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The Psychological Health of Russian Students

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Annotation. The new concept of teacher education in Russia is intended to change the system of teacher training. Unfortunately, it is not based on knowledge of the psychological characteristics of today's students. In 2013-2015, we studied cognitive abilities, psycho-emotional portrait, psychosocial characteristics and psychophysical condition of students of teacher training institution of higher education. 466 students took part in our research: 331 females, 135 males. Pupillometry demonstrated that about 13 % of students had intensive, and 11,04% acute pathological fatigue, thus, a fifth of the surveyed needed rest and recovery. 17% of students showed the residual effects of resource loss. About 11-14% of the students had excessive, pathological neuroticism, anxiety, emotional impulsivity and

extraversion. The attention switching exceeded the age norm by one third. 13, 95% showed extremely fast switching, high distractibility, inability to concentrate on one thing, reduced ability to memorize and remember the information. The results can be connected with phenomena of digital dementia which means a deterioration in cognitive abilities caused by over-use of smart phones and game devices that hampers the balanced development of the brain. The results of study show the actual need of psychological support of the education process in higher educational institutions.

Keywords: psychological health; attention; working memory; cognitive control; digital dementia, internet-addiction, pupillometry.

Психологическое здоровье российских студентов

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Аннотация: Новая концепция педагогического образования в России призвана поменять систему подготовки учителей. К сожалению, она не опирается на знания о психологических особенностях современных студентов. В 2013-2015 г. нами было проведено исследование когнитивных способностей, психоэмоциональных особенностей, психофизического состояния, психосоциальных характеристик студентов педагогического вуза. Было обследовано 466 человек от 17 до 25 лет: 331 девушка, 135 юношей. У 12,9% обнаружен высокий нейротизм, истеричность, Безудержность реакции, снижение контроля было отмечено у 13, 73% испытуемых. Показатели

переключаемости студентов на 1/3 выше возрастной нормы. 13,95% имеют крайне быструю переключаемость - что свидетельствует о повышенной отвлекаемости, неспособности сосредоточиться, сниженных возможностях к запоминанию и сохранению информации. Полученные результаты могут быть проявлением «цифрового слабоумия» - нарушением когнитивных способностей, связанным с чрезмерным использованием смартфонов, игровых приставок и других цифровых устройств, и приводящим к нарушению в развитии мозга. Результаты исследования свидетельствуют о необходимости организации психологического сопровождения процесса обучения в вузе.

Ключевые слова: психологическое здоровье; внимание; оперативная память; когнитивный контроль; цифровое слабоумие; интернет-зависимость; пупиллометрия.

Since the collapse of the USSR, the Russian educational system has been in a situation of protracted reform, which is called modernization last years. In fairness, we have to notice that a similar process has a global scale today. One of the reasons might be the fact that modern society exists on the crest of the third (post-industrial or informational) wave of changes, which is associated with too many changes in too short period of time, according to the remarks of the sociologist and futurologist Elvin Toffler [Toffler, 2002]. Obviously education must play a huge role in society`s process of adaptation to change. We are talking about a new philosophy of education, the "education programs oriented to changes" or "preparing people for the future." Unfortunately, we have a lot of problems in this area which are caused by imbalance between the rate of changing of the environment and the limited speed of human response. A key figure in education was and still is a teacher. Teachers are responsible for training and educating the man of the Future, who will be capable to live in the information world according to its laws.

The problem of the quality of teacher’s training is the most discussed at all levels of social hierarchy today. The claims about future teachers are numerous: they do not master the methods of teaching, they know little about their own subject, they can not work with children who have 'special' educational needs. The question of so-called "double negative selection" is vigorously debated: according to opinion polls,

80% of the students have admitted that they enter teacher training faculties for the sake of getting a diploma of higher education. After the graduation only those, who cannot find a more suitable place of work, return the school. It is not possible to change this situation immediately. Any reorganization, modernization or development require time, material and intellectual costs.

The Ministry of Education and Science has prepared a project "Concept of supporting the development of teacher education", which aims to change the entire system of teacher training.

Professionals managers are well aware that this change is necessary to undertake, but it`s known that the results of every change are directly related to the knowledge of peculiarities of the people they have to work with. In our case we talk about students (the future teachers), responsible of the future of our country.

There is enough knowledge about the psychological characteristics of the kids. The complex changes in contemporary Childhood confront teachers, psychologists, educators and parents with a number of challenges [Feldshtein, 2011, p. 45-54]. The students` psychology has been studied much less.

In the 80s in scientific literature, a new term «a digital native» appeared. The term was proposed by Mark Prensky to name the children who had been born in the digital era and would not be able to (could not) imagine their life without digital media and communication. [Ershova, 2014].

