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**INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES**<http://doi.org/10.5281/zenodo.912120>Available online at: <http://www.iajps.com>**Research Article****THE IMPACT OF LONG - TERM EXPOSURE OF STRESS
FACTOR ON ANTHROPOMETRIC MEASUREMENTS OF
SCHOOL CHILDREN'S****R.F. Nazmutdinov*, I.Kh.Vakhitov, G.S. Luchkin**Institute of Engineering, Kazan Federal University, Kremlyovskaya Street, 18, Kazan,
420008, Russia**Abstract:**

The features of the change in anthropometric measurements of schoolchildren of senior classes during the school year were studied. It was revealed, that stress factors did not exert significant influence on the growth rates of schoolchildren. The body length of children in 10 and 11 grades varied according to age norms.

At the same time, stress factors significantly influences the body weight of high school pupils. It was found, that in boys and girls in grade 11, the body weight increased from September to January, and then from February to May there was a steady decrease in body weight. In this case, in girls, weight loss was more pronounced.

It was revealed, that boys and girls in grade 10 had less pronounced fluctuations in body weight throughout the school year.

Keywords: *schoolchildren, body length parameters, body weight, stress factors, academic year.*

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INTRODUCTION:

Introduction to the education system of the Unified State Exam (USE) makes significant demands on the developing organism. S.M. Mironov is one of the USE opponents: "... I am a categorical opponent of the unified state exam in any form" [10].

"It is impossible to create a single educational standard for all minds" [11].

At the same time, Andrey Fursenko positively assesses the examination campaign: "It was the USE, despite all its shortcomings, for the first time revealed all the defects in the structure of education" [12].

Alexander Pochinok is sure, that the USE has more pluses than minuses [13].

Undoubtedly, the USE is a significant stress factor for a growing organism. There is a significant number of publications in the literature, the authors of which rightly point to the determining role of the USE in the development of stress, to the nature and severity of changes in physiological functions, caused by stresses [1, 2, 5, 9].

For emotional stress, the generalized distribution of sympathetic and parasympathetic excitations is characteristic, leading in some individuals to disruption of the cardiovascular system, in others to ulceration of the gastrointestinal tract [3, 4, 6, 7, 8].

Thus, leading experts do not have a common opinion on the impact and evaluation of the USE. Moreover, the question of the USE effect on the pupils' organism remains practically unexplored. In the available literature, we have not found works, devoted to the study of the USE impact on the developing organism. The peculiarities of changes in anthropometric measurements during the preparation for these examinations remain practically unexplored.

The purpose of the study was to study in dynamics the changes in the anthropometric measurements of schoolchildren of senior classes.

The tasks of the research:

- to study the changes in the body length of schoolchildren of senior classes;
- to analyze the changes in the body weight of children of senior classes.

METHODOLOGY:

The investigations were conducted among schoolchildren in grades 10-11, in the municipal budgetary general education institution "Smailskaya secondary school" in the Baltasinsky district, the Republic of Tatarstan. 39 pupils took part in the research. Children were conditionally divided into 4 groups:

The 1st group: girls in grade 10 (9 people);

The 2nd group: boys in grade 10 (10 people);

The 3rd group: girls in grade 11 (11 people);

The 4th group: boys in grade 11 (9 people).

All schoolchildren belonged to the main medical group (according to the state of health) and were under constant medical supervision.

Studies were conducted during the school year, i.e. From September to May.

OWN RESEARCH**COMPARATIVE ANALYSIS OF CHANGES IN BODY LENGTH OF BOYS IN GRADES 10-11**

Analyzing the results of the growth rates of body length in boys, studying in the 10th and 11th grades for the semesters, we found that:

- the increase of body length from September to January in boys of the 10th and 11th grades, were approximately equally pronounced.
- however, from January to May, the increase in body length of boys in grade 11 was slightly higher, compared with the increase in body length of boys in grade 10.

According to the results of investigations, the body length of boys in grade 10 for the whole academic year increased by 3.4 cm. The body length of boys in grade 11 increased by 3.6 cm during the academic year, which was 0.2 cm more, than the dynamics of body length change of boys in grade 10. Thus, during the whole academic year, the most pronounced increase in body length was found in boys in grade 11.(Table 1)

Table 1: Changes In The Body Length Of Boys In Grades 10-11.

