Metacognitive Strategy of Students with Problematic Internet Use

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Abstract. The paper presents the results of a study of metacognitive strategies in students. The study found that students with normative internet behavior, with problematic internet use, and students with symptoms of Internet addiction are characterized by different level of such metacognitive strategies as Introspection, Quasi-reflection, Formulation of questions, Role-playing games. The conscious formulation of questions for filling the gaps in knowledge is typical for students with normative internet usage; Introspection, Quasi-reflection, Role-playing games - for respondents with problematic Internet use. It was revealed by factor analysis that non-constructive metacognitive strategies implying creating imaginary communication situations, focusing on one's own thoughts, fantasies, and problematic experiences are part of a unified symptom complex with symptoms of Internet addiction. The results can be applied in cognitive-behavioral therapy for problematic Internet use by developing constructive metacognitive strategies in students.

Keywords: problematic internet use, internet addiction, metacognitive strategy, metacognitive regulation, university student.

Introduction

University students can be perceived as a group of the most active Internet users nowadays. According to a number of surveys, the majority of students almost constantly use various types of mobile devices and gadgets for different types of online activities, such as search, communication, educational and creative activities, gaming etc. In this respect, the importance of study of the psychological consequences of students ' involvement in virtual interaction is increasing. One of these consequences is defined as a problematic Internet use – excessive non-functional involvement into the Internet communication, which implies long-term and systematic uncontrolled using of the Internet. Problematic Internet use is defined as a factor of risk of the Internet addiction. A significant number of studies of a problematic Internet use are currently being

implemented. However, the issue of its psychological mechanisms remains open. One of the promising area in solving this problem is the study of the characteristics of metacognitive regulation of behavior of Internet users ' as prerequisites for its problematic use. Particular relevance in this respect acquires the identification of metacognitive and reflexive strategies that mediate the normative or problematic character of Internet communication among the university students.

1 The Main Features of Problematic Internet Use of Students

The Internet usage is defined as an integral part of the daily life of the university students. Modern Russian students are, indeed, the first representatives of the "digital generation", which since childhood are being strongly interacting with cyberspace. They use different practices of an internet-communication; implement different types of activity in the virtual space [29]. According to the data of D. V. Rudenkina and A. I. Rudenkina [25], 97% of Russian young people consider themselves active Internet users and actually can't imagine their life without it. They spend a significant amount of time on social networks, at scientific and educational resources, gaming sites. The Internet becomes a kind of living space for university students, where communication, cognition, entertainment and recreation are realized [10, 38]. Thus, most young people use smartphones and other gadgets all the time to get the access to the Internet. They are inclined to problematic Internet use without specific purposes, which is related to a decrease or loss of control over interaction in the network, willingness to be online constantly, deterioration of emotional well-being when it is impossible to get the access in to the Internet, expressed by preference for virtual communication [8, 21, 31, 32, 33]. As it was demonstrated in the survey of Varlamova S. N. et al [30] problematic Internet usage or a moderate tendency to Internet addiction, is common to 95% of young people in the world's metropolises. Problematic Internet usage often replaces or deforms various types of student activity. The negative consequences of problematic Internet usage by youth could be communicational difficulties, weakening of social ties and frustration, escapism, formation of emotional Internet addiction, acts of aggression and autoaggression in situations of limited access to the network, reduced academic performance and deterioration of quality of life, the risk of various forms of deviant behavior (gaming addiction, cyberbullying, cyber vandalism, etc.) [2,3,24,34,36]. A number of studies have identified psychological preconditions for problematic Internet usage among students, which include communication problems, a tendency to fantasize, focus on their inner world, a low level of reflection, conceptualization of their own cognitive and emotional processes, difficulties in decisions making, difficulties in semantic regulation of life activity, etc. [5,6,11,17,19,26]. Therefore, it is essential to review predictors of problematic Internet use.

2 Metacognitions and Their Role in Problematic Internet Use

Metacognitions constitute the ability to carry out "thinking over thinking", namely, reflection and self-regulation of cognition. Metacognitive processes serve as an integral regulator of activity, responsible for evaluating, interpreting, and controlling

cognitive activity, and also involve in regulating emotions and cope behavior [12, 13, 14, 18]. Thus, metacognitions can be both constructive and non-constructive. Disruption of metacognitive regulation can be observed in neurotic disorders, adaptation disorders, addictive behavior, etc. [7, 16].

