Peculiarities of Sensory-Motor Response in Girls of 14-17 Years with Different Rates of Sexual Maturation

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Abstract

According to the rate of sexual maturation girls of 14-17 years (n = 137) were divided into three groups: girls with a normal rate of maturation (n = 90), those with an accelerated one (n = 30) and girls with retarded maturation (n = 17). Girls participated in the experiment on studying the influence of the sexual development rate on speed and qualitative characteristics of the sensory-motor response on visual and acoustic stimuli in a stochastic reflexometric program. Marked peculiarities of the performance of reflexometric tasks having fractal structure of interstimuli intervals were detected both in girls with an accelerated and retarded rate of maturation. More evident and significant differences were revealed in a complex task on visual differentiation. Its less qualitative performance was observed in girls with an accelerated rate of sexual maturation.

Keywords: Acceleration, Fractal Regimen of Stochastic Reflexometry, Retardation, Sexual Maturation, Teen Girls

1. Introduction

Adolescence is unique in its own way. It is the age particularly susceptible to the influence of social factors, largely determining the stage of life when completing the process of formation as the body and the whole person. At the same time, the rapid development and transformation of the individual is accompanied by significant qualitative morpho-functional changes the structure and functioning of the body and the Central Nervous System (CNS). In adolescence, the maturation is virtually complete for cortical and other structures responsible for the processes of perception, imagery processing and speech information and making decisions based on them.

However, the maturation of neuronal systems of the frontal cortex is not completed during adolescence and is extended to 20 years or 21 years, that defines the backlog regulation decision-making process and the formation of the control of their behavior. Specificity of cerebral provision for cognitive processes that require the participation of control and regulation, is manifested in adolescents not sufficiently that defines less flexibility in choosing the strategy of behavior, difficulty braking wrong answer and decision.

1.1 The Significance of the Problem

The central event in adolescence is certainly sexual maturation, which has a decisive influence on the entire body, including the Central Nervous System. Sex hormones, due to the wide dissemination of their receptors in the subcortical structures of the Central Nervous System,
have a formative influence on the organizing, structural and functional maturation of the brain. Effect of sex hormones on the structural and functional processes of the Central Nervous System dictates personality traits and behavior of adolescents, which is unpredictable, impulsive, reflective thinking and the weakness of voluntary control. All this manifests itself in sexual relationships of teens who represent a significant value in this age.

Girls have been known to reach sexual maturation earlier than boys, so it is girls to manifest many of the negative features of sexual maturation. In particular, an increase in the number of early sexual debut and, consequently, abortion, the weakening of the value of marriage and family relations, low reproductive culture. According to the literature, 25-35% of today's teenagers become sexually active at age of 15 and younger. At the same time a significant portion of women not using contraception, leading to an increase in the number of teenage pregnancies and sexually transmitted diseases.

This data obtained in previous studies by different authors, confirms the possibility of the negative role of accelerated puberty in preserving reproductive health of girls and their life script that emphasizes the possible negative role of accelerated puberty in preserving reproductive health of girls and their life scenarios. Significantly less is known about the manifestations of retardant maturing of adolescents in behavioral and sensory-perceptual activity, which is one of the objectives of our study.

1.2 Key Ideas and Hypotheses of the Study
It was found that in any sample of adolescent girls, there is the central tendency of the age of maturation, to which most of the girls belong. At that, a certain percentage is fixed of women with a higher rate of sexual maturation (age acceleration in general) and refers to the part of women to representatives of the sustained pace of puberty (age retardation in general). Teens with different rates of maturation characteristics and sexual behavior of adolescents, which is unpredictable, impulsive, reflective thinking and the weakness of voluntary control. All this manifests itself in sexual relationships of teens who represent a significant value in this age.

The article contains new materials that continue to study the effects of the fractal structure of sensory flows on sensorimotor reaction test as a specific theoretical model study of chaos and nonlinear dynamics in psychological systems. The novelty of the present work is related to the study of differential sensory-motor response of girls with different rate of sexual maturation. It is postulated that the qualitative and quantitative couples, sensorimotor reactions reflect the development of the cortical mechanisms of formation of motor reactions to dynamically organized visual and acoustic stimuli with fractal structure interstimulus intervals.

