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## **INTERRELATIONS OF PUPILS' PHYSICAL DEVELOPMENT, FUNCTIONAL CONDITION AND PHYSICAL COMPETENCE**

### **INTRODUCTION**

The improvement of the new generation's lifelong learning is impossible without a holistic perception of young person's psychic and physical actions and deep studies of psychophysical determinants in all stages of continuous education. Nevertheless, today this principle enters the physical education process at a very slow pace. This is the reason for an inadequate attitude of a large portion of the population towards physical activities and sport. Recently with the development of information technologies and with the increase of the schoolchildren's study load, children and youth spend more time sitting at the computer or doing homework, instead of in sports classes or other physical activities. Therefore it is not a wonder that due to lack of movement, a part of Latvian young people suffer from such problems as obesity, posture disorders, disorders of the cardio-vascular system, as well as different other health disorders caused by motionlessness and emotionally tight study regimen (Selga, Lāriņš et al., 2008). Sufficient physical activity and sound nutrition is essential for successful growth and development of one's organism (Rubana et al., 2008). Movements facilitate the development of the CNS' (CNS-central nervous system) regulative and coordinative mechanisms, as well as the activity of an organism's humoral regulation (Malina et al., 2004). In the inquiry about physical activities where physical activity is defined as any action that increases the frequency of heart and breathing and this activity lasts at least for 60 minutes, it was found out that 3.5% of schoolchildren had been inactive, 8% - had been physically active for one day, but the majority of schoolchildren had been physically active for more than two days.

Physical competence is applied as a competence that is expressed as a complex kinetic expression of movement literacy in the realisation of movement skills (Giles, 2000). Very often it is referred to as general fitness that is the foundation for further progressive development of school children.

Regular physical activity participation has been suggested to contribute to optimum growth and development (Malina et al., 2004), develop and maintain optimal

fitness and health (Armstrong and Welsman, 1997). The insufficient parameters of physical condition and health of Latvia secondary school pupils make it necessary to study the causes and work out strategies to improve pupils' health.

### **RESEARCH AIM**

To state the interrelations between the pupils' physical development, the parameters of the functional conditioning and the parameters of their physical competence. The research was carried out within the framework of the project „Implementation of sports education at school – to promote pupils' health in a long-term period in Latvia”.

### **METHODS**

Physical competence measured by physical performance tests: push ups against the bench (girls); pull-ups (boys); hanging from the lying position (girls); hanging with the arms bent (boys); sit-ups (the legs flexed, the arms on the chest) 30s; standing long jump; shuttle run 3 x 10 m; 30 m running; endurance run 6 min; bending while standing on elevation; Harvard Step Test, anthropometry, pulsometry, mathematical statistics.

### **SAMPLE**

12 Riga schools with 1170 pupils were involved, results of 697 pupils were analyzed: grade 6 – 371 (196 boys, 175 girls); grade 8 - 172 (83 boys, 89 girls); grade 11 – 154 (34 boys, 120 girls).

### **RESULTS**

A great dispersion of the results can be observed in all parameters of the pupils' physical development, the functional condition and physical competences, taking into account the pupils' age and gender. Mostly there are correlative connections between the parameters of the pupils' physical development, the functional condition and physical competences, and it shows the dependence of the physical competences parameters on pupils' peculiarities of physical development. As seen in Table 1, there are interrelations between grade 6 boys' parameters of physical development and physical competences ( $r_s=0.14 - 0.26$ ,  $p<0.01$ ), except for the results of the exercise – sit ups 30 s. There is weak correlation between the grade 6 girls' parameters of physical development and physical condition ( $r_s=0.15 - 0.29$ ,  $p<0.01$ ), except for the results of the exercises - push ups against the bench, standing long jump and shuttle run 3x10 m. The boys' results in standing long jump, 30 m run, 6 min endurance run and bending when standing on elevation correlate both weakly positively and weakly

negatively with load power in the Step test. There is positive correlation between all the girls' parameters of physical competence and load power in the Step test. The girls' results in hanging from the lying position ( $r_s=0.19$ ,  $p<0.05$ ), 30 m running ( $r_s=0.18$ ,  $p<0.05$ ), 6 min endurance run ( $r_s=0.19$ ,  $p<0.05$ ), bending when standing on elevation ( $r_s=0.17$ ,  $p<0.05$ ) correlate with pulse frequency after load in the Step test.