The role of metacognitive processes in the building of problematic Internet use is not properly studied, though, there are specific studies of diverse aspects of this problem. Thus, the thesis of Leili Mosalanejad and Mohammed Amin Ghobadifar shows that negative metacognitive beliefs diminish emotional self-regulation, so serve as preconditions for over involvement in Internet communication [23]. M. Spada et al [27], who showed that metacognitive abilities act as mediators between emotional regulation and behavior, obtained similar results; metacognitions influence the manifestations of negative emotions, which, in turn, act as preconditions for problematic Internet use. Metacognitive beliefs about anxiety, the impossibility of control and danger, the necessity to control your thoughts, cognitive confidence and cognitive identity reinforce the tendency to problematic Internet usage. Conversely, developed emotional regulation decrease the propensity to problematic Internet usage. There valuable results were obtained in the study of Dorit Alt, Meyran Boniel-Nissim, which demonstrate that problematic Internet usage is connected with a formal and superficial approach to adolescents learning, as well as with the fear of missing opportunities or benefits (FoMO "fear of missing out") [1]. It was revealed by D. P. Tkachenko that the tendency to control of anxiety in situations of self-presentation is typical for people who tend to escape from loneliness and social problems in virtual reality [28]. In fact, there are no studies devoted to interconnection between metacognitive strategies and problematic Internet use among students, which explains the relevance of this work.

3 Research Questions

In accordance with the results of a theoretical analysis of the problem of the correlation between metacognitions and the problem of the Internet usage for students, we posed the following research questions (RQ):

RQ 1: Is there any difference between the metacognitive strategies among students with normative, problematic Internet use and students with signs of Internet addiction?

RQ 2: What is the correlation between metacognitive strategies and problematic Internet use of students?

RQ 3: What are the main factors of metacognitive regulation of students' behavior on the Internet?

4 Methods

4.1 Participants

The participants were 111 students (28 males, 83 females, M= 22,6 SD=3,84) from full-time and extra-mural courses in social sciences and the humanities at various institutions of higher education in Saint Petersburg, Russia.

The choice of humanitarian students was a result of a desire to partially eliminate the influence of a subjects chosen educational field (precise sciences, natural sciences and technology). The sample group showed a numerical preponderance of young women, which according to the data of the Federal State Statistical Service is roughly in accordance with the gender distribution in the general overall body of students studying social sciences and the humanities [37]. Based on the Chen Internet Addiction Scale (CIAS) and according to the report by Malygin et al. the cutoff point at a score of 65 to determine Internet addiction via CIAS gave a good performance in respect of reliability and validity [22]. Following Malygin et al., we adopted this cut-off value to classify normal internet use (n= 31, range = 27–42), problematic internet use (n=59, range=43–64) and internet addiction (n= 21, overall level of IA >65).

4.2 Measures

Problematic Internet use. The adolescents completed a CIAS – the self-rating questionnaire comprising 26 items, with a four-point Likert's scale ranging from 1 (Does not match my experience at all) to 4 (Definitely matches my experience). The questionnaire was specially developed for assessing internet addiction [9]. The scale (IA) is made up of five subscales: 1) compulsive use (5 items); 2) withdrawal symptoms (5 items); 3) tolerance (4 items); 4) interpersonal and health-related problems (7 items); 5) time management problems (5 items) and two integral indicators: 6) key symptoms of IA (IA-Sym = (Com+Wit+Tol)); 7) negative effects of Internet use (IA-Rp = (In+Tm)). The CIAS was adapted for use in Russia by V.L. Malygin et al. [22]. According to their report, the cutoff point at a score of 65 was used to define IA; ranges of 27–42 and 43–64 respectively were classified as normal internet use and problematic internet use (PIU). Cronbach's alpha fell in the range of 0.757 the scale of compulsive use to 0.9 on the scale of time management problems. IA test/re-test correlation on all subscales showed a good performance on reliability (a Pearson's correlation coefficient not less than 0.7–0.75).

Differential Test of Reflexivity [20]. The questionnaire consists of 30 statements grouped in 3 theoretically based scales:

1. Introspection (e.g. "Often I am completely focused on my condition"):
2. Systemic reflection (e.g. "I usually think about the reasons for what is happening to me"):
3. Quasi-reflection (e.g. "I can dream and forget about everything").

