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SELF-REGULATION DEVELOPMENT AND THE INTERNET ADDICTION: AN EFFORT TO FIND THE CONNECTION

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Abstract

Self-regulation development is considered to be a complicated multi-level process occurring under the influence of various factors. Multiple studies are trying to explain the problematic Internet use from the point of view of self-regulation deficits, but they consider the situation here and now. The current study represents a part of a fifteen-year longitudinal research. It is aimed at establishing the connection between the self-regulation level in the age of 7-8 and 11-12 years and the characteristics of Internet pathological use in the age of 20-21 years. Self-regulation is considered from the point of view of three-level model introduced by Nikolaeva. At first, we compare the results of the neuropsychological tests with the level of learning motivation and academic results, in the age of 20-21 years the Meaning of the Life Orientations Test (MLOT), the Self-Regulation Profile Questionnaire (SRPQ) and the Chen Internet Addiction Scale (CIAS) have been used. Statistically significant differences in the CIAS indexes have been found out among the groups with different self-regulation levels. We have confirmed the connections between the self-regulation levels on each stage of the research but we cannot yet establish statistically significant connections between the results of the third stage with the results of the previous ones. However, we have groped for some tendencies to be confirmed in future studies. We presume that the three-level model of self-regulation could be a methodological basis for designing programs of psychological interventions for dealing with pathological use of the Internet.

Keywords: self-regulation, development, Internet pathological use, Internet addiction.

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1. INTRODUCTION

The individual system of self-regulation integrates dynamical and constant, conscious and unconscious structures of personality. Self-regulation development can be considered as a complex multi-level process occurring under the influence of various factors.

The self-regulation issues are being discussed by the researchers from various fields of psychology, but Nikolaeva's (1993, p. 80) approach introduces a common ground for different views on the problem of self-regulation. She considers self-regulation as "a system process providing an adequate changeability, flexibility of the vital activity of the subject on each of its levels". The three-level model of self-regulation includes the following levels (Figure 1):

The level of self-regulation of mental states. Its aim is keeping an optimal level of mental activeness, which is necessary for performing the activity;

The operational level, providing conscious organization and correction of the subject's actions;

The motivational level, which allows to understand the motives of the person's activity and opens the opportunity to be a master and creator of the person's life (Nikolaeva, 1993).

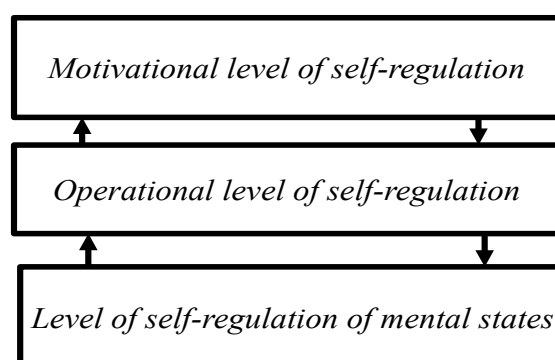


Figure 1. Three-level model of self-regulation.

According to Sultanova (2005), formation of the self-regulation systems begins during the prenatal period. A hazardous environment, high stress level of the expecting mothers, unjustified application of stimulation of birth activity and abdominal delivery can lead to injuries of sub-cortical structures, which are at that moment very sensitive to the harmful influences such as hypoxia, intoxication and other injuries (Sultanova, 2005). Sometimes the children undergoing light injuries of the central nervous system do not demonstrate pronounced neurological symptoms at the preschool age and the peculiarities of their behavior are easily explained by their individual traits. But, after the beginning of the school education the uncompensated defects of self-regulation development can prevent a child with intellect within the age norm from mastering learning activity and lead in

some cases to school maladjustment (Semenovich, 2002). Semenovich indicates that the “cerebral provision of the systems of self-regulation of an individual... is provided at the first place by the frontal structures of the brain” (Semenovich, 2002, p. 187).

In the first two steps of our research we tried to trace how the three levels of self-regulation interact with each other: which level is the leading one in a certain age and how the defects of the lower levels of self-regulation can be compensated spontaneously. We have started our study when the participants were 7-8 years as this is the age when the first term marks are obtained, and then made a follow-up in three-year period. Unfortunately, we did not have a chance to make a new follow-up when our participants were 17-18 years old and we had the opportunity to continue our research in their 21-22 years of age. At that moment, the Internet-related problems came into the focus of our research activity and we decided to include the diagnostics of problematic Internet behavior in the follow-up and to compare the results with the data of the first two stages.

