Relationship of parameters of the impulsivity – reflexivity cognitive style with propensity to Internet addiction in high school students

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ABSTRACT

Aim. To study the relationship between parameters of the impulsivity – reflexivity cognitive style and the level of Internet addiction among high school students.

Materials and methods. 154 students from general education institutions aged 16–17 years were diagnosed using the J. Kagan's reflection – impulsivity test and the Chen Internet Addiction Scale. The one-way analysis of variance was used, followed by post-hoc pairwise comparisons using the Tukey's test.

Results. An inverse relationship between the level of Internet addiction and decision latency in a multiple-choice situation and a direct relationship between the level of Internet addiction and the number of errors in the J. Kagan's reflection – impulsivity test were revealed.

Conclusion. High school students with propensity to Internet addiction tend to have the impulsive cognitive style, while students without such a tendency – the reflective style. In cognitive activity, the impulsive cognitive style is generally less productive than the reflexive one. The impulsive cognitive style is similar to the so-called clip thinking, which allows to consider the relationship between Internet addiction and this phenomenon through the prism of cognitive and style features.

Keywords: Internet addiction, high school students, impulsivity – reflexivity cognitive style

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Связь показателей когнитивного стиля «импульсивность/рефлексивность» со степенью склонности к интернет-зависимому поведению у старшеклассников

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РЕЗЮМЕ

Цель – изучение связи характеристик когнитивного стиля «импульсивность/рефлексивность» с уровнем интернет-зависимости у старшеклассников.

Материалы и методы. Проведена диагностика 154 обучающихся общеобразовательных учреждений 16–17 лет посредством теста Дж. Кагана для определения показателей когнитивного стиля «импульсивность/рефлексивность» и теста «Шкала склонности к интернет-зависимому поведению» С. Чена. Использовался однофакторный дисперсионный анализ с последующими попарными апостериорными сравнениями критерием Тьюки.

Результаты. Установлено наличие обратной связи между уровнем интернет-зависимости и латентным временем принятия решения в ситуации множественного выбора и прямой связи между уровнем интернет-зависимости и количеством ошибок в тесте Дж. Кагана.

Заключение. Старшеклассники со склонностью к интернет-зависимости тяготеют к импульсивному типу по исследованному когнитивному стилю, без таковой склонности – к рефлексивному типу. В познавательной деятельности использование импульсивного когнитивного стиля в целом менее продуктивно, чем рефлексивного. Импульсивный когнитивный стиль обнаруживает черты сходства с так называемым клиповым мышлением, что позволяет рассматривать связь интернет-зависимости с этим явлением через призму когнитивно-стилевых особенностей.

Ключевые слова: интернет-зависимость, старшеклассники, когнитивный стиль «импульсивность/рефлексивность»

INTRODUCTION

The phenomenon of Internet addiction (IA) is widely studied all over the world [1–3]. Various aspects of the impact of Internet addiction on mental [4] and physical health [5] are being investigated, especially in adolescents. A steady increase in the time spent on the Internet is inevitable due to sociocultural processes, as well as an increasing tilt of education and many types of professional activity to the online environment [6]. Uncontrolled use of the Internet, especially social networks, and viewing content not related to professional or educational activities is a powerful addictive factor. Internet addiction already takes its place among other addictions and is difficult to correct [7, 8]. A recent Russian study of 3,012 adolescents aged 12–18 years showed that maladaptive use of the Internet is typical of 43.6% of adolescents, and the incidence of Internet addiction increases with age [9].

Along with the increase in Internet addiction among the population, the phenomenon of the so-called clip thinking is becoming more and more pronounced, especially among the younger generation, who have been active Internet users since childhood [10]. At the same time, there are practically no generally accepted methods for diagnosing clip thinking; variants of its detection are also very vague and diverse [11, 12]. However, all researchers of clip thinking, one way or another, admit that its main features include perception of information through bright, short, often unrelated images, fast switching from one topic to another, and a need for constant information updates. All these factors combined result in problems with concentration, inability to analyse information and retain it in memory, misunderstanding of the meaning of what was read, increased suggestibility, etc.

It seems promising to investigate a relationship of Internet addiction, first of all, with the parameters of the impulsivity – reflexivity cognitive style [13], because it is individuals with the impulsive cognitive style that, in our opinion, show some similarity with people characterized by clip thinking. This task is especially relevant for high school students [14], who, on the one hand, have to increasingly use the Internet for education, and on the other hand, are constantly faced with all sorts of temptations to spend time on the Internet on unproductive activities with addictive potential.

The aim of this research was to study the relationship between parameters of the impulsivity – reflexivity cognitive style and the level of Internet addiction among high school students.

MATERIALS AND METHODS

The subjects of the study were students of general education schools aged 16–17 years from the cities of Simferopol (99 people, 32 males and 67 females) and Nadym (55 people, 17 males and 38 females).

As a tool for diagnosing Internet addiction, we used the Chen Internet Addiction Scale adapted by K.A. Feklisov and V.L. Malygin. The parameters of the impulsivity – reflexivity cognitive style were diagnosed using J. Kagan's "Comparison of Similar Drawings" test. The subject of the study was presented with 2 training sheets, and then with 12 basic sheets: on top of the sheet, there was an image of a familiar object (reference figure), at the bottom, there were 8 practically identical images of the same object arranged in two rows, among which only one fully corresponded to the reference figure. The subject had to find and indicate an image that was completely identical to the reference figure. The following parameters were recorded: 1) the average decision latency of the first response in 12 series (in seconds); 2) the total number of errors made in the test.