The following non-directional research verifies the hypothesis: different rate of sexual maturation of girls determines the characteristics of the formation of sensorimotor reactions fractal organized a series of visual and auditory stimuli, the maximum difference of the quality and speed of sensorimotor reactions in girls with different rate of sexual maturation occurs in complex tasks. Thus, the aim of the work is a comparative analysis of sensory-motor response of girls with different rate of sexual maturation in the case of a series of sensory dynamic organization. Implications work can be used in the development of coronary risk reduction of physical and mental health of girls, both acceleration and retardation of sexual maturation.

The theoretical value of the proposed experimental data related to the further study of the influence of stochastic structure of sensory dynamic flows on the accuracy and stability of sensorimotor reactions in the adolescent age.

2. Test Methods and Procedures
2.1 The Selection of Subjects
The experiment was conducted from 2009 to 2011 based on the Youth Centre “Rzhevka” (SHI PMP No. 68) of Krasnogvardeisky administrative district of St. Petersburg; it was attended by 136 girls from 14 to 17 years. The average age of girls was 15.3±0.7. Girls studying in high
Valentina Georgievna Kamenskaya, Yuliya Aleksandrovna Russak and Leonid Vladimirovich Tomanov

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3

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2.2 The Method to Detect Rate of Sexual Maturation for the Subjects

The result of collection and analysis of anamnestic data about the peculiarities of sexual maturing of the subjects (based on personal conversation with the experimenter each of the girls) divided the girls into 3 groups with different rate of biological, including sexual, maturation (Table 1). The main criterion was the division by age of onset of menstruation (menarche). Age at menarche is the most reliable biological indicators, based on which were considered by us the characteristics of the process of acceleration and retardation.

The mean age at menarche in the sample is 12.5±0.5 years. In addition, we took into account peculiarities of the formation of secondary sex characteristics (breast growth, growth of hair in armpits and pubic area and so on).

An important anthropometric index, which was also used in the fission of the sample into groups, is the index of "developmental distance" - that is, the rate of biological maturation of a human being, which are the primary indicators of weight and height. As a practical criterion for acceleration and retardation, A. E. Lichko proposed a deviation of 1 - 2 periods (chronologically 2 - 4 years) from the same for boys and in girls' standards. It is proved that the differences between the three groups is formed by the index “developmental distance” significant (for ϕ* - Fisher criterion), which confirms the validity of the division of subjects into three groups of biological indicators characterizing the rate of biological maturation (Table 1).

Statistical analysis of the results of the application of the two methods of determining the rate of sexual maturation has proved that the insignificant difference chronological age girls have significant differences in the age at menarche and significantly differ in the developmental course.

Thus, on the basis of two important exponent of biologists - the age at menarche and developmental distance test, the volunteers were divided into three groups: one group of girls with the accelerated rate of sexual maturation (30 persons), 2 group of girls at an average rate of sexual maturation (90 persons), 3 group of girls from a slower rate of sexual maturation (16 persons). Such a distribution of the number of subjects corresponds to the distribution of adolescents with different rates of maturation in the general population.

2.3 Operation Conditions of the Experiment

To investigate sensorimotor reactions of girls 14-17 years old with a different rate of sexual maturation, the authors used a computer program for complex reflexometry "Stochastic Reflexometer Time-test", (state

| Group | The average age of the subjects, years | The average age of menarche, years | Ontogenetic distance, years |
|-------|--------------------------------------|----------------------------------|-----------------------------|
| 1. Girls with the accelerated rate of sexual maturation | 15.40 ± 1.22 | 10.77** ± 0.43 | 4.63* ± 0.43 |
|       |                                     | t cr. = 3.37 | ϕ cr. = 2.46 | ϕemp. = 2.49 |
|       |                                     | temp. = 17.0, | at p ≤ 0.001 | at p ≤ 0.05 |
| 2. Girls with the average rate of sexual maturation | 15.21 ± 0.84 | 12.47** ± 0.50 | 2.74* ± 0.98 |
|       |                                     | t cr. = 3.39 | ϕ cr. = 2.34 | ϕemp. = 2.35 |
|       |                                     | temp. = 16.6, | at p ≤ 0.001 | at p ≤ 0.01 |
| 3. Girls with slower rate of sexual maturation | 15.56 ± 0.81 | 14.13 ± 0.34 | 1.44±0.51 |