The problem of pathological Internet use is one of the issues brought to our life by new technologies. Many researchers suppose the problematic use of Internet and a deficient self-regulation to be connected: in Billreux & van der Linden’s (2012) review we can find some of those approaches. But the most of the existing studies do not consider the aspects of self-regulation development; they focus on the situation here and now. Still, the predisposition to a non-chemical addiction is supposed to be formed in an earlier age and that justifies the importance of studying the connection between the self-regulation level and problems related to addiction to the Internet. Malygin et al. (2015b) have stated that the adolescents with the Internet-addictive behavior have the following characteristics from the neuropsychological point of view: they demonstrate a certain deficit of the stem and sub-cortical structures, which according to Semenovich (2002) can be marked as the deficit of involuntary self-regulation; also, the functions of their frontal lobes are underdeveloped, in other words, they have deficiency in voluntary self-regulation as well.

So, the comparison of the self-regulation characteristics defined in the neuropsychological research during the school years and the data of the same participants concerning their use of Internet obtained ten years later seemed to be a promising idea.

Thus, the current research aimed at establishing the connection between the self-regulation level in the age of 7-8 and 11-12 years and the characteristics of Internet pathological use in the age of 20-21 years.

2. MATERIALS AND METHODS

The research sample includes students of mass school in Moscow without severe somatic or mental diseases, related to three age groups:

First stage: 7-8 years old – 30 participants;

Second stage: 11-12 years old – 28 participants;

Third stage: 20-21 years old – 23 participants.

The major part of the original sample (83%) were from the 2nd form of the same school, 17% were recruited using the snowball sampling technique. The same people participated in the second and third stage of the research although their number slightly decreased as we lost connection with some of them.

According to the school results at the first two stages the participants are divided into two groups:

Successful students: good academic progress

Problem students: poor academic progress

The following research methods have been used at the first two stages: parents' structured interview; the Luria's neuropsychological battery of tests (Semenovich's adaptation) (Semenovich, 2002); methods for studying learning motivation according to the participants' age: Ginsburg's Technique of Studying Learning Motivation (Ovcharova, 1996) in the age of 7-8 years; in the age of 11-12 years Grebenyuk & Grebenyuk (2000) Scale of Learning Motivation has been applied.

The third stage includes Leontiev's Meaning of the Life Orientations Test (MLOT) (Leontiev, 2000) for studying the motivational level of self-regulation, Morosanova's Self-Regulation Profile Questionnaire (SRPQ) (Morosanova, 1998) for the operational level (further we use the index GLSR for the general level of self-regulation) and Chen Internet Addiction Scale (CIAS) in Malygin's adaptation (Malygin, 2011). The last instrument allows diagnosing the risk of Internet addictive behavior not just in the form of online computer games, but the addiction to the social media as well.

At each stage of the research, the sphere of self-regulation is considered from the point of view of the three-level model of self-regulation. The influence of the level of self-regulation of mental states (the first self-regulation level) and the motivational level (the third level) on the operational level of self-regulation (the second level) have been defined.

At the first two stages the comparison of the formal results of the learning activity with the degree of maturity of the first and the third levels has been carried out.

The standard method of the neuropsychological diagnostics allows estimating the level of self-regulation development. Firstly, such problems of operational level as praxis and gnosis are being diagnosed. At the same time, some non-specific characteristics can be defined. Such patho-phenomena as hyper- or hypotonus, synkineses; tics; plasticity or rigidity in the course of performing an action; attention fluctuations etc. represent the basal, unconscious level of self-regulation (Semenovich, 2002). That allows us evaluating the Index of Involuntary Self-Regulation (IISR). At the same time, whether a child is prone to simplifying the program; whether he or she follows the given instructions or impulsively starts performing the task; whether he or she is able to check the task performance and to correct it if needed – such facts can demonstrate the level of the voluntary self-regulation and this information is used for defining the Index of Voluntary Self-Regulation (IVSR) (Sedova, 2015). Further we refer to the results of the first stage as IISR1/IVSR1, whereas we use IISR2/IVSR2 for the second stage. Both indexes

have the inverse character: the lower is the index the higher is the corresponding self-regulation level.

