SOMATIC ANALYSIS OF PE STUDENTS WITHIN A FOUR-YEAR RESEARCH PERIOD

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Modern theories and studies interpret sport performance as a defined system of elements which are characterized as components, determiners, factors, etc. Somatic factors concerning the support system are supposed to be a significant factor group. Body height, weight, length, width and circuit measurements belong to the group of somatic factors and they determine physical build (frequently characterized by a somatotype).

This paper deals with the physical build of 1st year PE students who can be considered a selected group of the population with a relatively large volume of physical activity. The research was carried out within the years 2001–2004, 265 students (166 men and 99 women) were included in a sample. Heath and Certer's method (Riegerová & Ulbrichová, 1993) was used to determine the somatotype.

As for average somatotypes, no significant differences concerning PE students were noted during the consequent years of research. The only exception was perhaps the endomorphic component which proved a distinctively downward trend (the value approached statistical significance at $\alpha = 0.05$).

PE students can be regarded as a group of the population with a large volume of physical activity, therefore a significant development of physical build as well as a somatotype reaching an optimum somatotype for PE students can be expected to be present (Riegerová & Ulbrichová, 1993). However, the measurements proved that students had fallen behind, especially in the mesomorphic component, which correlates with the population normative.

We do assume that our findings and results may prove a decreasing physical level and related somatic development in our population.

Keywords: PE students, somatotype, optimal somatotype, individual sportspersons, PE.

INTRODUCTION

Modern theories and studies interpret sport performance as a defined system of elements which are characterized as components, determiners, factors, etc. Somatic factors concerning the support system are supposed to be a significant factor group. Body height, weight, length, width and circuit measurements belong to the somatic factors and they determine physical build (frequently characterized by a somatotype).

As a variety of subjects taught at departments of physical education are practical disciplines, a certain level of sport efficiency is necessary and the PE students' performance and efficiency influence their success in their studies (Pavlík, 1999; Štěpnička et al., 1979).

Many previous studies have focused on this subject field (Belej & Gáborová, 1981; Riegerová et al., 1995; Štěpnička et al., 1979). The very last study was carried out almost ten years ago and other research studies are much older. Therefore we have decided to repeat the investigative research and find out whether there was a change in the somatotype of PE students in relation to the last measurements. As for the increased number of PE students admitted to Ostrava University who do not enter their studies (at the present time it concerns 20–25%, in previous years 5–8%) we have to accept students who passed the entrance exams, nevertheless their results are under average concerning the testing score of successful students. This situation leads to admitting such weaker students. Therefore we do assume that there have been changes in our students' somatotypes.

RESEARCH OBJECT

The aim of the project is to compare the state and quality of PE students' somatotypes in particular components regarding the healthy population as well as absolute values. The research was done within the years 2001–2004.

METHODOLOGY OF APPLIED PROCEDURE AND CHOICE OF GROUP

Group characteristics

The basic group consisted of all admitted students of physical education. Altogether 99 women and 166 men were included in the sample. The research was carried out within the years 2001–2004.

Procedure of measurements and applied methods

Measurements were carried out at the very beginning of each academic year, within a diagnostic week. Heath and Certer's method (Riegerová & Ulbrichová, 1993) was used to determine the somatotype. Measurements were realized by just one skilled trainer. The statistic analysis of received results was based on the analysis of variance by means of the SPSS product (research time period 2001–2004).

The standards index (Ni) Bláha et al. (1986) was applied to compare the average somatotype values of PE students (women) to the average values of women gymnasts at the Czechoslovak spartakiada (national gymnastics festival) whose values are usually used as a population normative.

RESULTS AND DISCUSSION

TABLE 1 refers to the development of average values regarding partial somatotype components and characterizes probability of test criteria F used for basic analysis of variance (ANOVA).