Note:
**Differences in the data in the upper column is valid for the data in the lower column at t - Student test
* Differences in the data in the upper column relative to reliable data in the lower column on ϕ - Fisher criterion
registration number of the computer program and database: 2013613651 on April 11, 2013 and October 9, 2013621330 2013) developed by V. G. Kamensky, L.V. Tomanov and V. M. Uritsky. The principal feature of this program is its block structure, which allows specifying a combination of sensory stimuli of the visual and sound modalities with different temporal organization and the amount of interstimulus intervals.

Testing procedure was carried out as follows: a series of stimuli were presented subjects on the screen in the following sequence: speed series with the value of the fractal interstimulus interval - 1.0 s. (First series). Last, the second was the visual differentiation problem with interstimulus interval - 1.0 seconds.

We used a series of sensory stimuli with a short exposition of visual and acoustic stimuli (number of stimuli in the series is constantly equal to 64). Visual stimuli are represented by circles of red, blue, green with lined brightness; as an acoustic stimulus used filling horn with a frequency of approximately 900Gts, volume 60 dB and a duration of 100 ms. Stimuli with specific characteristics in the data series show the same amount of time - 16 and alternated randomly. The probability of each type of stimuli presentation same equal to 0.25. Stimulus series were characterized by fractal regime alternation interstimulus intervals equal to the fractal dimension of 1.34, which was reflected in the presence of long interstimulus intervals of correlation relations among themselves. A more detailed analysis of the characteristics of the fractal regime interstimulus intervals are listed in the following articles14,15,17 and and the monograph1.

In the first series the girl, according to instructions in response to each stimulus were to press the key “gap” as quickly as possible, i.e., from teenagers required speed sensorimotor reactions to all stimuli. Successful implementation of these tasks could only be in the event that was understood instructions, if she could keep it in memory and act accordingly throughout the entire series. In the last series were instructed not to respond by pressing a key on the red circle. The success of this more complex task dependent on the ability of a teenager for an urgent alteration of sensorimotor reactions and the formation of inhibitory responses, which is possible if the subjects have sufficient mental plasticity. These experimental conditions are available to adults who can perform this task with few errors - reactions pressing on the brake signal and a relatively short reaction time to the other stimuli14,18.

2.4 Registration of Indicators
Computer program in the on-line mode counting speed response to all visual stimuli and acoustic stimuli, in addition counted the average Time of Response (ToR) for all sensory stimuli taking into account the sign of reaction. In addition, we take into account the missing reaction to stimuli, the measure pass - this time values greater than 450 ms, during which the motor response was not registered. This measure has been established empirically based on previous studies14,15; the ToR is 450 ms latency exceeds the motor response in the case of a single presentation of visual and acoustic stimuli. In addition, the authors took into account the number of motor responses, leading localization stimulus on the time axis, the number of so-called false starts. The problem of differentiating counted as the number of erroneous reactions of the subjects in the form of clicking on the banned red light. In addition to these traditional parameters typical for most reflexometric methods, the program evaluates the parameter characterizing the degree of connectedness of individual stochastic motor reactions with each other, so-called Hurst index. According to the concepts by F. Feder13 in excess of the absolute value of the Hurst index value equal to 0.55, it is possible to talk about authentic connectedness of individual motor reactions to each other. The greater the absolute value of the index in the range of 0.55 - 0.75, the higher the coherence of the individual test reactions, the process is more organized sensorimotor responses.

2.5 Variables and Statistical Processing Method
As independent variables, there was used complexity of the problem in differentiating the series with a high rate of stimulus presentation) as well as the modality of stimuli (three types of visual and auditory one type). Dependent variables (features) were quantitative and qualitative characteristics of sensorimotor reactions and stochastic properties of the distribution of individual motor responses. The dependent variables are listed above under “Registration figures”.

We used methods of descriptive statistics, estimation of the arithmetic and Mean Standard Deviation (MSD). Differences signs of problems in the program were evaluated in SPSS app using Student t-test for dependent samples in the case of a normal distribution, as well as the corner of Fisher criterion - φ *. The structure of the
complexity of relationships and dynamic organized flow with the basic characteristics of sensory-motor response was assessed using regression analysis program SPSS (11-11.5) for Windows by main components (Rudkevich32).

