by means of a 100 m dash.

RESULTS: In all four cases (two motor tests, two genders) our analysis indicated non zero trends of performance (all the verified between years differences were significant; $p < 0.001$). Polynomial functions constantly show an initial convex followed by a concave composition (change taking place during the 1998–1999 period) in cases of the dash and swimming (male only) performance. The female swimming performance trend increases throughout the whole period. The concavity of the polynomial functions denotes the possibility of increasing performance, which mostly decreased during the period 1993–2001 (for the dash) and 1996–1999 (for swimming).

CONCLUSIONS: On the basis of our findings we had to reject our research hypothesis and submit evidence of change to both swimming and dash performance in a specific population. We found out positive (female) and mostly positive (male) trends of swimming performance in the observed time period. No purely positive nor purely negative trend of dash performance was found. After the increase during the initial 3 years of observation; the level of dash performance mostly decreased. However, the last measurement in 2006 indicates some tendency of increasing performance as well as concavity of polynomial functions (trend function) at the end of the observed time period.

Keywords: Swimming performance, dash performance, long term trends, physical inactivity, PE study.

INTRODUCTION

Our present European society is going through changes and the speed of these changes has growth character. It is not only a move in knowledge, but in values and norms. Value systems and principles in sports change according to the move from a society with stable values, a clear hierarchy and the want of basic insurance to a society with allowed differences, changes and new experiences. Engström (2004) feels a change from a daily life with a high level of physical life activities to a more sedentary life as one of the basic social changes. Blair (2001) can see the solution to growing inactivity in getting physical activities more deeply into the life-style of an individual, rather than to perform physical activities as a logical answer to their absence. For an individual it means that "I do physical activities, because I want to, not because I feel that I have to".

According to the creation of the basics of one's life style during one's childhood (Rychtecký et al., 2006), the educational system plays an important role in building a positive relationship to physical activities. From among the characteristics, forming the basis of the individual variability of life style (Bouchard et al., 1990), which are mainly built by the school educational system, it is possible to name personality, motivation and the attitudes of the pupil. To a certain point, the role of the school system is given by the Range Educational Program (REP) (Výzkumný ústav pedagogický/Pedagogical Research Institute, 2009), according to law no.561/2008 giving the mandatory content, range and conditions of education. REP, in the area of human life and health, takes on the task (Výzkumný ústav pedagogický, 2009) of deepening the relationship between pupils and their health, to strengthen mental and emotional feelings towards these problems, and to give them a chance to learn practical abilities, which build a healthy life style

and the quality of the future adult's life. The role of an educator is at the same level as REP for the building of the basis of a healthy life style during the educational process. The pedagogue is responsible for the carrying out of REP.

An active life style naturally goes together with one's level of physical fitness and motor performance, which can be described with the following categories: physical activity – physical fitness – life style. Everyday life in today's modern society has become less and less active (Engström, 2004), which is true in our homes as well as at work. This change, together with other factors (relationship to physical activity and sport, values...) logically leads to a decrease in physical fitness and motor performance, which is referred to by a number of Czech authors (Burian, Korvas, & Slonková, 2001; Měkota & Cuberek, 2002; Měkota & Zahradník, 2003) and foreign authors (Claessens & Lefevre, 1992; Dawson et al., 2001; Košťál, Sedláček, & Dremmelová, 1999; Przewęda & Dobosz, 2003; Martínez-González et al., 1999; Ekblom, Oddsson, & Ekblom, 2004).

Rychtecký et al. (2006, 85) in agreement with different European studies state: "In most European countries a small decrease in motor performance and movement abilities took place during the period of 2–3 decades identified youngsters; strong decrease in endurance performance (boys and girls) and less decrease in power performance took place; progressive increase in measurement of stomach muscles (boys and girls) took place in period more than twenty years."

As a key point, in building pupil's life style, pedagogue could play a significant role. In our case, PE teachers. Role of PE teachers, as positive factor (for sports and physical activities), is important in building one's personal qualities, motivations and attitudes of pupils. Graduated students aren't entering the role of pedagogue of physical education with knowledge and practical abilities only, but entering as a complete personality – with his/her values, lifestyle, attitudes etc. All these characteristics, as written before, are very dynamic and influenced by a lot of factors – society (its development), family, educational process etc. The teacher of physical education is a constant factor, which has an influence on "one's lifestyle – one's physical activity – one's physical fitness – one's motor performance", but on the other hand, it is a part of dynamically developing today's European society.