In the follow-up, in the age of 20-21 we compare the results of studying the sphere of self-regulation (operational and motivational level) with indexes of the CIAS as well as the data of self-regulation level (SR-level) obtained at the first two stages.

We used the Spearman's rank correlation and Mann-Whitney U-Test for the statistical data processing.

3. RESULTS

3.1. The results of the first stage (age of 7-8 years)

The groups of successful and problem students have been compared by the indexes of voluntary and involuntary self-regulation (the IVSR and IISR). By using Mann-Whitney U-Test the statistically significant difference is obtained ($p \leq 0.001$). The distribution of the IVSR from a wider sample (Sedova, 2015) allows us marking out three levels of self-regulation development: high, medium and low. So, according to this data in the group of successful students three corresponded subgroups can be marked out.

There are students with good school progress having high and medium level of self-regulation. But the most interesting subgroup is the third one, where relatively good academic progress is combined with a low self-regulation level. The fact needed explanation, so we have included studying the parent-child interaction in the participants' families. The participants from this subgroup have the highest level of overprotection in the families compared with the other two subgroups. In the subgroup with a high IVSR all the participants have an adequate style of familial upbringing.

In the group of problem students there are only two subgroups: with a medium and low self-regulation level; there are no participants with a high self-regulation level in this group.

It should be mentioned that in the age of 7-8 years the majority of the samples have a high level of learning motivation, but it does not influence their school results: even if a child with a poor academic progress has a good motivation, the defects of the level of mental states self-regulation prevent him or her from achieving high results at school.

3.2. The results of the second stage (age of 11-12 years)

The results of the first follow-up show the improvement of the neuropsychological indexes which demonstrates functional development of the brain. The most pronounced results can be seen in children who has shown worse results at the first stage of research, so some defects of self-regulation have been compensated spontaneously. Another tendency which is clearly seen is a decay of learning motivation. In this age, we can observe the situation when the level of motivation influences the school results, i.e. operational level of self-regulation.

The best improvement we see in the participants whose parents have changed their style of upbringing from overprotection to the adequate style with balanced combination of rights and responsibilities.

As for the participants who have shown a paradoxical result: good school marks combined with a low level of self-regulation we can observe three outcomes. The first variant is seen when the parents change their way of treating the child and turn from the overprotection towards delegating the child some responsibilities. In this case even a shift from the low to a high level of self-regulation in the follow-up can be observed. The second situation supposes no change in the overprotection level: a child does not learn to control him or herself and the parent (or sometimes, grandparents) play the major part in the child's school activity. So, the school marks can remain good, and the self-regulation level is still low. The third variant is that the parents stop helping to the child with school tasks, but a low level of self-regulation prevents children from mastering learning activity and the school marks are getting considerably low in the follow-up, so the participants move from the group of successful students to the group of the problematic ones.

3.3. The results of the third stage (age of 20-21 years)

In the second follow-up, we do not use the neuropsychological methods as in this age they are not so informative in case we deal with normative development. So, we have studied the characteristics of operational and motivational level of self-regulation and have compared the results with the indexes, characterizing pathological use of Internet, regarding them as the problems of the first level of self-regulation.

In the second follow-up only 23 participants of the first sample have taken part. The first surprising result is that only five of them can be characterized as having a "minimal risk of Internet addictive behavior" according to the CIAS results. Three participants demonstrate the signs of Internet addiction. 62% of the participants demonstrate a tendency to forming addiction to the Internet. It means they have faced some problems connected with the pathological use of Internet: either compulsive or withdrawal symptoms or other difficulties. Paradoxically, 12 participants have a high level of self-regulation according to the Morosanova's Self-Regulation Profile Questionnaire. The distribution of the sample according to the index of addictive behavior is presented on the Figure 2.