**Table 1.** Correlative connections between the parameters of the pupils' (grade 6) physical development (PD), functional condition (FC) and physical competence (PC)

PD/FC PC	PD Body mass (kg)	PD Height (standing) (cm)	PD Height (sitting) (cm)	PD Lower extremities: R (cm)	PD Lower extremities: L (cm)	PD Upper extremities: R (cm)	PD Upper extremities: L (cm)	FC Step test: load power (kg m/min)	FC Step test: pulse rate after load (bpm)
Hanging with bent arms (boys) (s)	,11	,13	,08	,17*	,17*	,14*	,14*	,04	-,09
Pull-ups (boys) (r)	,12	,13	-,03	,11	,11	,15*	,15*	,07	-,11
Standing long jump (boys) (m)	,19**	,25**	,08	,19**	,18*	,17*	,17*	,14*	-,11
Shuttle run 3x10 m (boys) (s)	,03	,05	-,03	,05	,04	,09	,09	,03	,01
30 m running (boys) (s)	,19**	,27**	,10	,23**	,23**	,26**	,25**	,21**	-,07
Endurance run 6 min (boys) (m)	-,23**	-,17**	-,03	-,07	-,06	-,17*	-,17*	-,18*	,01
Bending while standing on elevation (boys) (cm)	-,23**	-,21**	-,13	,00	,00	-,14*	-,15*	-,18*	,11
Push ups against the bench (girls) (s)	-,05	,11	-,03	-,02	,02	-,04	-,04	,72**	,15
Hanging from the lying position (girls) (r)	,04	,25**	,15*	,10	,05	,11	,10	,58**	,19*
Sit-ups (legs flexed, arms on the chest) (girls) 30 s	,12	,08	,19*	,11	,09	,09	,09	,22**	,13
Standing long jump (girls) (m)	-,03	-,02	-,09	,10	,11	,12	,11	,46**	,10
Shuttle run 3x10 m (girls) (s)	,03	,04	-,13	,01	,03	-,02	-,03	,37**	,08
30 m running (girls) (s)	-,09	-,16*	,15	,07	,10	-,01	-,01	,53**	,18*
Endurance run 6 min (girls) (m)	,14	,23**	,29**	,20**	,19*	,07	,09	,52**	,19*
Bending while standing on elevation (girls) (cm)	,11	,18*	,06	-,01	,02	-,06	-,06	,69**	,17*

\* Correlation is significant at the 0.05 level; \*\* Correlation is significant at the 0.01 level (2-tailed)

As seen in Table 2, there is weak ( $r_s=0.27 - 0.39$ ,  $p<0.01$ ) and medium correlation ( $r_s=0.51 - 0.63$ ,  $p<0.01$ ) between grade 8 boys' parameters of physical development and physical competences, except the results of the exercises – pull ups and bending while standing on elevation. There are weak ( $r_s=-0.22 - 0.36$ ,  $p<0.01$ ) correlative connections between the grade 8 girls' parameters of physical development and physical competence, except the results of the exercises – push ups against the bench, sit ups 30 s and bending while standing on elevation. The boys' results in hanging with bent arms, standing long jump correlate both positively and weakly negatively with load power in the Step test. There is negative correlation between the following girls' parameters of physical competence – 6 min endurance run and load power ( $r_s=-0.33$ ,  $p<0.01$ ), pulse frequency after load in the Step test ( $r_s=-0.52$ ,  $p<0.01$ )