Computers and the Internet have now become familiar learning tools, sources of information, entertainment and communication.

In our country there is increasing implementation of information technology in the educational process: interactive whiteboards, multimedia presentations and distance learning these are seen as instruments that improve the training activities and development of the child, who are surrounded by digital gadgets not only in school, but also at home.

Since September 2016 only the textbook which have free downloadable

electronic copy may be used in schools in the Russian Federation.

Meanwhile, in 2007, South Korean psychologists have found cognitive and emotional disorders in children and adolescents in their country that have been called «digital dementia». Note that South Korea – is a country which previously embarked on the path of digitization. Today, 83.8% of South Koreans have access to the Internet, 73% of Koreans have a smartphone (in the US - 56.4%, in Russia - 36.2%) [Spitzer, 2014]. At the beginning of March 2015, all news agencies released the news story about how the 12-year-old American twice tried to poison his mother because she didn't let him use his smartphone.

Digital dementia in children and adolescents is manifested in the following ways: as an attention disorder of (instability, high mobility, inability to concentrate), memory impairment, low cognitive control, depression. Moreover there are changes in the brain similar to those that occur after traumatic brain injury or early senile dementia. Experts explain the reason for such disturbance with the early interaction with digital technologies and new learning format, does not imply a deep analysis of information processing and memorizing material [Spitzer, 2014; Brod, 1984].

In 2012, we invited a group of first-year students (56 people) to participate in a study. They had to abandon the usage of computer, mobile phone, TV for a week. During this time they had to keep diaries twice a day (in the morning and in the evening) to measure their emotional state using the Personal Feeling Scales (of Wessman- Ricks). 24 students (16 girls and 8 boys) agreed to participate in survey, but 15 students declared its withdrew from the survey after 1 or 2 days of participation. The remaining nine participants (6 girls and 3 boys) - asked to complete the survey in 5 days instead of the original seven days. A steady decline of activity and mood by the 4th-5th day were observed in 3 students. 2 students had used their telephone once; two others could not give up watching TV and have increased watching TV time by 13% versus the usual time. On average, the students have increased their reading time by 11% and communication with friends by 13%. Two

participants noted that they had slept more. All students agreed that five days without digital devices was extremely difficult.

In 2013-2015, the Company conducted a comprehensive survey to study computer addiction and some aspects of mental health (status) of students. It was attended by 466 volunteers, whose average age was 19.7 years: 331 were girl and 135 were boys [Ershova et al., 2014]. Computer addiction was studied by Russian version of the questionnaire Chen (Chen Internet Addiction Scale (CIAS) in adaptation KA Feklisova, VL Malygina) [Maligin et al., 2011]. The questionnaire allows parallel measurement of specific symptoms of addiction, among which are: tolerance, withdrawal symptom, compulsion and psychological aspects of addiction: the ability to manage personal time and the presence of intrapersonal problems.

Cognitive, psycho-emotional features, psychophysical condition and psychosocial characteristics were performed with the usage of pupillometry «SSaS» («Sambon Stress and Soul»), developed by the South Korean company «Sambon Precision and Electronics Co., LTD», That allows the determination of the physiological and psychological characteristics of the subject for the reaction of the pupil to light flash.

It is known that the pupillography method (registration and analysis of a pupillary reflex - pupil reaction for light stimulus) allows us to find dependence of an examinee`s physical conditions and characteristics of his/her vegetative nervous system’s activity, i.e. common reactivity, speed of reaction, overall stamina, restoration ability of an organism after load [Minoru Nakayama et al., 2004].

Pupillography testing consists of:

- synchronous video registration of pupil reactions for supraliminal light stimulus (flash more bright than minimal for photoreaction) of both eyes;
- automatic processing of eye images and pupillogram building;
- computing of pupillographic parameters;

– interpretation of results.

Pupillograms are registered three times during the test. First and second registrations are made with a light stimulus of 3 LUX intensity and a 10 ms duration (it is weak flash). Third light stimulus has an intensity of 145 LUX and a duration of 30ms (strong flash). The duration of each registration is two and a half second (2,5). The flash is set off simultaneously for both eyes. Pupillogram's registration of both eyes is done synchronously with an accuracy of no more than 200 microseconds. The overall time of the procedure is about 3 minutes.

The method of "SSaS" is based on the analysis of three basic phases of pupillary reaction (fig.1):

1. Latent period: the time between the moment of the light stimulation and the start of the pupil constriction.

2. The phase of pupil constriction, reflects the condition of the parasympathetic nervous system,

3. The restoration phase reflects the condition of the sympathetic nervous system.

Figure 1. Pupillogram and its diagnostic criteria

Fig. 1 shows the following coordinates: x-axis (t) – time, axis of ordinates (R) - pupil size.