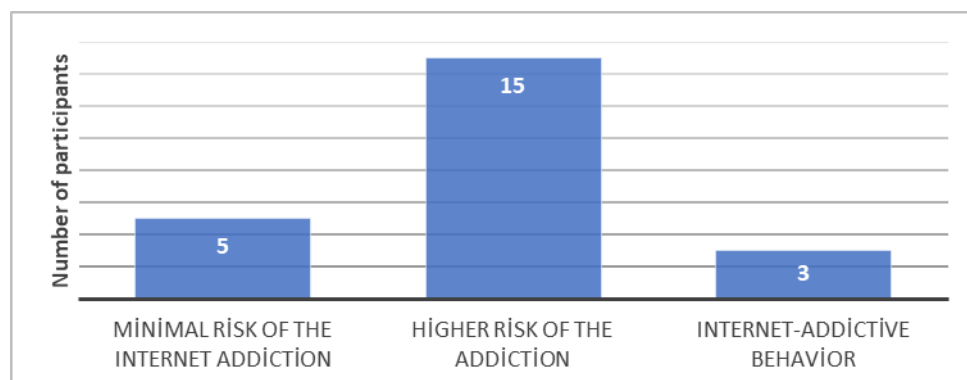


Figure 2. Distribution of the sample according to the CIAS indexes.

We have obtained the following statistically significant results. Mann-Whitney U-Test shows that there is a difference between indexes of CIAS in the groups with the medium and high GLSR indexes ($p \leq 0.05$): $U=6.60^*$; $p=0.013$. Then we have

analyzed the connections between different levels of self-regulation according to the three-level model. Coefficient of Spearman's rank correlation between the CIAS indexes and indexes of Life Values, obtained in the Leontiev's test MLOT is -0.425^* ; $p=0.043$. The statistically significant correlation between the second and the third level can be seen when we compare the level of self-regulation (high, medium or low) with the level of life values (also high, medium and low) ($p \leq 0.05$): $\rho=0.415^*$; $p=0.045$. We have found out that a statistically significant correlation between the indexes characterizing the first and the second level of self-regulation (indexes of the CIAS and GLSR) can be seen only for the high and medium level of GLSR ($p \leq 0.05$): Spearman's rank correlation coefficient is -0.477^* ; $p=0.033$; $N=20$.

Then we have compared the results of the first two stages with the characteristics obtained at the third stage. Table 1 shows the correlation coefficients between indexes of the CIAS and IISR/IVSR of the first and second stages. There are no statistically significant correlations.

| Index | Spearman's coefficient of correlation | Significance |
|-------|---------------------------------------|--------------|
| IISR1 | .125 | .569 |
| IVSR1 | -.068 | .757 |
| IISR2 | -.120 | .586 |
| IVSR2 | -.085 | .700 |

Table 1. Correlation between indexes of CIAS and the results of the first two stages.

So, we would like to focus on the qualitative analysis. As for the three participants with a pronounced pattern of the Internet addictive behavior, one of them has shown a low level of self-regulation level combined with good school results, although at this stage she demonstrates a medium level of self-regulation. Another participant in two first stages demonstrates the medium self-regulation level combined with poor academic results. The third case is the most interesting one as the participant always had good school results. At the first stage she belongs to a subgroup with medium self-regulation level, and in the age of 11 she even shows a high level.

Three of the participants with the minimal risk of Internet addictive behavior according to CIAS and having a high GLSR-level according to the SRPQ (the most favorable situation), show a medium SR-level combined with good school results at the first stage. The fourth participant shows very good dynamics in self-regulation development: in 8 years, she shows a low SR-level combined with good academic results, then at the age of 12 she still has good academic progress and the SR-level is medium for her age, and at the age of 21 she has a high operational and motivational SR-level.

Thus, we can see that the participants with a higher SR-level have lower risk of Internet addictive behavior at the second follow-up. Further analysis of some cases

can be helpful to find a connection between self-regulation development and addictive behavior.

4. DISCUSSION

In the context of current research, we would like to refer to the following main conclusions of the two first stages:

Three levels of self-regulations are connected with each other. Both upward and downward connections can be traced.

In the age of 7-8 years the leading role in the self-regulation process belongs to the level of mental states. In the age of 11-12 years the motivational level of self-regulation dominates.

The style of familial upbringing influences the process of self-regulation development. Let us focus on the results of the latest stage of research. First of all, it should be mentioned that when we started our research about fifteen years ago, we could not foresee the scale of the problem of the Internet pathological use we are facing nowadays. That is why at that moment we did not focus on predicting the addictive behavior in future, but we were trying to establish some patterns in self-regulation development regarding the learning activity. In the second follow-up, we made an effort to interpret those data regarding the Internet-connected problems of our participants. On the one hand, it represented a restriction of the current research: we did not have enough data concerning the young people with a pronounced pattern of the Internet-addictive behavior.