3. Results

It was found that in the sample with respect to dysfunctional sexual behavior and health of girls attending special youth center “Rzhevka”, a pronounced heterogeneity of the sample rate of sexual maturation. Moreover, the most central group was presented with a standard rate of maturation; the minimum number of girls has a retardation of sexual maturation.

The general trend, detected when the high-speed series of fractal girls, a smaller value of the mean ToR to acoustic stimuli compared with the visual one (Tables 2 and 3), which is typical of adult subjects with standard intellectual development14,15,17. The percentage value of false starts, which is associated with the group average value of the response time to all stimuli, does not differ in the three groups of subjects close to the same values was manifested in adults. Here, there are number of missed responses determined by the rate of physical development: compared with the group with the regulatory development of accelerated girls and retardant girls admit no accident larger number of stimuli (Table 2).

Materials of Table 2 indicate that the fractal series with interstimulus intervals of 1.0 seconds is performed by retardant girls and girls with the normative rate of physical and sexual development with a significantly higher percentage of skipped reactions. At that, accelerated girls and girls with the normative rate of sexual maturation was significantly quicker to react to visual and acoustic stimuli compared with girls-retardants and the same number of false starts. Hurst index values in this group are minimal in the speed problem, just exceeding the threshold of correlation of individual motor reactions (Table 2). Despite the fact that women with a normative rate of sexual maturation and girls retardants have values of Hurst index higher, significant differences in the values of the index Hurst girls of three groups were obtained.

A certain pattern found in representatives of the third group of retardant subjects (Table 2). They react significantly slower than all the other girls in this relatively difficult situation because of the high rate of receipt of sensory information, but rather precisely and accurately, according to the number of inessential leading sensorimotor reactions and missed stimuli.

Significant changes of parameters of response were recorded when performing complex differentiating task. Quantitative and qualitative characteristics of sensory-motor response in a complex differentiated problem are given in Table 3.

Materials of Table 3 indicate lower quality performing this difficult task in comparison with the simple task of speed all the girls without exception, the complexity of which is not only fast paced flow of information, but

### Table 2. Mean group performance indicators for sensorimotor tasks in a high-speed fractal series

| Groups             | ToR to all stimuli (in ms) | ToR-color (in ms) | ToR-sound (in ms) | Breakaway (in %) | Gaps (in %) | Hurst Index |
|--------------------|----------------------------|-------------------|-------------------|------------------|-------------|-------------|
| 1. Accelerated maturation | 186,9±93,6               | 262,8±104,8       | 191,1±136,8       | 8±7,9           | 1,5**±2,5   | 0,59±0,08  |
| 2. Regulatory maturation    | 219,5±78,4               | 353,2±72,9        | 217,4±100,8       | 11±9,1          | 0,8±1,8     | 0,61±0,20  |
| 3. Slow maturation          | 325,44*±156,68           | 378,06*±64,26     | 327,28*±134,85    | 8±8,4           | 1,4**±2,8   | 0,61±0,05  |

Note:
* - The difference of the data in the group is not random with respect to the corresponding parameters in other groups at p<0.05 according to t - Student criterion
** - These differences in groups 1 (accelerated maturation) and 3 (delayed ripening) are valid with respect to the relevant parameters in group 2 (standard pace of ripening) at P<0.01 for the F - Fisher criterion.

Explanations:
1) The value of criterion $F_1 = 3.00$, $p<0.01$, while $F_{table} = 1.28$; $F_2 = 1.67$, $p<0.01$, while $F_{table} = 1.64$, therefore, the difference in the variability of false starts in the experimental (1.3) and control (2) groups of subjects can be considered significant.
2) The value of criterion $F_1 = 1.88$, $p<0.01$, while $F_{table} = 1.28$; $F_2 = 1.75$, $p<0.01$, while $F_{table} = 1.64$, hence the difference in the gaps in the experimental variability (1.3) and control (2) groups of subjects can be considered significant.
also the need to brake the sensorimotor response to one of the stimuli that had previously been exciting. This task requiring from girls high capacity for fixed-term retraining sensorimotor response, characterized by a substantial and significant increase in the number of missed stimuli, reduced the value of the index Hurst, reduce the speed of response to visual and acoustic stimuli in comparison with the simple task of high speed, regardless of the rate of sexual maturation.