As final aspect of showed changes, it is possible to expect changes in number of characteristics (for example personal, movement, social...) of future undergraduate PE students – population which is every year entering the University environment to enrich themselves with knowledge and abilities necessary for their teaching profession.

We assume that the complex of social changes, growing inactivity and obesity, and further negative process-

es may change logically the motor performance of the mentioned population as well. We predicted long term changes of the motor performance, which is a mirror of today's life style of future undergraduate students.

Empirical researches focused at the long term trends of motor performance, which is a very difficult topic, because it needs to test a representative sample of population in at least a twenty years range (Měkota & Cuberek, 2005) with the same condition and motivation. Important roles, during such a research, have a number of inappropriate factors, which influence long time changes and development. Monitoring of motor performance trends have tradition in the Czech Republic, but there are not many publications about the problem.

Population of the future undergraduate PE students at the Palacký University, which was thanks to the entry exams easier accessible for our research, helped us to explain long term changes in the motor performance in a number of kinetic areas.

The aim of our study was to describe long term trend in swimming and in dash performance of future undergraduate students of PE teaching studies, and assessed influence of possible changes to the profile of graduate PE teacher. From our literature review and according to the society changes there is a strong likelihood of negative changes in human motor performance. We stated our hypothesis about long term changes in motor performance – two motor tests – 100 m swimming and 100 m dash. These motor tests can be observed during the entering exams of future undergraduate students of PE teaching studies. Formally we stated our research hypothesis as H₀ – There are no changes in motor performance of future undergraduates during the period 1991 to 2001 and in the year 2006 (separately in swimming and dash performance).

METHODS

The sample comprised 2,012 males and 1,705 females aged $Mdn = 19$ years. The subjects were future undergraduate students with PE teaching competency in their study profile who applied for a PE university study (next only future PE students). Data were obtained at the Faculty of Physical Culture of Palacký University in Olomouc during the period 1991 to 2001 and in the year 2006. Participants were measured by motor tests used during PE entrance exam. The exams within the admission procedure were organized by the Department of Sports. The data were processed anonymously upon the approval of the Faculty of Physical Culture.

For description of swimming and dash performance tests we used 100 m swimming and 100 m dash motor tests. These tests were performed according the methods that were described in detailed, in the Manual of PE entrance exams (Měkota, Komeščík, Kovář, & Zháněl,

1999). 100 m swimming test was measured in the 50 m swimming pool according to the free style swimming rule (in seconds, manual time measuring). 100 m dash test we measured at the track and field track according the IAAF rules (in seconds, electronic time measuring).

The Kruskal-Wallis test (ANOVA) was used to verify evidence of neutral trend in swimming and in dash performance. We verified hypothesis H₀ – The factor “Year of observation” has no effect on the dependant variable (the level of motor performance); $p = .05$. Four cases were verified – two motor tests for two groups (by gender). The longitudinal trends in swimming and in dash performances were described by polynomial equations (3rd grade) created from the time series of means (yearly).

RESULTS AND DISCUSSION

We rejected null hypothesis at $p = .05$ for all cases (in 100 m dash and in 100 m swimming for both genders) (TABLE 1). Therefore we can state, that non neu-

tral trends exists in swimming and in dash performances of future PE students during 15 year period, because at least one sample (one from years) coming from population with different mean. Presented polynomial equations (TABLE 2) denote some systematic changes also visible in Fig. 1 to Fig. 4.

TABLE 1

Results of Kruskal-Wallis analysis of variance (group factor “Year of observation”)

	Motor test	
	100 m dash	100 m swimming
Male	H = 115.1232 p = 0.0000	H = 43.64415 p = 0.0000
Female	H = 106.4838 p = 0.0000	H = 56.17988 p = 0.0000

Legend:

H – test criterion

p – p-level

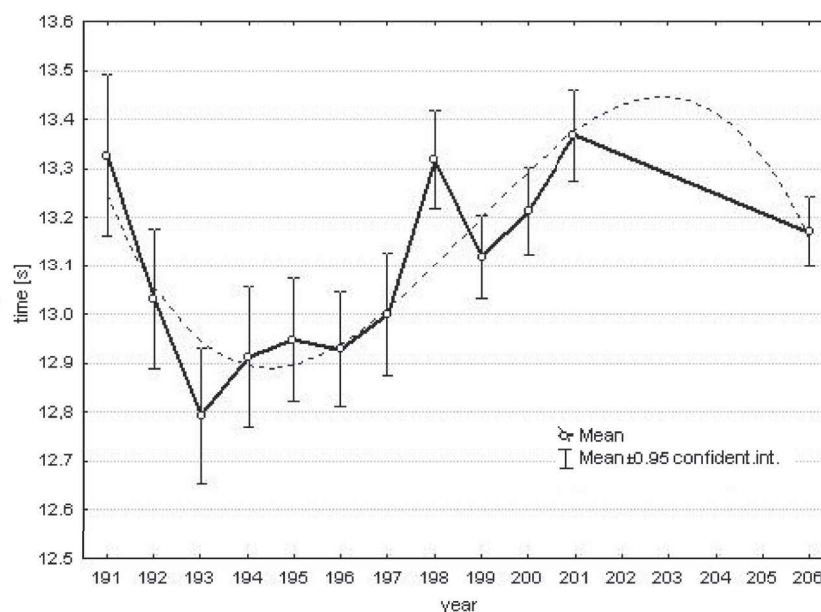
TABLE 2

Equations of polynomial trend

	Motor test	Equation
Male	100 m dash	$y = 13.5205 - 0.3198x + 0.0486x^2 - 0.0019x^3$
	100 m swimming	$y = 111.2592 - 6.0309x + 0.721x^2 - 0.0257x^3$
Female	100 m dash	$y = 16.2468 - 0.4847x + 0.0768x^2 - 0.003x^3$
	100 m swimming	$y = 124.7941 - 1.2918x + 0.0488x^2 - 0.0017x^3$

Fig. 1

Dash performance (100 m run) of future PE students (male) in time period from 1991 to 2006

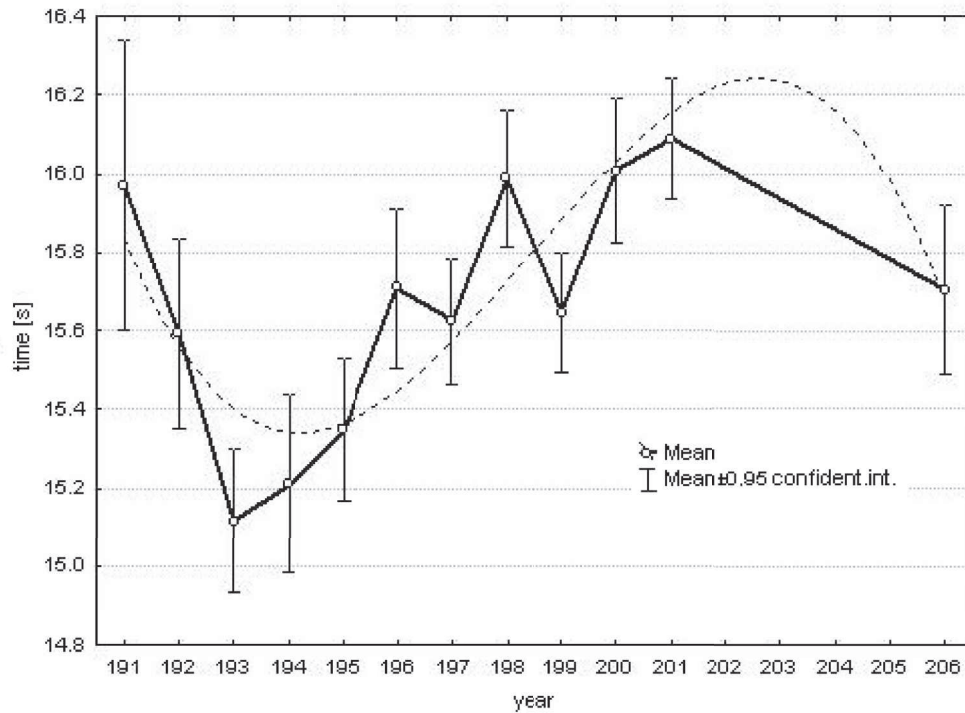


Legend:

Years are presented in reduced format (191 instead of 1991, etc.)