Respondents rated the statements on a four-point Likert's scale ranging from 1 (Does not match my experience at all) to 4 (Definitely matches my experience). The internal consistency of the questionnaire scales has values between Cronbach's alpha=0.79 to 0.83.

The Scale of Self-assessment of Metacognitive Behavior by D. LaCosta [14]. This technique was developed in 1998 and is a short questionnaire, fairly easy to use and interpret. Respondents are required to assess the following metacognitive strategies as: 1) Strategic planning (planning, monitoring and evaluation of activities); 2) Formulation of questions (conscious formulation of questions addressed to gaps in a particular field of knowledge); 3) Conscious decision-making (predicting the effect and consequences of each choice); 4) Differentiated assessment (reflective assessment of one's own actions according to various criteria); 5) Comprehension of achievements (correlation of subjectively assessed achievements with objective feedback); 6) Overcoming subjective limitations (awareness of the possibilities of solving complex problems and persistent conscious search for solutions); 7) Paraphrasing and summarizing the information received (rethinking of incoming ideas); 8) Designation of cognitive behavior (definition of the used cognitive strategies and their significance for solving the problem); 9) Definition of terminology (wording of precise definitions of initially vague, ambiguous, or poorly understood terms); 10) Role-playing games (playing the position of a communication partner, a mental dialogue with him); 11)Keeping diaries (writing down your own thoughts); 12) Modeling (building mental representations of experience). Respondents rated the statements on a five-point Likert's scale ranging from 1 (very rarely) to 5 (very often). The summarizing scale of the questionnaire "Overall level of metacognitive behavior", Cronbach's alpha: 0.743.

4.3 Data Analysis

The chi-square test was used for determining whether level of PIU were independent of student's gender. We conduct the ANOVA to examine the metacognitive strategies in different groups of independent variables (normal/ problematic internet use/internet addiction). The samples were homoscedastic (Levene's test, $p>0.05$). The Scheffe test to correct alpha for to account for multiple comparisons and Spearman's correlation coefficient to examine the associations between CIAS and metacognitive behavior. To determine the dimensions of the factor model metacognitive regulation of internet behavior, the factor analysis (principal component method) with varimax rotation computed. A test of using factor analysis was carried out based on the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) and Bartlett's teste of sphericity. Statistical significance was set at a level of $p < 0.05$. The Statistica 10.0 software package was used for analyses in this study.

5 Results

In the first stage of the study, we specify that the indicator of PIU does not depend on the sex of students ($\chi 2$ (2) =0.93, p=0.62). In the next stage, a comparative study of metacognitive strategies in groups with different CIAS score (normal internet use/problematic internet use/internet addiction) was conducted.

Table 1 (Means and SD of reflexivity parameters) contains significant distinction in the forms of reflexivity of the survey participants. The indicator of systemic reflection, associated with the ability to look at yourself from the outside, declines depend-

ing on the build-up in signs of Internet addiction, however these differences are presented only at the level of the trend.

There were found quite significant differences in introspection indicators (F=8. 31, p <0.00), the state, related to concentration on one's own state and experiences, the Sheffe post-hoc test are significant at p < 0.05. In addition, quasi-reflection, related to separation from the relevant situation (F=9.13, p<0.00), the Sheffe post-hoc test are significant at p < 0.01. These forms of reflection are often related to such negative effects as maladaptive styles of coping, pessimism, neuroticism, low success in solving problems and lack of social support [19]. The severity of these metacognitive strategies increases depending on the strengthening of signs of Internet addiction.

Table 1. Means and SD of reflexivity parameters
(Note: significant differences are highlighted)

Variables	Normal Internet Use		Problematic Internet Use		Internet Addiction	
	M	SD	M	SD	M	SD
Systemic reflection	40.61	4.23	40.24	5.00	39.24	5.64
Introspection	20.81	6.45	23.88	5.14	27.38	6.21
Quasi-reflection	22.97	5.87	26.20	4.61	29.00	5.17

Table 2 (Means and SD of parameters metacognitive behavior) contains significant differences in the parameters of metacognitive students behavior.