It is noted that a single component - the number of erroneous reactions inhibitory stimulus - red circle has a magnitude that exceed adult samples (ranging from 3 to 6 errors)\(^{14,15}\). Moreover, accelerated girls with sexual development when compared with the standard group made the maximum number of errors and the girls with sexual maturation retardation (Table 3). These inter-group differences were significant at \(p = 0.01\) (angular Fisher test). The number of false starts has changed in the task of differentiating all the girls inconsequential way.

It should be noted that the performance of complex reflexometric tasks is accompanied by worst performance among girls with accelerated physical and sexual maturation. They show the maximum number of errors and the lowest connection sensorimotor reactions with each other, as the Hurst index in this group has a minimum value.

Speed parameters differentiating performance objectives compared with the same speed characteristics perform a simple task fractal with interstimulus intervals of 1.0 seconds.

We tested three groups of latency sensorimotor reactions to visual stimulus are of the nature of the changes in the task of differentiating the average group ToR increases. Less noticeable increase in the time characteristics in a group of girls from a slower rate of physical maturation (32 ms). The maximum extension of the latent period in the visual stimulus was found in girls with statutory rate of sexual maturation (74 ms). The average value of the group ToR to an acoustic stimulus is more complex dynamics in the three groups. BP recorded an increase in the sound in the two groups (with standard and accelerated maturation), the girl with the accelerated rate have a significant increase in the problem of differentiating ToR for 173 ms compared to the speed. The girls with the retardation of sexual development problem in differentiating ToR to an acoustic stimulus is reduced by 54 ms compared to the speed problem.

Consequently, girls with slowing sexual maturation difficult task has not caused a significant reduction in the quality of its performance and reducing processing speed. Accelerated subjects accomplish this difficult task much worse than the other girls do. Thus in this situation, only they have significantly longer fixed latency response to auditory stimulation when compared to visual stimuli. Based on these facts, we can conclude that the mechanisms of sensorimotor integration girls accelerated sexual maturation has features of an age of immaturity manifests itself in underdeveloped unnecessary braking motor reactions, functioning on the basis of the frontal-motor communication systems.

Thus, the maximum difference in the sensorimotor response of girls surveyed three groups were obtained by differentiating difficult task. The connection of different quantitative and qualitative characteristics of sensorimotor reactions to the rate of sexual maturation was verified using regression analysis. Material of this analysis shows that only the number of errors in this difficult task

### Table 3. Mean group performance indicators sensorimotor tasks in differentiating series

| Groups | Series title                                      | (in ms) | ToR-color (in ms) | ToR-sound (in ms) | Errors | Breakaway (in %) | Gaps (in %) | Hurst Index |
|--------|--------------------------------------------------|---------|------------------|------------------|--------|-----------------|-------------|-------------|
| 1      | Differentiation problem with interstimulus intervals of 1.0 seconds | 222.5   | 332.5*           | 364.60           | 11***  | 7               | 15.6        | 0.49±*      |
|        |                                                  | 33.1    | 91.1             | 59.5             | 2.8    | 2.5             | 5.4         | 0.07        |
| 2      |                                                  | 208.2   | 427.6            | 272.80*          | 6      | 10              | 14.2        | 0.56±       |
|        |                                                  | 84.05   | 55.1             | 105.2            | 3.7    | 8.1             | 4.6         | 0.06        |
| 3      |                                                  | 253.50* | 410.25*          | 273.75           | 7      | 9               | 14.8        | 0.52±       |
|        |                                                  | 71.45   | 53.79            | 80.75            | 4.5    | 8.1             | 5.8         | 0.09        |

Note: * - these differences are not accidental in the group with respect to the relevant parameters in the other groups a \(p<0.05\) according to \(t\) - Student criterion; ** - The difference of the data in the group is not random with respect to the corresponding parameters in other groups at \(p<0.05\) according to \(t\) - Student criterion *** - The difference data in the group 1 are valid with respect to the corresponding parameters in the group 2, with \(p<0.01\) for \(F\) - Fisher criterion

**Explanations:**
1) The value criterion \(F = 1.83, p<0.01\), while \(F_{Table.F} = 1.28\), therefore, the difference in the variability of errors in the group of accelerated girls (1) and control (2) groups of subjects can be considered significant.
significantly associated with the rate of sexual matura-
tion. Table 4 shows the parameters of the linear regres-
sion equation.