Fig. 2

Dash performance (100 m run) of future PE students (female) in time period from 1991 to 2006

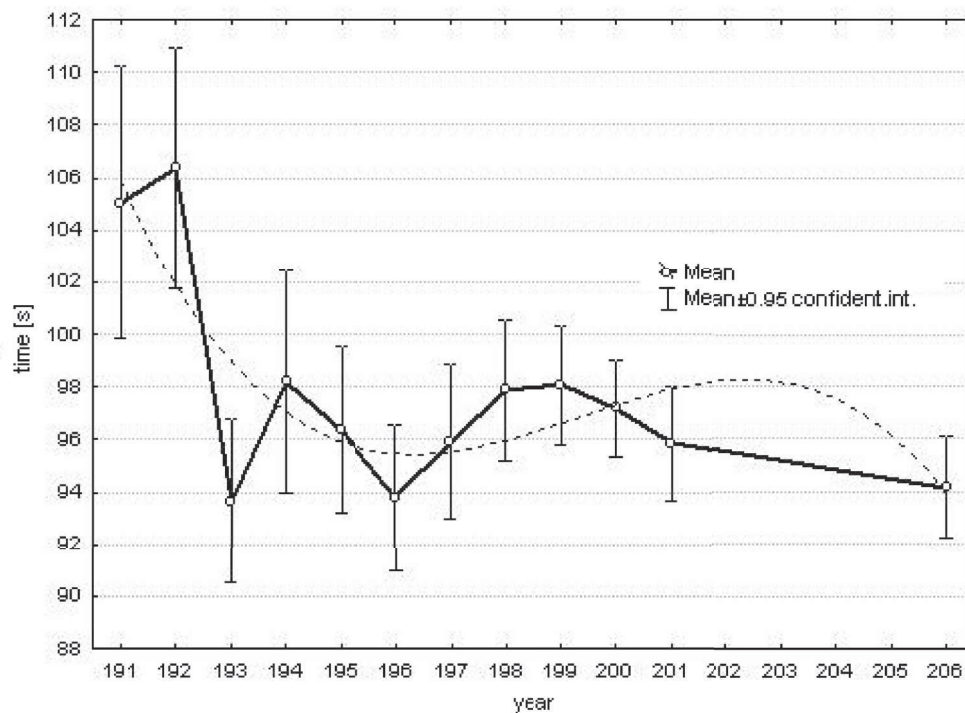


Legend:

Years are presented in reduced format (191 instead of 1991, etc.)

Fig. 3

Swimming performance of future PE students (male) in time period from 1991 to 2006

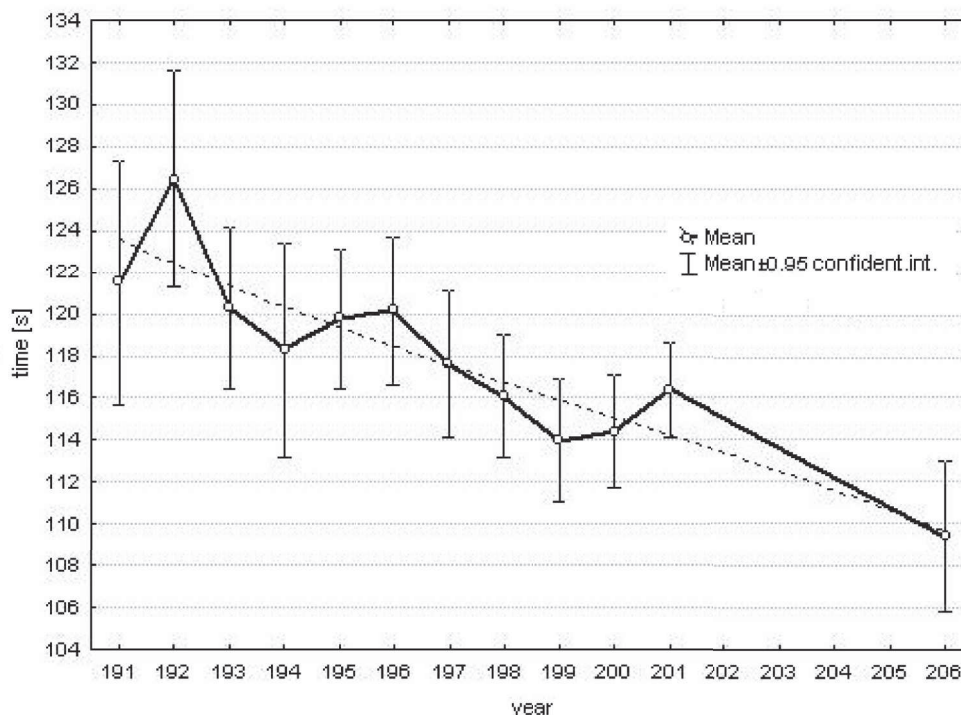


Legend:

Years are presented in reduced format (191 instead of 1991, etc.)