№	Academic year (Months)	10 grade		11 grade	
		Body length (cm)	Difference (cm)	Body length (cm)	Difference (cm)
1	September	174,0±1,2	0	176,4±1,2	0
2	October	174,5±1,3	0,5	177,0±1,5	0,6
3	November	175,0±1,4	0,5	177,4±1,6	0,4
4	December	175,2±1,4	0,2	177,7±1,7	0,3
5	January	175,6±1,5	0,4	178,0±1,8	0,3
6	February	176,1±1,6	0,5	178,2±1,8	0,2
7	March	176,6±1,7	0,5	178,8±1,9	0,6
8	April	177,0±1,8	0,4	179,4±2,0	0,6
9	May	177,4±1,1*	0,4	180,0±1,1*	0,6

* - the difference is reliable in comparison with the initial values (P <0.05).

Table 2: Changes in the body length of girls in grades 10-11.

№	Academic year (Months)	10 grade		11 grade	
		Body length (cm)	Difference (cm)	Body length (cm)	Difference (cm)
1	September	160,8±1,1	0	162,9±1,2	0
2	October	160,9±1,1	0,1	163,0±1,2	0,1
3	November	161,1±1,2	0,2	163,1±1,3	0,1
4	December	161,2±1,2	0,1	163,2±1,3	0,1
5	January	161,4±1,3	0,2	163,3±1,4	0,1
6	February	161,5±1,3	0,1	163,3±1,4	0
7	March	161,6±1,4	0,1	163,5±1,5	0,2
8	April	161,7±1,4	0,1	163,5±1,5	0
9	May	161,9±1,5	0,2	163,6±1,6	0,1

* - the difference is reliable in comparison with the initial values (P <0.05).

COMPARATIVE ANALYSIS OF CHANGES IN BODY LENGTH OF GIRLS IN GRADES 10-11

Analyzing the results of the growth rates of body length of girls, studying in the 10th and 11th grades, for the semesters, we found that:

- the increase in body length from September to January in girls in grade 10 is 0.2 cm higher, than the body length of girls, studying in the 11th grade.
- also from January to May, the increase in body length of girls in grade 10 was 0.2 cm higher, compared with the increase in body length of girls in grade 11 (P <0.05).

The body length of girls in grade 11 increased by 0.7 cm for the entire academic year. The body length of girls in grade 10 increased by 1.1 cm for the academic year, which is 0.4 cm more than the change in the body length of girls in grade 11 (P <0.05). Thus, during the academic year, the most pronounced increase in body length, we found in girls in grade 10. (Table 2)

COMPARATIVE ANALYSIS OF BODY LENGTH CHANGES OF BOYS AND GIRLS IN GRADE 10

Comparing the results of the conducted studies, we found that in boys, studying in the 10th grade, the increase in body length from September to November was 0.9 cm higher than the growth in the body length of girls of the same age (P <0.05). From December to February, the increase in body length in boys also turned out to be greater by 0.7 cm, compared with the increase in body length of girls of the same age (P <0.05). Also, in boys in grade 10, the increase in body length from March to May is more intense by 0.8 cm, than the increase in body length of girls in grade 10. Consequently, in boys, studying in grade 10, the growth rate of body length was significantly higher, than that of girls of the same age.

The body length of boys in grade 10 for the whole school year increased by 2.3 cm, for girls of the same grade this increase was only 1.1 cm (P <0.05). (Table 3.)

Table 3: Changes in the body length of girls and boys in Grade 10.

№	Academic year (Months)	Girls		Boys	
		Body length (cm)	Difference (cm)	Body length (cm)	Difference (cm)
1	September	160,8±1,1	0	174,0±1,2	0
2	October	160,9±1,1	0,1	174,5±1,3	0,5
3	November	161,1±1,2	0,2	175,0±1,4	0,5
4	December	161,2±1,2	0,1	175,2±1,4	0,2
5	January	161,4±1,3	0,2	175,6±1,5	0,4
6	February	161,5±1,3	0,1	176,1±1,6	0,5
7	March	161,6±1,4	0,1	176,6±1,7	0,5
8	April	161,7±1,4	0,1	177,0±1,8	0,4
9	May	161,9±1,5	0,2	177,4±1,1*	0,4

* - the difference is reliable in comparison with the initial values ($P < 0.05$).

Table 4: Changes In The Body Length Of Girls And Boys In Grade 11.

№	Academic year (Months)	Girls		Boys	
		Body length (cm)	Difference (cm)	Body length (cm)	Difference (cm)
1	September	162,9±1,2	0	176,4±1,2	0
2	October	163,0±1,2	0,1	177,0±1,5	0,6
3	November	163,1±1,3	0,1	177,4±1,6	0,4
4	December	163,2±1,3	0,1	177,7±1,7	0,3
5	January	163,3±1,4	0,1	178,0±1,8	0,3
6	February	163,3 ±1,4	0	178,2±1,8	0,2
7	March	163,5±1,5	0,2	178,8±1,9	0,6
8	April	163,5±1,5	0	179,4±2,0	0,6
9	May	163,6±1,6	0,1	180,0±1,1*	0,6

* - the difference is reliable in comparison with the initial values ($P < 0.05$).