**Table 2.** Correlative connections between the parameters of the pupils' (form 8) physical development (PD), functional condition (FC) and physical competence (PC)

PD/FC PC	PD Body mass (kg)	PD Height (standing) (cm)	PD Height (sitting) (cm)	PD Lower extremities: R (cm)	PD Lower extremities: L (cm)	PD Upper extremities: R (cm)	PD Upper extremities: L (cm)	FC Step test: load power (kg m/min)	FC Step test: pulse rate after load (bpm)
Hanging with bent arms (boys) (s)	-,31*	-,17	-,17	-,04	-,30*	-,33**	-,33**	-,27*	,13
Pull-ups (boys) (r)	,04	-,15	-,13	-,20	-,07	-	-,16	-	-
Standing long jump (boys) (m)	,51**	,52**	,22	,37**	,53**	,58**	,57**	,53**	-,08
Shuttle run 3x10 m (boys) (s)	-,16	-,22	-,63**	-,39**	-,57**	-,12	-,12	-,11	,05
30 m running (boys) (s)	-,09	-,16	-,37**	-,15	-,34**	,18	,22	-,05	-,01
Endurance run 6 min (boys) (m)	,07	-,06	-,19	-,15	-,02	,27*	,31*	,04	-,13
Bending while standing on elevation (boys) (cm)	-,09	-,05	-,02	-,03	,06	,12	,15	-,09	-,19
Push ups against the bench (girls) (s)	-,15	-,05	-,02	,09	,11	-,03	-,03	-,12	,07
Hanging from the lying position (girls) (r)	-,03	-,13	,10	-,27**	-,29**	,01	-,03	-,06	,10
Sit-ups (legs flexed, arms on the chest) (girls) 30s	,03	,09	,10	-,08	-,10	,01	,07	,08	,15
Standing long jump (girls) (m)	,09	,16	,16	,29**	,25*	,19	,15	,09	,18
Shuttle run 3x10 m (girls) (s)	,02	,04	-,30**	,03	,04	-,05	-,02	,02	-,07

30 m running (girls) (s)	,07	-,08	-,36**	-,17	-,19	-,08	-,03	,12	,12
Endurance run 6 min (girls) (m)	-,29**	-,22*	-,01	,07	,08	-,18	-,14	-,33**	-,52**
Bending while standing on elevation (girls) (cm)	-,01	,08	,12	,16	,13	,10	,14	,04	,05

\* Correlation is significant at the 0.05 level; \*\* Correlation is significant at the 0.01 level (2-tailed)

As seen in Table 3, in grade 11 there are weak ( $r_s=0.36 - 0.39$ ,  $p<0.01$ ) and medium close ( $r_s=0.43 - 0.58$ ,  $p<0.01$ ) correlations between boys' parameters of physical development and physical competences, except for the results in standing long jump. There is correlation ( $r_s=-0.25 - 0.29$ ,  $p<0.01$ ) and medium close ( $r_s= -0.40$ ,  $p<0.01$ ) between the grade 11 girls' parameters of physical development and physical competences, except the results of the exercises – push ups against the bench, shuttle run 3x10 m and bending while standing on elevation.

**Table 3.** Correlative connections between the parameters of the pupils' (form 11) physical development (PD), functional condition (FC) and physical competence (PC)