Fig. 4

Swimming performance of future PE students (female) in time period from 1991 to 2006



Legend:

Years are presented in reduced format (191 instead of 1991, etc.)

Performance trends in swimming and in dash were not significantly positive or negative during the fifteen year period (Fig. 1 to 4), with one exception in female swimming performance, where it was strongly positive. In all other cases we could recognize a few often similar signs for male and female.

Polynomial functions constantly showed initially convex and then concave composition (during the period 1998–1999) in case of dash and swimming performance (male only). The concavity of the polynomial function showed us the possibility of an increasing performance, decreasing only during the year 1993 (100 m dash)/1996 (100 m swimming). It is important to say that assessment of the polynomial trend was figured from the non equidistant series of the measurements (during the time period 1991 to 2001 and 2006, after four year break) – this decreased the accuracy of the assessment of the trends at the end of the period. Therefore we couldn't exclude the fact that the increase of performance at the end of observed period could be an effect of a one year deviation from a "real model trend" only.

Results were not always negative values in a yearly differences in swimming (male), whole tendency were decreasing, so for both, male and female, we could conclude it as positive trend in swimming performance during the time period 1991 to 2006. On the other hand we

could mark trend in dash performance as mostly negative with the sign of a positive change during the time period 2001 to 2006 (maximum of the concave part of curve is close to 2003).

In time period 1967–1971 (Měkota & Cuberek, 2002) the level of male sprint performance was 12.74 s, mean of male swimming performance 112.8 s and the mean of female swimming performance 138.4 s in adequate population. We compared those values with our results of measurements (in time period 1991 to 2006) and found evident decrease in dash performance in twenty years distance. On the other hand results of our measurements were greatly improved in 100 m swimming. In almost four decades we could watch increase in swimming performance and decrease in dash performance. In the case of swimming performance the decrease was explained (Měkota & Cuberek, 2002) by increase of facilities for swimming (number of indoor swimming pools), swimming lessons at schools (in the past regular lessons) and by the fact that swimming was at the first place as a top sport for boys and girls at the grammar schools (Frömel et al., 1995). In 100 m dash, there was a more visible forty year decrease at dash performance, because of the condition changes during the test – from the cinder track to synthetic track; the use of the spike shoes – which caused differences (according to estima-

tion of the track and field teachers of the Faculty of Physical Culture it could be from 0.3 to 0.4 s).

The test in 100 m dash and in 100 m swimming represented the fitness and ability tests during the entry exams (at the same row). The level of performance in 100 m dash helped to assess motor abilities of future PE students at the area of speed abilities (area of the physical condition presumption). This activity showed the level of explosive power, speed frequency (at beginning and in the middle of the running distance) and the level of speed endurance (the end of the running distance). Our showed trend mostly indicate changes in dash performance (there could be some different factors too) in mentioned abilities. Although 100 m swimming performance depended at the level of short time power endurance, changes in performance were done mostly by increasing level of the swimming skills.

In our fitness presumption for future PE students we do not expect positive changes in performance. Foundation for our contention is firstly; negative changes in the status of free living physical activities of the Czech youth (Rychtecký et al., 2006; Sak & Saková, 2004), secondly; change of the character of the physical education at the collages and grammar schools. This is according to the Range Education Program (REP) done by the School Law (MŠMT ČR, 2008). As described in REP, pupil's output should be mainly health aspects and aims to increase one's physical fitness to the level of keeping health; the increase of one's fitness is taken only like a higher standard (Výzkumný ústav pedagogický/Pedagogical Research Institute, 2009). In conjunction with a general decrease of interest in physical activities (compared to the other free living activities) in Czech youth (Sak & Saková, 2004) all these factors can negatively manifest decrease of the level of physical abilities for the future undergraduate students in the years follows.

If we want to keep the same level of "motor requirements for students" in practical classes during the PE studies, then the decrease of physical condition come through definitely as negative. The ratio of practical classes expressed by credits (versus theory) is 64, 38 and 37% (one field studies) and 40, 55 and 30% (two fields studies) during the first three years of study. Because of the above suggested percentage decreasing level of physical fitness involves more time for preparation for "motor requirements for students" and by this it restricts their study time - time for theoretical classes. Discovered increase in swimming performance is a positive finding. However, for complete assessment of difficulties during the training for "motor requirements for students" we need to analyze also the entrance performance level of future PE students in the other fundamental skills, which could be important for a successful study.