The material in this table indicates that 14.8% of the
variance of errors in differentiating the problem due to the
influence of rate of sexual maturation. It suggests varying
degrees of maturity and inhibitory responses from to-
motor systems in girls with different rate of sexual matu-
ration in girls are the least mature with acceleration.

4. Discussion

A common fact discovered when the fractal-speed series
all girls, is the smaller value of the mean ToR to acoustic
stimuli compared with the visual that was shown earlier
in the works carried out on adult subjects\textsuperscript{14,15}.

It is worth noting that even the high-speed perfor-
mance of the task of simple series of short interval between
stimuli is tested for certain complexity, but the latter has
a maximum difficulty differentiating motor response
inhibition task to one of the visual stimuli. A signifi-
cant impact of this problem is on the quality parameters
of sensory-motor response. All the groups showed the
increased the number of missed stimuli compared to the
high-speed challenge with the same interstimulus inter-
vals and decreased the index Hurst, reflecting the degree
of connectivity between individual responses. These facts
confirm the previously discovered evidence of deteriora-
tion in the quality of sensory-motor response at compi-
lcation dynamically organized problem\textsuperscript{1,14,15}.

Degree of difficulty of the problem is reflected in the
quantitative characteristics of sensorimotor reactions.
The girls of the two groups (with acceleration and regu-
laratory development) to sensory stimuli, ToR increases
while maintaining and longer latency to visual stimuli.
However, accelerated girls showed sensorimotor integra-
tion features that are characteristic of young children with
developmental disorders of speech: ToR to the sound is
bigger than ToR to the light\textsuperscript{16}. These girls are different
from the rest of the participants of the experiment the maximum number of error responses to the forbidden
red circle, which is a braking problem differentiating
stimulus. Another dynamics is observed in retardant girl,
in their task of differentiating the average response time
to the sound of 54 ms less than the speed at insignificant
increase Leading reactions than is usually explained by a
short ToR to acoustic stimuli\textsuperscript{14,15}. However, they are signi-
ficantly slower to react to visual stimuli than girls with
the development of the regulatory option, which is prob-
ably indicative of disharmonious formation of perceptual
processes. The number of erroneous reactions of the girls
with maturation retardation is the same as in the group
with standard biological maturation.

However, regression analysis indicated that only the
number of errors in complex problem differentiating sig-
nificantly correlated with the rate of sexual maturation.

Thus, we have proved the specific features of sen-
sory-motor response in girls with different rates of
sexual maturation, most notably in the complex task of
differentiating.

The facts stated in the article, lead to the conclusion
that the causes of the negative health and social effects
are not only social but also biological nature. Acceler-
ated girls exhibit a pronounced desynchronization of
maturation, mature reproductive system is combined
with immature behavior and control mechanisms of any
control over it. Similar manifestations of early sexual
maturation are observed in clinical studies\textsuperscript{6,8,21,22}.

However, the results of clinical studies in smaller
groups of girls with sexual maturation retardation also
show some of the negative features of sexual behavior and
its consequences. Significantly smaller proportion of girls
compared to accelerated sexual maturation starts having
sex before 15 years, this group also recorded some births
and abortions. The most intact reproductive health is
noted in the group of girls with a standard rate of sexual
maturation. It is possible that these characteristics are
related to sexual behavior among girls – retardants with
unfavorable social situation of development, which signif-
icantly affects the behavior during adolescence\textsuperscript{2,5,9,12,18,20}.

Thus, marked deviation of sexual maturation, even
though they have different physiological manifestations

| Dependent variable          | R  | R²  | F     | p    | B       | β     | t    |
|-----------------------------|----|-----|-------|------|---------|-------|------|
| The number of errors in     | 0.385 | 0.148 | 23.348 | 0.000 | 12.415  | -0.385 | 10.857 | 4.832 |
| differentiation series      |    |     |       |      |         |       |      |      |
at the level of organization of sensorimotor reactions requires psychological and special education in the case of a negative scenario, the life and health monitoring of reproductive health.