The small size of the sample can also explain the fact that a statistically significant correlation between the CIAS indexes and GLSR can be traced in the groups with the high and medium general level of self-regulation, but not in the group with the low level.

On the other hand, the results can be considered alarming: 62% participants of the sample do have Internet-related problem although not reaching the level of the addiction. Alongside with four participants with a high SR-level with a minimal risk of Internet-addictive behavior, we have found out six participants who show a high GLSR-level according to the SRPQ test, but still have the problems with the Internet use. We can interpret it in two ways. Firstly, those facts characterize an unstable situation: for the moment, the Internet-related problems do not have a sufficient impact on the operational level of the self-regulation, but under the influence of some circumstances the situation can change and in that case the self-regulation level would also decrease. The second possible explanation is that those participants have a pronounced inclination for forming Internet-addictive behavior, but the high level of self-regulation prevents them from serious problems in this sphere. It is characteristic that three of those participants have a very slight difference with a critical value (1-2 points) and the other three have the indexes in the middle of the range characterizing a higher risk of Internet addiction. We can suppose that for the first three persons our first explanation suits better and the second one explains the situation with the other three participants.

Analyzing the research results from the point of view of the three-level model, we can say that the statistical data confirm the connection between the

motivational and operational level of self-regulation (significant correlation between index LV calculated in the MLOT and the GLSR from the SRPQ test) as well as the connection and of the operational level and the level of self-regulation of mental states (by comparing the results of the CIAS and SRPQ). We also found out correlation between the motivational level and the level of the self-regulation of mental states.

Those conclusions can be regarded as the experimental confirmation of the theoretical model of self-regulation. The implementation of the model can may involve designing intervention programs. Based on the discovered connections, we suppose that influencing the motivational and operational level of self-regulation can improve the situation with the Internet-related problems.

The connection between a low motivational level and the risk of Internet addiction corresponds to the results of the research of Malygin et al (2015b). It has been shown that the adolescents with the Internet addiction have some differences in the sphere of life values comparing with their peers. The more pronounced symptoms of the Internet addiction they have, the sharper sense of emptiness and lack of fullness of life they feel and the less satisfied with their lives they are (Malygin et al, 2015a).

We can also trace some effects of the familial upbringing style in the results of the longitudinal research. There are participants showing sufficient progress from the first to the third stage of research: they have a low self-regulation level at the first stage, then the medium level in the first follow-up and the high self-regulation level in the second follow-up. Here we find some factors in the perinatal period, which could have influenced the defects of the self-regulation in the beginning of our research. Some of those defects have been compensated to the first follow-up, and at the third stage those participants show the high level of self-regulation. In those cases, a balanced system of rights and responsibilities of the child has been demonstrated in the parents' interview. Studying the biographical details of the participants we can see that both of them now have a relatively high level of self-independence for their age.

The opposite situation is observed in the families of the participants who demonstrate the pattern of Internet-addictive behavior. Thus, two participants with negative dynamics of the self-regulation level from the first to the second follow-up is from the family with a high level of overprotection. Those data are in concordance to the results of research (Smirnova, 2013; Makarova, 2021), emphasizing the influence of the familial upbringing on Internet-addictive behavior.

The statistically significant difference in the general level of self-regulation (GLSR) and characteristics of pathological use of the Internet correspond to the results of the studies (LaRose et al, 2003), indicating the connection between self-regulation deficient and Internet-addictive behavior.

5. CONCLUSIONS

The research has been carried out in the framework of the three-level model of self-regulation and the obtained data confirm the connections between the levels of the model. We have found out that the participants with high indexes of the motivational level of self-regulation have higher indexes in the operational level as well, and hence, have less problems related to the pathological use of the Internet. So, we have confirmed the interconnections between different self-regulation levels on each stage of the research but we cannot yet establish a statistically significant connection between the results of the third stage with the results of the previous ones.

Based on the discovered connections, we suppose that influencing the motivational and operational level of self-regulation can improve the situation with the Internet-related problems. We presume that three-level model of self-regulation could be a methodological basis for designing programs of psychological interventions for dealing with pathological use of the Internet.

Thus, the connection between self-regulation development and forming the Internet-addictive behavior still leaves many open questions. One of them concerns the connection between the style of parent-child relationship and forming a pathological use of the Internet.

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