COMPARATIVE ANALYSIS OF BODY LENGTH CHANGES OF BOYS AND GIRLS IN GRADE 11

In boys, studying in grade 11, the increase in body length from September to November was 0.8 cm higher than the increase in body length of girls of the same age ($P < 0.05$). From December to February, the increase in body length of boys was greater by 0.6 cm, compared with the increase in body length of girls ($P < 0.05$). Also, in boys in grade 11, the increase in body length from March to May is more intense by 1.5 cm, than the increase in body length of girls of the same age. Consequently, in boys, studying in grade 11, the growth rate of body length was significantly higher, than that of girls of the same age. (Table 4)

COMPARATIVE ANALYSIS OF CHANGES IN BODY WEIGHT OF BOYS IN GRADES 10-11

Comparing the results of rates of weight gain in boys, studying in the 10th and 11th grades for the academic semesters, we found:

- an increase in body weight from September to January in boys in grade 11, was 1 kg more, than the body weight gains of boys in grade 10.
- however, from January to May, the increase in body weight of the boys in grade 11 was 0.7 kg less, compared with the increase in body weight in boys in grade 10 ($P < 0.05$).

The body weight of boys, studying in the 10th grade increased by 1.8 kg for the whole academic year. In boys in grade 11, the body weight for the academic year increased by 2.1 kg, which is 0.3 kg more, than the dynamics of changes in the body weight of boys in grade 10 ($P < 0.05$). (Table 5)

Table 5: Changes in the body weight of boys in grades 10-11.

№	Academic year (Months)	10 grade		11 grade	
		Body weight (kg)	Difference (kg)	Body weight (kg)	Difference (kg)
1	September	67,3±2,2	0	68,5±1,8	0
2	October	67,5±2,3	0,2	69,1±1,9	0,6
3	November	67,9±2,4	0,4	69,8±2,0	0,7
4	December	68,3±2,6	0,4	70,5±2,1	0,7
5	January	68,6±2,7	0,3	70,8±2,2	0,3
6	February	68,7±2,7	0,1	70,8±2,2	0
7	March	68,8±2,8	0,1	70,9±2,3	0,1
8	April	68,9±2,8	0,1	70,8±2,2	-0,1
9	May	69,1±2,9	0,2	70,6±2,1	-0,2

* - the difference is reliable in comparison with the initial values ($P < 0.05$).

COMPARATIVE ANALYSIS OF CHANGES IN BODY WEIGHT OF GIRLS IN GRADES 10-11

Analyzing the results of rates of weight gain in girls, studying in the 10th and 11th grades for the academic semesters, we found:

- an increase in body weight from September to January in girls, studying in grade 11, was 0.2 kg more than the body weight gains of girls in grade 10.
- however, from January to May, the increase in body weight of girls in grade 11 was 0.9 kg less, compared

with the increase in body weight of girls in grade 10 ($P < 0.05$).

According to the results of the research, the body weight of girls in grade 10 for the entire academic year increased by 1.7 kg. In girls in grade 11, the body weight for the academic year increased by 1.0 kg, which is 0.7 kg less than the dynamics of change in the body weight of girls in grade 10 ($P < 0.05$). Thus, during the academic year, the most pronounced increase in body weight, we found in girls, studying in grade 10. (Table 6)

Table 6: Changes in the body weight of girls in grades 10-11.

№	Academic year (Months)	10 grade		11 grade	
		Body weight (kg)	Difference (kg)	Body weight (kg)	Difference (kg)
1	September	52,4±1,2	0	54,4±1,4	0
2	October	52,6±1,2	0,2	54,6±1,4	0,2
3	November	53,0±1,3	0,4	54,8±1,5	0,2
4	December	53,1±1,3	0,1	55,2±1,5	0,4
5	January	53,4±1,4	0,3	55,6±1,6	0,4
6	February	53,5±1,4	0,1	55,7±1,6	0,1
7	March	53,7±1,5	0,2	55,8±1,7	0,1
8	April	53,8±1,6	0,1	55,7±1,7	-0,1
9	May	54,1±1,7	0,3	55,4±1,8	-0,3

* - the difference is reliable in comparison with the initial values ($P < 0.05$).

COMPARATIVE ANALYSIS OF BODY WEIGHT CHANGES OF BOYS AND GIRLS IN GRADE 10

Comparing the results of the rates of weight gain in boys and girls in grade 10 for the semesters, we found that, from September to January, the weight gain of boys was 0.3 kg more, than the increase in the body weight of girls ($P < 0.05$). From January to May, an increase in body weight by 0.2 kg was greater in girls in grade 10, compared to the increase in body weight of boys of the same grade ($P < 0.05$). Thus, the increase in body weight in boys in the first half of the year is greater, but in the second half of the year it is less, compared with the increase in the body weight of girls of the same age.