5. Conclusion

In conclusion, we can formulate the following:

- Heterogeneity of sample of girls 14-17 years old is confirmed, which recorded three groups according to the tempo of puberty: girls with normative rate (90), a girl with a slowdown in sexual maturation (16 people) and women with sexual maturation (30).

- Quantitative parameters of high-speed performance of the task do not differ in groups of girls with the accelerated and normal rate of sexual maturation. The number of missed responses is determined by the rate of physical development: compared with the group with the regulatory development of girls with accelerated maturation and girls retardant maturation passed not by chance more and more stimuli.

- Performing simple tasks characterized by maximum specificity girls sustained rate of sexual maturation: they react significantly slower on all sensory stimuli, but rather precisely and accurately, according to the number of inessential leading sensorimotor reactions and missed stimuli.

- The maximum difference in the sensorimotor response of girls surveyed, the three groups were obtained in the complex task of differentiating. Girls with the slow rate of sexual maturation showed that the complex tasks caused the least noticeable decline in the quality of its performance and reducing processing speed. Accelerated subjects performed considerably worse than this difficult task than the other girls, they have recorded the highest number of false responses to inhibitory stimulus. Thus in this situation, only their latency response to auditory stimulus is compared to visual stimuli.

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7. References

1. Aks DJ. Temporal and spatial patterns in perceptual behavior: implication for dynamical structure. Chaos and Complexity in Psychology. The Theory of Nonlinear Dynamic Systems; New York–Leningrad, 2009. p. 132–76.
2. Bayard RT, Bayard D. Your troubled adolescent: practical textbook for desperate parents. Moscow: Prosveshchenie; 1991. [In Russian].
3. Coates J, Gurnell M, Sarnyai Z. From molecule to market: Steroid hormones and financial risk taking. PhilosTrans R Soc. Lond Biol Sci. 2010 Jan; 365(1538):331–43.
4. Gogotadze IN. Retard of girls’ sexual development. (Differential tests of different pathogenetic modus and therapeutic method. St. Petersburg: LLC PK Gavanskiy; 2006. [In Russian].
5. Golovey LA. Ontopsychology – psychology of individual development. Psikhologicheski zhurnal, 2007; 28(5):61–9. [In Russian].
6. Gurkin Yu A, Suslopatov LA, Ostrovskaya EA. Basis of juvenility midwifery. St. Petersburg: Foliant; 2001. [In Russian].
7. Darinski Yu A, Skvortsova EI, Rudkevich LA. Evolutionary androgenital tendency as reflection of secularity trend. Vestnik Baltiyskoy Pedagogichesky Akademii. 2007; 73;78–80. [In Russian].
8. Dobriakov IV, Ilchenko VV. Psychosexual peculiarities of development and sexuality of youth girls with different sexual temp. Voprosi Psichicheskogo Zdorovia Detei i Podrostkov, 2005; 5(2):28–36. [In Russian].
9. Dubrovina IV. Personal form within time of adolescent to young. Moscow: Pedagogika; 1987. [In Russian].
10. Dubrovsinskaia IV, Farber DA, Bezrukikh MM. Psychophysiology of children. Psychophysiological basis of childhood valeology. Moscow: Vlados; 2000. [In Russian].
11. Dubrovsinskaia IV. Adolescent brain and behavior in sexual mature. Russkiy Ucheny; 2012. Available from: http://www.russianscienrist.jrg/files/archive/2012_DUBROVINSKAIA-28pdf [In Russian]
12. Enikeeva DD. Children and adolescent sexuality. Moscow: Eksmo; 2003. [In Russian].
13. Feder F. Fractals. Moscow: Mir;1991. [In Russian].
14. Kamenskaya VG, Dekhanova IM, Tomanov LV. Fractal traits of sensorimotor reaction as base of student cognitive activity. Psikhologicheskii Zhurnal. 2011; 28(3);78–82. [In Russian].