TABLE 1a
Average somatotypes of PE students and ANOVA results

Year of study	Endomorphic component		Mesomorphic component		Ectomorphic component	
	$(\bar{x})$	Ni	$(\bar{x})$	Ni	$(\bar{x})$	Ni
2001 (n = 39)	2.50	–0.57	3.70	–1.59	3.00	+0.46
2002 (n = 39)	2.50	–0.57	3.60	–1.70	3.10	+0.55
2003 (n = 40)	2.20	–0.85	3.80	–1.48	3.00	+0.46
2004 (n = 48)	2.10	–0.95	4.10	–1.17	3.00	+0.46
ANOVA Probability of **the F-test**		0.07		0.22		0.90

The value development of the endomorphic component is undergoing a downward trend, which proves the obvious comparison made within the years 2001–2004 (the value approached statistical significance at $\alpha = 0.05$). There is one question remaining: whether the decrease in the endomorphic component by half a point can distinctively improve sport performance and efficiency as well as increase the PE students' success in passing practical subjects of their study field.

The value development of the mesomorphic and ectomorphic components is obviously statistically of no importance. The mesomorphic component has gone up slightly, nevertheless the biggest difference noticed between the year 2002 and the year 2004 is, in neither case, of any importance. The ectomorphic component is of constant value.

The comparison concerning spartakiada gymnasts copies the development of individual somatotype components. Concerning the endomorphic component, the first group and the second group are characterized within the average, whereas the third group and the fourth group are below the average (a slight downward trend of endomorphy). In terms of the mesomorphic component of the first and the second group, the values are intensively below average as well as the third and the fourth group, which reach below average values (a slightly rising character of mesomorphy). The trend of the ectomorphic component is constant (as mentioned above) and the values of all groups have reached the average.

TABLE 1b
Average somatotypes of PE women students and ANOVA results

Year of study	Endomorphic component		Mesomorphic component		Ectomorphic component	
	$(\bar{x})$	Ni	$(\bar{x})$	Ni	$(\bar{x})$	Ni
2001 (n = 19)	3.4	–0.51	2.9	–2.67	2.8	+0.27
2002 (n = 19)	3.2	–0.68	3.6	–1.69	2.8	+0.27
2003 (n = 15)	3.4	–0.51	2.8	–2.81	3.1	+0.55
2004 (n = 46)	3.3	–0.60	3.1	–2.39	2.9	+0.36
ANOVA Probability of **the F-test**		0.91		0.22		0.67

The development of individual somatotype components is obviously of no importance as it was only in the results of the men (just the endomorphic component approached statistical importance). When comparing the individual grades there was no development trend among women students and the values are constant within the whole time period. To the contrary, there was a decreasing trend within the endomorphic component and downward significant trend within the mesomorphic component concerning the group of men students.

The comparison concerning spartakiada gymnasts copies the development of individual somatotype components. The values of all groups reach the average regarding the endomorphic component. The values of the mesomorphic component are intensively below average (the only exception is noted in 2002, where the value is

also below average). The values regarding the ectomorphic component of all groups reach the average.

The optimal somatotype for PE students has been specified by Štěpnička et al. (1979). The same values of somatotype components are recognized as optimal by Riegerová and Ulbrichová (1993).

The optimal somatotype for PE students is supposed to be the type of somatotype whose values of endomorphic component are <3 and of a mesomorphic component of >5.

TABLE 2a
Occurrence of optimal somatotype regarding PE study within the group of men

Year of study	Frequency of optimal somatotype occurrence	Occurrence of optimal somatotype (%)
2001 (n = 39)	6	15.38
2002 (n = 39)	5	12.82
2003 (n = 40)	6	15.00
2004 (n = 48)	5	10.41

TABLE 2a presents the number of male students whose optimal somatotype was found and proved. Obviously, the number of these male students concerning all groups is very low. From the global point of view the trend is constant (the occurrence is not higher than 16%).

The average values of the endomorphic component in all groups can be evaluated as optimal (they are not higher than 2.50 points). However, the average values of the mesomorphic component significantly fall behind the optimal values.

The optimal somatotype for PE students (women) is supposed to be the kind of somatotype whose values of endomorphic component are <3.5, while the mesomorphic component is dominant (or equals the endomorphic component within the limits of 3.5–4) and the ectomorphic component is not higher than 4 points.