According to the results of the investigations, we found, that the body weight of boys in grade 10 for the whole academic year increased by 1.8 kg; for girls in the same grade this gain was 1.7 kg. (Table 7)

COMPARATIVE ANALYSIS OF BODY WEIGHT CHANGES OF BOYS AND GIRLS IN GRADE 11

In boys, studying in the 11th grade, the increase in body weight from September to November was 1.0 kg more, than the increase in body weight of girls of the same age ($P < 0.05$). From December to February, the increase in body weight in boys also was 0.1 kg more than, the increase in the body weight of girls of the same age ($P < 0.05$). Later in boys and girls in grade 11, from March to May, there was a decrease in body weight. In this case, in girls, weight loss was more intense.

Comparing the results of the rates of weight gain in boys and girls in grade 11, we found, that from September to January, the weight gain of boys was 1.1 kg more, than the gain in the body weight of girls ($P < 0.05$). In boys and girls, from January to May, the decrease in body weight was approximately equally pronounced.

According to the results of the investigations, we found, that the body weight of boys in grade 11 for the whole academic year increased by 2.3 kg; for girls in the same grade this gain was only 1.0 kg. (Table 8)

Table 7: Changes In The Body Weight Of Girls And Boys In Grade 10.

№	Academic year (Months)	Girls		Boys	
		Body weight (kg)	Difference (kg)	Body weight (kg)	Difference (kg)
1	September	52,4±1,2	0	67,3±2,2	0
2	October	52,6±1,2	0,2	67,5±2,3	0,2
3	November	53,0±1,3	0,4	67,9±2,4	0,4
4	December	53,1±1,3	0,1	68,3±2,6	0,4
5	January	53,4±1,4	0,3	68,6±2,7	0,3
6	February	53,5±1,4	0,1	68,7±2,7	0,1
7	March	53,7±1,5	0,2	68,8±2,8	0,1
8	April	53,8±1,6	0,1	68,9±2,8	0,1
9	May	54,1±1,7	0,3	69,1±2,9	0,2

* - the difference is reliable in comparison with the initial values ($P < 0.05$).

Table 8: Changes In The Body Weight Of Girls And Boys In Grade 11.

№	Academic year (Months)	Girls		Boys	
		Body weight (kg)	Difference (kg)	Body weight (kg)	Difference (kg)
1	September	54,4±1,4	0	68,5±1,8	0
2	October	54,6 ±1,4	0,2	69,1±1,9	0,6
3	November	54,8±1,5	0,2	69,8±2,0	0,7
4	December	55,2±1,5	0,4	70,5±2,1	0,7
5	January	55,6±1,6	0,4	70,8±2,2	0,3
6	February	55,7 ±1,6	0,1	70,8±2,2	0
7	March	55,8±1,7	0,1	70,9±2,3	0,1
8	April	55,7±1,7	-0,1	70,8±2,2	-0,1
9	May	55,4±1,8	-0,3	70,6±2,1	-0,2

* - the difference is reliable in comparison with the initial values ($P < 0.05$).

DEDUCTIONS

According to the results of our investigations, the stress factors have no significant effect on the body length parameters of schoolchildren of senior classes. The body length of children in 10 and 11 grades varies according to age norms. The values of the body length of schoolchildren of senior classes were less prone to psychological, emotional and other unfavorable factors. Long preparation for the Unified State Exam (USE) does not have a significant impact on the body length parameters of schoolchildren and these values are natural, steadily increasing. Consequently, the body length parameters in children of senior classes vary proportionally to the age norms.

Some other changes occurred in the values of body weight in schoolchildren of senior classes. In boys and girls, studying in grade 10, a significant increase in body weight was observed from September to January. Later, from January to May, the rates of body weight gain in these schoolchildren were less.

In boys and girls, studied in grade 11 from September to January, we observed a stable tendency to increase in body weight. However, further, from January to May, there was a significant decrease in the body weight of schoolchildren. In this case, the weight loss in girls was more pronounced.

Thus, schoolchildren in grade 11 have a decrease in body weight, most likely by virtue of influence of stress factors and increased psychological stress, due to the forthcoming of the date of Unified State Exam.

CONCLUSIONS:

1. In the schoolchildren of senior classes, the body length parameters do not undergo significant changes during the period of preparation for the USE. There is a consistent, steady increase in body length.

2. There is a decrease in body weight of schoolchildren in grade 11, due to the forthcoming of the date of Unified State Exam. Herewith, the weight loss in girls occurs much earlier and is more pronounced, than in boys of the same age.

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