15. Kamenskaya VG, Dekhanova IM, Tomanov LV. Speed and stochastic parameter of sensorimotor reactions to dynamical regularity visual and acoustical stimuli. Psikholo-gichesky Zhurnal. 2011b; 32(3);78–82. [In Russian].
16. Kamenskaya VG, Melnikova IE. The growth anatomy, physiology, and hygiene. St. Petersburg: Piter; 2013. [In Russian].
17. Kamenskaya VG, Alekseeva EE. The correlation temperamental properties of persons with reaction time of nervous system. Psikhologichesky Zhurnal. 2013; 34(4):95–105. [In Russian].
18. Kon IS. Adolescent sexuality on threshold of XXI century. Social and pedagogical analysis. Dubna: Fenix+; 2001. [In Russian].
19. Kon IS. Sexuality and culture. St. Petersburg. SPbGUP; 2004. [In Russian].
20. Kolesov DV. Modern adolescent: growth and sex. Moscow: MPSI: Flinta; 2003. [In Russian].
21. Kulavski LA, Dautova RS. Medico-social aspects of reproductive health protection. Proceedings of the 4th Ros. Forum "Mother and Child' 02". 2002. Part. 1: p. 50–52. [In Russian].
22. Kulikov AV, Krotin PN, Panova OV. The pediatrician participation in reproductive health defense of children and adolescent. Farmateca dlya Practikuyushikh Vrachei. 2011. Available from: http://www. Pharmateca. Ru/ru?archive(article)8094 [In Russian].
23. Leontev AN. Activity. Conscience. Personality. Moscow: Nauka; 1975. [In Russian].
24. Lichko AE. Psychopathology and character accentuation of adolescent. Leningrad: Meditsina; 1983. [In Russian].
25. Luna B, Padmanabhan A, O’Hearn K. What has fMRI told us about the development of cognitive control through adolescence? Brain and Cogn. 2010 Feb; 72(1):101–13.
26. Luzan NV, Zaitseva EV. Sexual behaviour of modern adolescent: myth and reality. Novosibirsk: Sibirsky Khronograf; 1999. [In Russian].
27. Liavshina GKh. Children and adolescent education. Moscow: Dilya Publishers; 2003. [In Russian].
28. Medvedev VP, Kulikov AM, Chernova LA. Estimation of adolescent development: Study Guide. St. Petersburg: MedSU Publishing House; 1996. [In Russian].
29. Mikadze Yu V. Neuropsychology of childhood. 2009. Available from: http://www. Scorcher.ru/neuro/science/base/ch_ontogenesis.php [In Russian].
30. Miklashevskaya NN, Godina EZ. Russian children and adolescent growth processes at the North of European Part in Russia. Voprosy Antropologii. 1992; 86:53–70. [In Russian].
31. Nasledov AD. Mathematical methods in psychological study. Analysis and interpretation of data. St. Petersburg: Piter; 2004. [In Russian].
32. Rudkevich LA. Theoretical and experimental basis growth and differential psychosomatology [Extended abstract of Doctor's thesis]. St. Petersburg; 2000. [In Russian].
33. Rudkevich LA. Who is modern scholar? (Psychophysiological outlook on educational development). Vestnik Psikhologii Obrazovaniya. 2008; 3(16):12–7. [In Russian].
34. Russak Yu A. Species of sensomotor reactions of girls at 14-17 years old with different sexual mature temp. Izvestia Rossiiskogo Gosudarstvennogo Pedagogicheskogo Universiteta im. A.I Gerzena. 2009; 113:278–83. [In Russian].
35. Russak Yu A. Psychological and psychophysiological species of girls at 14-17 years old with different sexual mature temp [Extended synopsis from thesis of Candidate of Sciences]. St. Petersburg; 2011. [In Russian].
36. Schulz K, Molenda-Figueira H, Sisk C. Back to the future: The organizational activational hypothesis adapted to puberty and adolescents. Horm Behav. 2009 May, 55(5):597–604.
37. Skvortsova EA. Individual premises of gender forming at youth girls and boys 14-17 years old [Extended synopsis from thesis of Candidate of Sciences]. St.Petersburg: 2011. [In Russian].
38. Zvereva SV, Skvortsova EI. Psychological and psychophysiological peculiarities of young mail and woman with different degree of sexual traits. Psikhologiya Obrazovaniya v Polikulturnom Prostranstve. 2011; 27(1):47–55. [In Russian].