TABLE 2b
Occurrence of optimal somatotype regarding PE study within the group of women

Year of study	Frequency of optimal somatotype occurrence	Occurrence of optimal somatotype (%)
2001 (n = 19)	3	15.78
2002 (n = 19)	4	21.05
2003 (n = 15)	2	13.33
2004 (n = 46)	7	15.21

TABLE 2b presents the number of women students whose optimal somatotype was found and proved. Obviously, the number of these women students concerning all groups is very low. From the global point of view the trend is constant (the occurrence is not higher than 16%). The only exception was in 2002 when an optimal somatotype had been noticed with 21% of the women students. The results concerning the women students correspond with the results concerning the male students (in whom the occurrence of optimal somatotype was not higher than 16%). The average somatotype values can be assessed as optimal in all groups (with values not higher than 3.5 points). However, the average values of the mesomorphic component are, in all monitored groups, not dominant, which is unsuitable in terms of the optimal somatotype. The only exception was in 2002. The average values of the ectomorphic components can be assessed as optimal (values not higher than 4 points). The results concerning average values of individual somatotype components with regard to optimal somatotypes for PE students correspond with the results concerning PE male students.

Here we are comparing the average values of somatotype components regarding our PE students with the results carried out by other authors.

TABLE 3a
PE male students

Monitored group	Endomorphic component	Mesomorphic component	Ectomorphic component
Pedagogical Faculty, Ostrava 2001	**2.50**	**3.70**	**3.00**
Pedagogical Faculty, Ostrava 2002	**2.50**	**3.60**	**3.10**
Pedagogical Faculty, Ostrava 2003	**2.20**	**3.80**	**3.00**
Pedagogical Faculty, Ostrava 2004	**2.10**	**4.10**	**3.00**
Pedagogical Faculty, Brno (Pavlík, 1999)	2.30	5.20	2.80
Faculty of Physical Culture, Olomouc (Riegerová et al., 1995)	2.20	5.10	3.20

The comparison of our results with the results carried out by Riegerová et al. (1995) and Pavlík (1999) leads us to a statement that the values of the endomorphic and the ectomorphic components do not differ distinctively. However, there were significant differences concerning the mesomorphic component. The values were by 1–1.5 points higher regarding the students from Olomouc and by 1.1–1.6 points higher regarding the students from Brno.

TABLE 3b
PE women students

Monitored group	Endomorphic component	Mesomorphic component	Ectomorphic component
Pedagogical Faculty, Ostrava 2001	**3.40**	**2.90**	**2.80**
Pedagogical Faculty, Ostrava 2002	**3.20**	**3.60**	**2.80**
Pedagogical Faculty, Ostrava 2003	**3.40**	**2.80**	**3.10**
Pedagogical Faculty, Ostrava 2004	**3.30**	**3.10**	**2.90**
Faculty of Physical Culture, Olomouc (Riegerová et al., 1995)	3.50	3.50	3.10

The values of the endomorphic and the ectomorphic components applied to our women students from Ostrava are almost identical with the values of women students from Olomouc. More significant differences were found within the mesomorphic component. The values concerning the women students from Ostrava were by 0.4–0.7 points lower (the only exception was in 2002).

The comparison of our results with the results carried out by Riegerová et al. (1995) and Pavlík (1999) leads us to a statement that the values of the endomorphic and the ectomorphic components do not differ distinctively. However, there were differences concerning the mesomorphic component. The students from Olomouc show a gain in values (men had higher values by 1.5 points and women had higher values by 0.5 points).

CONCLUSION

As for average somatotypes, no significant differences concerning PE students were noted during the consequent years of research and neither was any development trend proven.

PE students can be regarded as a group of the population with a large volume of physical activity, therefore a significant development of their physical build was observed, as well as a somatotype reaching an optimum for PE women students (Riegerová, 1994). However, the measurements proved that students fell behind especially in the mesomorphic component, which shows in the comparing with gymnasts (of the healthy population) who had taken an active part in the Czechoslovak spartakiada. The physical build of our students (students from the Ostrava University) is weaker. The occurrence frequency of students with an optimal somatotype can be characterized as very low in relation to all groups.