We would like to extend above indicated prediction to highlight the quality of future PE students and to

raise the study preparedness of students for their profession. Prukner (2005), while he was searching relationship among motor tests of the PE entry exams and motor performance of PE students during their practical classes (at the Faculty of Physical Culture, Palacký University in Olomouc), labeled test 100 m dash as only good predictor. The other tests of the PE entry exams were not accepted as significant predictors of successful studies.

In a context of the thought relationship future PE students - quality of students - quality of graduates it is important to mention the study (Svozil, 2008) that included the assessment of the quality of PE that was provided by students after they finished the class "the pedagogical practice of PE at school". In most cases students considered their theoretical and methodical foundations as "average, sufficient" (third level out of five). As the biggest failings in existing studies they named a great number of theoretical classes and amount of duties, which were not in balance with the need of pedagogical practice. They felt some subjects as unimportant. The missing parts felt by students were not from the area of "motor preparedness", which could be considered as positive, but we couldn't rule it out wholly objectively.

From suggested associations we think that although changes in motor quality of the future PE students has not the straight relation to the teaching profession performance of the individuals, potential decrease of the level of performance can lead to a decrease of the profession preparedness of the graduates due to an increase of the time needed for a preparation for the practical classes requirements. In this direction the curriculum of PE studies should be changed, so the level of profession preparedness - mainly in sense of understanding graduates as a persons involved in one's life style (children and youth) - persists or increases. This change couldn't be in decreasing the requirements laying on students to the extent their study time only, but in whole change of the school curriculum in accordance with the failings suggested by students (Svozil, 2008). The changes in curriculum we understand as an effective step in prevention against inactivity, against diseases which relate with the decrease of the physical activities and changes of one's lifestyle mainly of children and youth.

CONCLUSION

According to our findings we have to reject our research hypothesis and submit evidence of changes in swimming and in dash performance of a specific population.

During the observed period 1991 to 2006 was noticed positive trend only in swimming performance

(male and female) of future undergraduate PE students. This trend lasts already from the seventies of the 20th century. On the other hand there was none purely positive or purely negative trend in dash performance presented by test in 100 m dash – after the initial increase of performance level it arises significant decrease, however the last measurements indicated some increasing tendency. Negative trend predominated in dash performance in observed fifteen years period. By comparison with close publications in past (e.g. Měkota & Cuberek, 2005; only man) we have noted a strong decrease in dash performance.

We consider long term changes in motor performance of future undergraduate PE students firstly as an indicator of the full social changes in the area of physical activities, and secondly as the indicator of the changes in population entering the University studies with special motor requirements on the student and population with the influence on the relation of common population and the physical activities in future.

We can suppose more likely decrease (or stagnation) of physical fitness level according to the social changes and the concept of the physical education at schools – as the study presumption of the future undergraduate students of physical education. Because of those trends we suggest to prepare more detailed analysis of their impact to the occupational skills of graduates. In case of negative impact findings it should lead to modification of the study programs, so it would be possible to educate students with lower level of motor assumptions and to make them high quality professionals – professionals ready to change today's negative trends such as increasing inactivity, obesity, osteoporosis, diabetes etc. By modification of the study programs of PE study we understand as an important step in a prevention of negative all society health phenomenon and as a reaction to the changing qualities of future undergraduate PE student population.

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REFERENCES

Blair, S. N. (2001). Physical inactivity: A major public health problem. In Z. Hanelová & H. Válková (Eds.), *Pohyb a zdraví: 2. mezinárodní konference pořádaná Fakultou tělesné kultury Univerzity Palackého v Olo-*