The figure denotes:

Alat - the initial radius of the pupil;

%Contr - dimension which characterizes the amplitude of pupil size constriction from the baseline in percent;

Tlat - the duration of the latent period of constriction of the pupil, i.e. the time that has elapsed between the light flash and the start of pupillary reaction (ms);

Para - the duration of the phase of the parasympathetic pupillary reaction (constriction of the pupil);

Plato - the duration of the latent period of the restoration of the pupil, i.e. time between the end of constriction of a pupil and the start of restoration of its size;

Symp - the duration of the sympathetic pupillary reaction phase (restoration of the pupil);

Cr70 - dimension characterize the amplitude of the reconstructed pupil size from baseline in percent;

Wide – width of pupillogram at a level of a half reduction which determines the activity of 2 phases of pupillary reactions: constriction and restoration;

UGlat - criterion of the activity of the pupil constriction - the acute angle between the line connecting the start point of the pupillary reaction with the middle of the "Plato".

Individual parameters of the pupillogram clearly correlate with the dynamic characteristics of the psyche, reflecting the temper of the person. Thus, the duration of the latent period of reaction (Tlat) is negatively correlated with the mobility of the fundamental nervous processes. Duration of the parasympathetic pupillary reaction phase (Para) and the magnitude of the reduction of the pupil (% Contr) are positively correlated with the reaction strength; speed reduction is also related to the pupil’s mobility of the fundamental nervous processes. Several other parameters also suggest that the asymmetry of the pupils, which covers the asymmetrical parameters of their reactions to light stimulus, indicate certain characteristics of the temper.

Asymmetry of pupillometric parameters reflects functional hemispheric asymmetry as well as persistent mental qualities inherent to temper, which may

manifest in various situations. This fact underlies the creation of a psychological portrait of a person on the basis of the pupillometry method. Depending on the pupillometric parameters values at certain parts of the pupillogram the states of the sympathetic and parasympathetic divisions of the autonomic nervous system (ANS) are determined differentially. This allows us to estimate a number of properties of the central nervous system and psyche, which are closely associated with ANS. Analysis of the psyche by the method «SSaS» is carried out by the interpretation of both the ANS state and hemisphere asymmetry according to basic understanding of them in modern psychophysiology. Thus, pupillogram analysis presents a concept of the psycho-emotional portrait of a human, which includes features of speech, thought, perception and attention. Quantitative nuances of psychological characteristics are determined by the gradation of pupillogram parameters.

The results obtained by means of pupillography give us the opportunity to detect psychological peculiarities among students, which are included the digital dementia symptoms:

- one third of students had a switching of attention above age norm, and 14% of students showed pathologically fast switching, accompanied by inability to concentrate on any concrete task;
- 44% of students showed a reduced ability to memorize information;
- 13% of students demonstrated high neurosis levels (emotional instability), 11.4% - hysterical, pathologically high excitability (strong, prolonged response for frustrative objects). On the emotional characteristics exceeded the norm in 36% of participants;
- 38% of participants showed abnormal self-control, inability to control mental activity, this may be treated as contra-indication for teaching;
- 14% of participants had intensive, and 11% pathologically big tiredness;
- 17% of students had residual effect of traumatization;
- 22% of students indicated excessive activity of nervous system, and activity of 27%

of students reached the pathological level.

At the next stage of the study in order to confirm the hypothesis about correlation of obtained abnormalities with excessive use of digital devices, we divided the participants into 2 contrasting groups: "addicted" (60) and "not addicted" (42 people) from the computer. The division was based on the CIAS questionnaire.

Comparison of the contrasting groups has revealed significant differences, some of which confirmed our hypothesis.

Differences (at trends) were found between groups in pupillometric parameters corresponding to the first response to weak flash, which is understandable: the reaction of the pupil to the first stimulus of the test depends on the sensitivity and skills (habit) to respond to unexpected stimuli. Whereas reaction to strong flash primarily indicates the presence of organic problems or intoxication, and then - the specifics of the cerebral hemisphere dominant, emotion and temperament. As the group consisted of the healthy young persons of the same age, the differences in the parameters of the weak flash are stronger (Table. 1):

Table 1

Differences in pupil reaction to weak flash between "dependent" and "independent"from the computer students (Independent-Samples t-test)

Pupillogram criteria	Mean "addicted"	Mean "not addicted"	t-value	df	p
Alat1	52,317	52,429	-0,133	100	0,895
Tlat1	17,067	18,226	-1,195	100	0,235
Amin1	49,650	49,476	0,199	100	0,842
Para1	18,996	17,869	1,069	100	0,287
Contr1	2,667	2,952	-0,825	100	0,411
UGlat1	82,708	81,583	1,477	100	0,143