PD/FC PC	PD Body mass (kg)	PD Height (standing) (cm)	PD Height (sitting) (cm)	PD Lower extremities: R (cm)	PD Lower extremities: L (cm)	PD Upper extremities: R (cm)	PD Upper extremities: L (cm)	FC Step test: load power (kg m/min)	FC Step test: pulse rate after load (bpm)
Hanging with bent arms (boys) (s)	,19	,49**	,58**	,45**	,51**	,15	,14	,26**	-,09
Pull-ups (boys) (r)	,26	,46**	,56**	,48**	,57**	,15	,18	,58**	,13
Standing long jump (boys) (m)	-,09	,30	-,21	-,00	,00	,52**	,49**	-,41*	-,30
Shuttle run 3x10 m (boys) (s)	,13	,31	-,01	,10	,03	,32	,27	-,20	,36*
30 m running (boys) (s)	,39*	,24	,31	,36*	,44**	,30	,31	,19	,14
Endurance run 6 min (boys) (m)	,43*	,21	,50**	,50**	,54**	,30	,29	,17	-,08
Bending while standing on elevation (boys) (cm)	,32	,45**	,26	,21	,171	,39*	,33	-,39**	,79**
Push ups against the bench (girls) (s)	,12	,02	,16	-,09	-,06	-,05	-,08	-,42**	,96**
Hanging from the lying position (girls) (r)	,15	,11	,25**	-,04	-,05	-,11	-,10	-,01	-,40**

Sit-ups (legs flexed, arms on the chest) (girls)30s	,00	-,11	-,40**	-,24**	-,26**	-,03	-,04	,40*	,25
Standing long jump (girls) (m)	-,10	,18	,29**	,15	,15	,02	,04	-,13	-,13
Shuttle run 3x10 m (girls) (s)	-,01	-,04	-,15	-,12	-,10	,15	,09	,35**	-,36**
30 m running (girls) (s)	-,03	-,02	-,25**	-,03	-,06	,03	,01	-,03	-,16
Endurance run 6 min (girls) (m)	-,28**	-,09	-,02	,03	,01	,03	,02	,14	-,21*
Bending while standing on elevation (girls) (cm)	,11	,04	,07	,05	,06	-,00	-,04	-,48**	-,12

\* Correlation is significant at the 0.05 level; \*\* Correlation is significant at the 0.01 level (2-tailed)

The boys' results in hanging with bent arms, pull-ups, standing long jump, bending when standing on elevation correlate both weakly positively and weakly negatively with load power in the Step test. There is weak and medium positive and negative correlation between the following girls' parameters of physical competence – push ups against the bench, sit-ups (legs flexed, arms on the chest), shuttle run 3x10 m, bending while standing on elevation and load power in the Step test. There is high correlation between girls' pulse frequency after load in the Step test and push ups against the bench ( $r_s=0.96$ ,  $p<0.01$ ), hanging from the lying position ( $r_s= -0.40$ ,  $p<0.01$ ), shuttle run 3x10 m ( $r_s= -0.36$ ,  $p<0.01$ ) and 6 min endurance run ( $r_s= -0.21$ ,  $p<0.05$ ).

## CONCLUSION

1. Predominantly there are correlative connections between pupil's parameters of physical development, functional conditioning and physical competence that prove the dependence of the parameters of physical competence on pupil's peculiarities of physical development.
2. Results suggest that during puberty, the intensive development of the organism and individual differences of the pupils' physical development might have an impact on physical competence. A difficulty in evaluation of the effects of activity on indicators of health and fitness in pupils relates to the fact that the outcome variables change with normal growth and maturation. There is a need to select adequate exercises for ipsative evaluation of the effect of a physical activity promotion program at school on the national level.

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**ABSTRACT**

The aim of the research was to state the interrelations between the pupils' physical development, functional conditioning and the parameters of their physical competence. The research was carried out within the framework of the project „Implementation of sports education at school – to promote pupils' health in a long-term period in Latvia”. The research methods included physical competences testing, Harvard Step Test, anthropometry, pulsometry and mathematical statistics. 12 Riga schools with 1170 pupils were involved. Results: a great dispersion of the results is observed in all parameters of the pupils' physical development and physical condition. Mostly, there were correlative connections between the parameters of the pupils' physical development and physical competences, and it showed the dependence of the physical competences parameters on pupils' peculiarities of physical development.

*Key words: pupils' physical development, pupils' functional condition, pupils' physical competence*