Table 2. Means and SD of parameters metacognitive behavior
(Note: significant differences are highlighted)

Variables	Normal Internet Use		Problematic Internet Use		Internet Addiction	
	M	SD	M	SD	M	SD
Strategic planning	3.68	1.17	3.29	1.18	3.10	1.37
Formulation of questions	3.84	1.04	3.62	1.02	3.25	1.03
Conscious decision-making	3.77	0.99	3.64	1.01	3.81	0.98
Differentiated assessment	4.13	0.88	3.97	0.96	3.62	0.97
Comprehension of achievements	3.48	0.96	3.47	0.95	3.67	1.02
Overcoming subjective limitations	4.03	0.84	3.75	0.98	3.90	1.04
Designation of cognitive behavior	3.71	0.90	3.29	0.93	3.38	1.20
Definition of terminology	3.32	1.28	3.32	1.11	3.24	1.18
Role-playing games	2.77	1.23	3.37	1.29	3.52	1.33
Keeping diaries	2.10	1.51	2.03	1.33	2.43	1.60
Modeling	3.48	1.03	3.32	1.15	3.57	1.12
Overall level of metacognitive behavior	42.29	7.15	40.81	6.67	41.86	7.36

It was revealed that significant differences in such parameter as "formulation of questions" (conscious formulation of questions, addressed to gaps in a particular area of knowledge) (F=3.49, p <0.03) are most vividly observed in students with normal

Internet use. The "role games" parameter, which means playing the position of the communication partner and mental dialogue with him, is more typical for respondents with signs of Internet addiction ($F=2.89$, $p<0.05$). In both cases, the Scheffe test are significant at $p<0.05$. The rest differences are presented at the trend level, while the severity of some metacognitive strategies decreases depending on the increasing the level of the independent variable, while others decrease.

In order to identify metacognitive strategies, associated with raising or lowering of total CIAS score, a correlation analysis was conducted, the results of it are presented in table 3. It is revealed that such forms of unproductive reflection as introspection and quasi-reflection are positively correlated with all parameters of problematic Internet use, as well as with total CIAS score.

Table 3. Correlation coefficients between indicators of PIU and reflexivity parameters (Note: highlighted coefficients are significant at *p< 0,01; **p<0.001)

Variables	Intro-spection	Quasi-reflection	Differenti-ated as-sessment	Role-playing games
Compulsive use	0.38**	0.32**	-0.17	0.18
Withdrawal symptoms	0.33**	0.34**	-0.18	0.13
Tolerance	0.43**	0.31*	-0.10	0.14
Interpersonal and health-related problems	0.34**	0.30*	-0.17	0.22*
Time management problems	0.26*	0.34**	-0.25*	0.19*
Key symptoms of IA	0.43**	0.38**	-0.18	0.17
Negative effects of Internet use	0.34**	0.35**	-0.23*	0.23*
Total CIAS score	0.42**	0.39**	-0.22*	0.21*

Table 4. Factor loading and factor structure of metacognitive regulation of Problematic Internet Use

Variables	Factor1	Factor2	Factor3
Differentiated assessment	0.78	0.06	0.28
Overcoming subjective limitations	0.77	-0.18	0.05
Comprehension of achievements	0.71	0.17	-0.05
Designation of cognitive behavior	0.60	-0.12	0.19
Conscious decision-making	0.56	0.33	0.15
Introspection	0.01	0.80	-0.02
Quasi-reflection	0.08	0.78	-0.06
Total CIAS score	-0.15	0.69	-0.12
Role-playing games	0.10	0.57	0.31
Keeping diaries	-0.07	0.12	0.65
Formulation of questions	0.42	-0.03	0.68
Strategic planning	0.14	-0.13	0.75
Expl.Var	2.62	2.28	1.70
Prp.Totl	0.22	0.19	0.14

Also metacognitive «role-playing games» strategy positively interconnected with an interpersonal and health-related problems (r=0,22, p=0,05), time management problems (r= 0,19, p=0,05), negative effects of internet use (r=0,23, p=0,05), total CIAS score (r=0,21, p=0,05).

To identify the structure of metacognitive regulation of Problematic Internet Use, the factor analysis (principal component method) with varimax rotation and factor scores coefficients was computed. The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) = 0.714; in Bartlett's test of sphericity $\chi 2$ = 324.97, df =66, α=0.000. Three factors were extracted with an eigenvalue greater than one. The variables with the factorial loading are shown in Table 4.