– beginning of pupil reaction (Tlat) is faster in "addicted" group, i.e. they spend less time on information analysis and making decision: this is a consequence of a long

communication with computer (clip way of electronic information structure);

- activity (intensity) of reaction (UGlat and %Contr) is less in the "addicted" group, it is explained by gradual desensitization, a brain habituation to regular processing of irritants (information requests). "Independent" showed a clear and profound response to weak light flash (%Contr) - on a psychological level this is similar to the reaction of surprise caused by the unexpected stimulus, such depth of reaction provides stability and concentration;
- Differences were found in the proportions of the parasympathetic activity (contraction of the pupil) and sympathetic (recovery of the pupil) phases pupillary reaction (Wide). In the "addicted" group impulsiveness (convulsive, seizure, instability), which is a predictor of cognitive decline psychophysiological control, neuroticism and emotional instability were registered.

Difference in pupillometric parameters corresponding to the reaction for strong flash between two groups at the level of the trends was fixed (Table 2).

Table 2

Differences in pupil reaction to strong flash between "dependent" and "independent"from the computer students (Independent-Samples t-test)

Pupillogram criteria	Mean "addicted"	Mean "not addicted"	t-value	df	p
Alat Cr	52,142	52,381	-0,274	100	0,784
Tlat Cr	15,175	15,131	0,216	100	0,830
Para Cr	28,567	29,012	-0,703	100	0,484
Contr Cr	11,200	11,179	0,052	100	0,959
Uglat Cr	69,150	69,405	-0,473	100	0,637
UG40 Cr	81,717	81,762	-0,170	100	0,865
Cr70 Cr	72,037	71,449	0,345	100	0,731
Wide Cr	67,408	73,321	-0,254	100	0,800
b/a Cr	18,559	25,612	-0,291	100	0,772
%Contr Cr	21,591	21,574	0,019	100	0,985
Speed2 Cr	0,757	0,746	0,379	100	0,705
Plato Cr	24,917	25,369	-0,689	100	0,492
Anisocory	-0,200	0,286	-1,333	100	0,186
Exhaustion	2,317	2,238	0,176	100	0,861
Activity	2,917	2,548	0,811	100	0,419

Stress	5,233	4,786	1,086	100	0,280

- refocusing (Plato) occurs faster in the "addicted" (383 ms) as compared to "independent" (467 ms). It provoked an increased switching speed distractibility, inability to concentrate on one thing for a long time;
- During the reference time after the stimulus (via 1167 ms) pupil recovers better and faster (higher sympathetic activity) in "not addicted" group on average to 76% of its original size (which is higher than the average age of normal). In the "addicted» group the indicator is worse and equal 66%, which is below the age norm. During one-second pupils of "not addicted" recovered on average to 65%, of «addicted" on average to 56%.

The above figures indicate signs of exhaustion of the nervous system in "addicted", which is also supported by higher levels of stress: the degree of misbalance of pupillometry parameters in this group is at 10% higher than in " not addicted" group.

Another interesting point was the distribution of the types of hemispheric dominance in two groups. From the "addicted" group was created a separate (third) group ("completly addicted" on the computer) which consisted of 7 people with the highest performance on the Chen`s test. Analysis of the results, showed the same percentage of subjects with balanced brain activities. The percentage of subjects with left brain is inversely proportional to the level of addiction. In the group "completely addicted" there are not the left brain subjects. Feedback statistics observed for right brain subjects: their number increase from 24% in the "not addicted" group to 57% in the "completely addicted" group. These results indirectly confirm the negative impact of digital devices to cognitive abilities.

Thus, this study revealed the following features of digital dementia in addicted of digital devices students: memory deficits, attention disorders, emotional instability neurotism, mental exhaustion and high level of stress.

Of course, the result of our study may be explained no only by impact of digital environment but also by "fatigue of genes", and medicalization of children population. We know that 20% of Russian children have the minimal brain dysfunction and 26.5% -have disharmonious development (psychopathy) [Feldshtein, 2011].

The obtained data once again shows the need for psychological support of the learning process of students in high school, which have include an individual and group psychological assessment helping to understand and to take control of their own lives and behavior, arrange the priorities in life, to combine rationally the study and leisure time.

An essential condition of successful reforms of teacher education provides the inclusion in "Concept of supporting the development of teacher education " a block of psychological support of students. "Too many educational reforms are aimed at making education independent of the teachers. All the world's most successful educational systems are based on the opposite principle. They invest in teachers. The reason is that people achieve spectacular success when next to them are those who realize their talents, abilities, and associated with these potential difficulties [Robins et al., 2010, p. 347].

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