We do assume that our findings and results may prove a decreasing physical level and a related somatic development of our population as well as our students. The significantly lower value of the mesomorphic component of our students can be caused by the increased number of admitted students to university who do not enter their studies. This trend leads to a shift towards weaker students (see the introduction).

REFERENCES

Belej, J., & Gáborová, M. (1981). Motorika a somatický profil poslucháčov telesnej výchovy na pedagogickej fakulte UPJŠ v Prešove. In J. Riegerová (Ed.), *Sborník prací konference Osobnost učitele tělesné výchovy* (pp. 492–501). Olomouc: Univerzita Palackého.

Bláha, P. et al. (1986). *Antropometrie československé populace od 6 do 55 let.* Praha: Ústřední štáb Československé spartakiády 1985.

Dovalil, J. (2002). *Výkon a trénink ve sportu.* Praha: Olympia.

Pavlík, J. (1999). *Tělesná stavba jako faktor výkonnosti sportovce.* Brno: Masarykova univerzita.

Riegerová, J. (1994). *Studium změn somatotypu dětí v období puberty (longitudinální sledování).* Olomouc: Univerzita Palackého.

Riegerová, J., & Ulbrichová, M. (1993). *Aplikace fyzické antropologie v tělesné výchově a sportu (příručka funkční antropologie).* Olomouc: Univerzita Palackého.

Riegerová, J., Přidalová, M., Vařeková, R., & Vodička, P. (1995). Hodnocení tělesné stavby studentů 1. ročníku FTK UP. In J. Riegerová (Ed.), *Sborník II. celostátní konference v oboru zdravotní TV a funkční antropologie Diagnostika pohybového systému: metody prevence, primární prevence, prostředky pohybové terapie* (pp. 41–48). Olomouc: Univerzita Palackého.

Štěpnička, J., Chytráčková, J., Kasalická, V., & Kubrychtová, I. (1979). *Somatické předpoklady ke studiu tělesné výchovy.* Praha: Univerzita Karlova.

SOMATICKÁ ANALÝZA POSLUCHAČŮ TĚLESNÉ VÝCHOVY VE ČTYŘLETÉM SLEDOVANÉM OBDOBÍ

(Souhrn anglického textu)

Moderní pojetí interpretuje sportovní výkon jako vymezený systém prvků, které jsou označovány jako komponenty, determinanty, faktory apod. Velmi důležitou skupinou faktorů jsou faktory somatické, které se týkají podpůrného systému. Za somatické faktory považujeme tělesnou výšku, hmotnost, délkové, šířkové a obvodové

rozměry a z nich tedy plynoucí tělesnou stavbu (velmi často vyjádřenou somatotypem).

Příspěvek se zabývá tělesnou stavbou studentů oboru TV 1. ročníku, které můžeme považovat za selektovanou skupinu populace s poměrně velkým objemem pohybové aktivity. Šetření bylo prováděno v letech 2001–2004 a bylo do něj zařazeno 265 studentů (166 mužů a 99 žen). Pro zjištění tělesné stavby byl určován somatotyp podle metodiky Heath-Carter (Riegerová & Ulbrichová, 1993).

Při srovnání průměrných somatotypů studentů tělesné výchovy v jednotlivých letech jsme nezaznamenali významné rozdíly. Za výjimku můžeme považovat snad jen endomorfní komponentu u mužů, která měla výrazně klesající trend (hodnota se blížila k hranici statistické významnosti $\alpha = 0{,}05$).

Vzhledem k tomu, že považujeme studenty tělesné výchovy za selektovanou populaci s velkým objemem pohybové aktivity, předpokládali jsme u nich výrazný rozvoj habitu a typ somatotypu, kterým se většina přiblíží optimálnímu somatotypu pro studenty TV (Riegerová & Ulbrichová, 1993). Měření však ukázala, že studenti výrazně zaostávají především v oblasti mezomorfie, což ukazuje také srovnání s populačním normativem.

Domníváme se, že zjištěné hodnoty mohou vypovídat o klesající úrovni fyzického a s tím souvisejícího somatického rozvoje naší populace.

Klíčová slova: studenti TV, somatotyp, optimální somatotyp, sportující jedinci, TV.

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