- mouci pod záštitou ICSSPE*, Olomouc, 15.–18. září 2001 (p. 17). Olomouc: Univerzita Palackého.
- Bouchard, C., Shepard, R. J., Stephens, T., Shuttton, J., & McPherson, B. D. (1990). *Exercise, fitness and health: A consensus of current knowledge*. Champaign, IL: Human Kinetic.
- Burian, J., Korvas, P., & Slonková, E. (2001). Srovnání úrovně tělesné zdatnosti studentů 1. ročníku MU v Brně v intervalu 15 let. In V. Vilimová (Ed.), *Nové poznatky v kinantropologickém výzkumu* (pp. 55–57). Brno: Masarykova univerzita, Pedagogická fakulta.
- Claessens, A. E., & Lefevre, J. (1992). Secular trends in somatic and motor characteristics of physical education students. *American Journal of Human Biology*, 4, 303–311.
- Dawson, K., Hamlin, M., Ross, J., & Duffy, D. (2001). Trends in the health related physical fitness of 10–14 year old New Zealand children. *Journal of Physical Education New Zealand*, 34(1), 26–40.
- Eklblom, Ö., Oddsson, K., & Eklblom, B. (2004). Health related fitness in Swedish adolescents between 1987 and 2001. *Acta Paediatrica*, 93, 681–686.
- Engström, L. M. (2004). Social change and physical activity. *Scandinavian Journal of Nutrition*, 48(3), 108–113.
- Frömel, K. et al. (1995). *Struktura sportovních zájmů a pohybových aktivit mládeže [Závěrečná výzkumná zpráva z řešení výzkumného projektu MŠMT ČR za rok 1995]*. Olomouc: Univerzita Palackého, Fakulta tělesné kultury.
- Košťal, J., Sedláček, J., & Dremmelová, I. (1999). Dlhodobé hodnotenie motorickej pripravenosti prijatých uchádzačov na FTVŠ UK Bratislava. In J. Pavlík (Ed.), *Nové poznatky v kinantropologickém výzkumu* (pp.125–132). Brno: Masarykova univerzita.
- Martínez-González, M. Á., Martínez, A. J., Hu, F. B., Gibney, M. J., & Kearney, J. (1999). Physical inactivity, sedentary lifestyle and obesity in the European Union. *International Journal of Obesity*, 23, 1192–1201.
- Měkota, K., & Cuberek, R. (2002). Změna úrovně plavecké a sprintérské výkonnosti kandidátů a kandidátek studia tělesné výchovy v odstupe 30 let. *Tělesná výchova a sport mládeže*, 12(2), 2–5.
- Měkota, K., & Cuberek, R. (2005). Problematika sekulárního trendu v antropomotorice. In J. Novotný (Ed.), *Sborník článků a abstrakt mezinárodní konference Sport a kvalita života konané 10.–11. listopadu 2005 v Brně* (pp. 96–98). Brno: Masarykova univerzita.
- Měkota, K., & Zahradník, D. (2003). Generation changes in physical fitness in university freshmen during last forty years. In W. Starosta & W. Osiński (Eds.), *New ideas in sport science: Current issues and perspectives, sport kinetics* (pp. 179–181). Leszno,

- Poland: Wydawnictwo Państwowej Wyższej Szkoły Zawodowej.
- Měkota, K., Komeščík, B., Kovář, R., & Zháněl, J. (1999). *Manuál talentové přijímací zkoušky na studia tělesné výchovy*. Olomouc: Univerzita Palackého, Fakulta tělesné kultury.
- MŠMT ČR. (2008). *Školský zákon č. 561/2004 Sb.* Retrieved 17. 4. 2009 from the Word Wide Web: <http://www.edu.cz/>
- Prukner, V. (2005). *Analýza vstupních motorických a somatických parametrů studentů tělesné výchovy, posouzení jejich vývoje a zhodnocení vztahů k výsledkům praktické části studia tělesné výchovy*. Disertační práce, Univerzita Palackého, Fakulta tělesné kultury, Olomouc.
- Przewęda, R., & Dobosz, J. (2003). Growth and physical fitness of Polish youth in two successive decades. *Journal of Sports Medicine and Sport Fitness*, 43(4), 465–474.
- Rychtecký, A. et al. (2006). *Monitorování účasti mládeže ve sportu a pohybové aktivitě v České republice*. Praha: Univerzita Karlova.
- Sak, P., & Saková, K. (2004). *Mládež na křižovatce. Sociologická analýza postavení mládeže ve společnosti a její úlohy v procesech evropeizace a informatizace*. Praha: Svoboda Servis.
- Svozil, Z. (2008). Evaluace vybraných aspektů profesní přípravy studentů učitelství. In H. Klimková (Ed.), *Sborník referátů z mezinárodního semináře „Pedagogická kinantropologie“* (p. 12). Ostrava: Ostravská univerzita, Pedagogická fakulta.
- Výzkumný ústav pedagogický. (2009). *Metodický portál. Rámcově vzdělávací programy*. Retrieved 17. 4. 2009 from the Word Wide Web: <http://www.rvp.cz/sekce/5>

VÝVOJ MOTORICKÉ VÝKONNOSTI U UCHAZEČŮ O VYSOKOŠKOLSKÉ STUDIUM TĚLESNÉ VÝCHOVY (Souhrn anglického textu)

VÝCHODISKA: Komplex sociálních změn, vzrůstající inaktivity a obezity a dalších negativních faktorů se dle našeho názoru přirozeně projevuje také ve změnách úrovně motorické výkonnosti budoucích vysokoškolských studentů. Dlouhodobý trend motorické výkonnosti proto považujeme za vhodný obraz současného životního stylu uvažované populace.