The third factor (with 14% variance) combines metacognitive parameters of behavior, related to strategic planning of activity: keeping diaries (0,65), formulation of questions (0.68), strategic planning (0,75). Table 5 (Intercorrelations among factor of metacognitive regulation of Problematic Internet Use) shows the results of intercorrelations between factors of metacognitive regulation of problematic Internet use.

Table 5. Intercorrelations among factor of metacognitive regulation of Problematic Internet Use (Note: **p<0.001)

Factors	F1	F2	F3
Factor 1 «Monitoring and evaluation»	1.00	-0.43	-0.70**
Factor 2 «Parameters of metacognitive behavior reinforcing symptoms of Internet addiction	-0.43	1.00	-0.26
Factor 3 «Strategic planning»	-0.70**	-0.26	1.00

As shown in Table 5, factor structure included one independent and two consistent factors. The independent factor covers parameters of metacognitive behavior, which are positively related to a total CIAS score. Interrelated factors reflect the predominance of metacognitive strategies, aimed either at monitoring and evaluating performance or at strategic planning.

6 Discussion

6.1 Findings

The obtained empirical data showed that students with normative Internet behavior, with problematic Internet use, and signs of Internet addiction are characterized by different level of expression of such metacognitive strategies as Introspection, Quasi-reflection, and Formulation of questions, Role-playing games. While, the conscious formulation of questions for filling the gaps in knowledge is typical for students with normative usage of the Internet. Role-playing games - tendency to replay mentally a dialogue with the opponent, unproductive reflection - Introspection, manifested in focusing on their own internal problems and states, Quasi-reflection – escaping into a fantasy, is more common for students with problematic Internet use and Internet ad-

diction, while these strategies are most evident for Internet addicts. The leading role of these metacognitive strategies in the problematic Internet use is confirmed by the results of correlation analysis. Thus, tendency to Introspection and Quasi-reflection assumes high severity of all signs of the Internet addiction.

Frequent usage of Role-playing games is connected with the existence of problems in the field of time planning, health, inner world of the individual relative to the Internet addiction. The ability to formulate questions consciously, in contrast, reduces the negative effects, associated with the Internet usage, and, first of all, problems with time management. It was revealed by factor analysis that non-constructive metacognitive strategies implying creating imaginary communication situations, focusing on one's own thoughts, fantasies, and problematic experiences are part of a unified symptom complex with signs of Internet addiction. Constructive strategies that involve metacognitive regulation of all main components of activity planning, monitoring and evaluation, are not predictors of a problematic Internet use. The results of our study are consistent with the data obtained in a number of studies. In particular, Marcantonio M. Spada [27] and others found out that negative metacognitive convictions are connected with negative emotional experiences and can cause PIU, since interaction on the Internet can serve kind of tool for improving the state, reducing metacognitive discomfort. Fatemeh Bidi et al [4] found that metacognition plays a significant role in shaping of coping strategies and largely determines mental health. Non-constructive metacognitions lead to non-adaptive coping strategies, including the problematic use of the Internet. In a survey of L. Mosalanejad and M. A. Ghobadifar [23], it was shown that metacognitive persuasions, acting as factors of increasing anxiety, are more common for students with PIU. This allows us to make a conclusion that metacognitions can act like preconditions for problematic use of the Internet among University students.

6.2 Study limitation and directions of future research

The limitations of this study are, first of all, that the results were obtained on a sample of students in the Humanities, a significant part of which are girls. Despite the fact that we found no differences in metacognitive strategies and problematic Internet use depending on gender, in the future it is advisable to expand the sample of the study, to balance it by gender and educational orientation. The establishing of correlations between metacognitive strategies and PIU with emotional and cognitive characteristics also acts as prospects for further researches, which will allow more detailed explore the role of metacognitions in PIU and Internet addiction of students.

Conclusion

This survey revealed metacognitive strategies that strengthen and weaken problematic Internet use by students. Metacognitions aimed at one's own inner world and imagination -introspection, quasi-reflection, mental playback of dialogues with a partner, strengthen PIU and act as preconditions for Internet addiction. Metacognitions that regulate cognitive activity and involve planning, monitoring, and activity evaluating, weaken the PIU. The achieved results reveal the possibilities of metacognitive therapy

in correcting Internet-dependent behavior, and allow determining directions of psychological prevention of PIU among students through the development of constructive metacognitive strategies.

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