CÍL: Hlavním cílem této práce bylo popsat dlouhodobý trend dvou vybraných motorických předpokladů u populace uchazečů o vysokoškolské studium TV.

METODIKA: Soubor tvořilo 2 012 mužů a 1 705 žen (uchazečů o vysokoškolské studium TV) ve věku

Mdn = 19 let. Úroveň plavecké a sprinterské výkonnosti byla zjišťována dvěma motorickými testy (plavání 100 m a běh 100 m) u příležitosti přijímacího řízení v letech 1991 až 2001 a v roce 2006.

VÝSLEDKY: Ve čtyřech případech (dva motorické testy, dvě pohlaví) analýza ukazuje na nenulový trend výkonnosti (ve všech případech byl alespoň jeden meziroční rozdíl signifikantní na $p = 0,05$). V případě sprinterské a plavecké (pouze muži) výkonnosti vykazují polynomické funkce trendu v počátku konvexní, později konkávní průběh (změna průběhu v letech 1998–1999). Trend plavecké výkonnosti žen je rostoucí v celé periodě. Konkávnost polynomické funkce naznačuje možnost opětovného nárůstu výkonnosti, jež byla v období 1993–2001 (sprint) a 1996–1999 (plavání) převážně klesající.

ZÁVĚRY: Na základě našich zjištění zamítáme výzkumnou hypotézu a konstatujeme tak existenci významných změn v úrovni plavecké a sprinterské výkonnosti v průběhu sledované periody. Byl zjištěn pozitivní (ženy) a převážně pozitivní (muži) trend plavecké výkonnosti. Naopak sprinterská výkonnost nevykazuje čistě pozitivní či negativní tendenci. Po nárůstu výkonnosti v úvodních třech pozorovaných letech tato výkonnost převážně klesá. Přesto poslední měření v roce 2006 naznačuje možnou tendenci opětovného růstu sprinterské výkonnosti, podobně jako konkávnost trendové funkce v tomto období.

Klíčová slova: plavecká výkonnost, sprinterská výkonnost, dlouhodobé trendy, tělesná inaktivita, studium TV.

Mgr. Roman Cuberek, Ph.D.



Palacký University
Faculty of Physical Culture
tř. Míru 115
771 11 Olomouc
Czech Republic

Education and previous work experience

2000 – graduated in Mathematics and Physical Education high school teacher, Palacký University (Mgr.).
2007 – Ph.D. in the field of Kinanthropology, Faculty of Physical Culture, Palacký University.
2004–2009 – an assistant and academic worker of Department of Anthropomotrics and Sport Training, Faculty of Physical Culture, Palacký University, Olomouc, Czech Republic.

Since 2009 – a researcher and academic worker of Center for Kinanthropology Research, Faculty of Physical Culture, Palacký University, Olomouc, Czech Republic.

Scientific orientation

Motodiagnosics and data analysis in the field of Human movement.

First-line publications

- Cuberek, R. (2007). *Stav a vývoj motorické výkonnosti kandidátů vysokoškolského studia tělovýchovného zaměření v letech 1991-2001*. Disertační práce, Univerzita Palackého, Fakulta tělesné kultury, Olomouc.
- Cuberek, R., Měkota, K., & Zahradník, D. (2005). Secular trend of physical fitness and somatic development of forthcoming university students in Czech Republic. In F. Vaverka (Ed.), *Proceedings of 4th International Conference Movement and Health in Olomouc, November 23-25, 2005* (pp. 79-80). Olomouc: Univerzita Palackého.
- Lehnert, M., Cuberek, R., & Spišák, O. (2009). Hodnocení herního výkonu volejbalového družstva žen se zaměřením na útok ve vybraných utkáních bundesligy. In V. Süß, J. Buchtel et al. (Eds.), *Hodnocení herního výkonu ve sportovních hrách* (pp. 155-161). Praha: Karolinum.
- Měkota, K., & Cuberek, R. (2002). Změna úrovně plavecké a sprinterské výkonnosti kandidátů a kandidátek studia tělesné výchovy v odstupu 30 let. *Tělesná výchova a sport mládeže*, 12(2), 2-5.
- Měkota, K., & Cuberek, R. (2007). *Pohybové dovednosti - činnosti - výkony*. Olomouc: Univerzita Palackého.
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