The Kolmogorov – Smirnov test was used to check the data series for normal distribution. Both for the total sample and for the 6 compared subsamples, no statistically significant differences in deviations of the data series from the normal distribution were found (Table). For the smallest sample, which comprised 20 variants, the more sensitive Shapiro – Wilk test was used to check for normality of distribution.

Since in none of the cases the statistical distribution of the data differed from the normal distribution, a one-way analysis of variance (ANOVA) was used, followed by post-hoc pairwise comparisons using the Tukey's test. Statistical processing was performed using the Statsoft Statistica 13 software (StatSoft Inc., USA).

Table

Results of testing data series for normality of distribution*

Samples	"Response time" variable	"Number of errors" variable
Total sample, n = 154	K–S d = 0.090	K–S d = 0.082
IA is absent, n = 52	K–S d = 0.086	K–S d = 0.110
Propensity to IA, n = 82	K–S d = 0.130	K–S d = 0.094
Pronounced IA, n = 20	S–W W = 0.94	S–W W = 0.98

*p > 0.05.

RESULTS

First, we performed ANOVA for the "response time" variable. Highly significant differences were revealed in the distribution of the trait in the subsamples according to the Fisher's criterion: $F(2, 151) = 10.21$, $p = 0.00007$. The analysis results are graphically presented in Fig. 1.
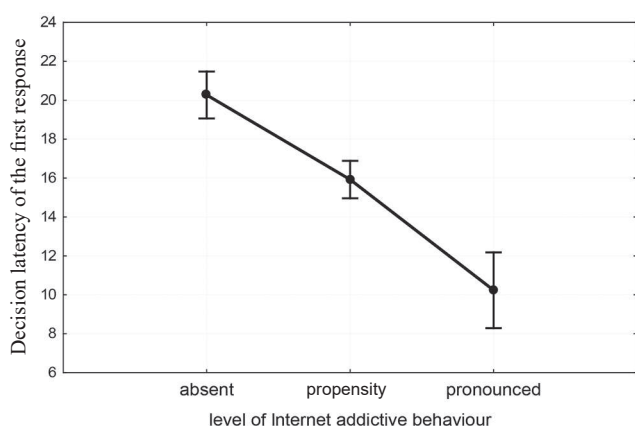

Fig. 1. ANOVA findings for the relationship between the decision latency of the first response in the J. Kagan's test and propensity to Internet addiction

A close to inverse relationship between the decision latency of the first response (response time) and propensity to Internet addiction was revealed. Thus, for individuals without IA, the response time was 20.27 ± 1.21 sec, for those with propensity to IA – 15.92 ± 0.96 sec, and for those with pronounced IA – 10.24 ± 1.96 sec.

Further analysis of statistical significance using the Tukey's honest significance test showed the presence of statistically significant differences between all the subgroups:

between individuals with no IA and those with propensity to IA, $p = 0.013$;

between individuals with no IA and those with pronounced IA, $p = 0.000055$;

between individuals with propensity to IA and those with pronounced IA, $p = 0.024$.

Thus, all IA levels are significantly different from each other in terms of decision latency and form a close to linear trend toward a decrease in the decision latency as propensity to Internet addiction increases.

Next, we analysed the distribution of the "number of errors" variable depending on propensity to IA. Significant differences in the distribution of the variable in the subsamples were revealed according to the Fisher's criterion: $F(2, 151) = 4.4452$, $p = 0.013$. The analysis findings are graphically presented in Fig. 2.
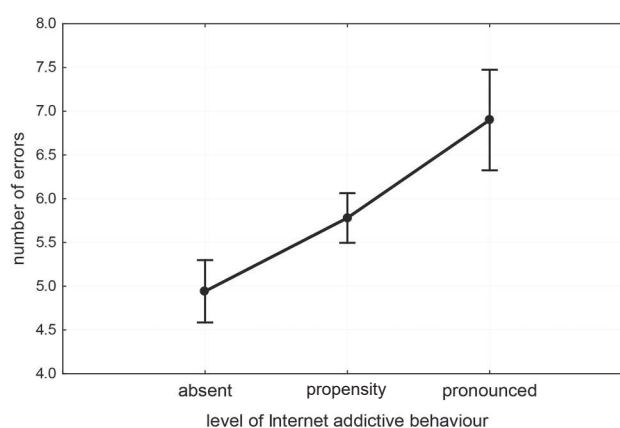

Fig. 2. ANOVA findings for the relationship between the number of errors in the J. Kagan's test and propensity to Internet addiction

For this variable, a close to inverse relationship between the number of errors in the test and the level of IA was revealed.

Thus, in individuals without IA, the number of errors was 4.94 ± 0.36, in those with propensity to IA – 5.78 ± 0.28, and in those with pronounced IA – 6.90 ± 0.57.

Further analysis of statistical significance using the Tukey's post hoc test showed the following levels of significance of the differences:

1) between individuals with no IA and those with propensity to IA: $p = 0.15$;

2) between individuals with no IA and those with pronounced IA: $p = 0.010$;

3) between individuals with propensity to IA and those with pronounced IA: $p = 0.18$.

The significant differences in the "number of errors" parameter were observed only between individuals without IA and those with it, while in individuals with propensity to IA no significant differences in the

"number of errors" parameter were revealed compared with the two mentioned subgroups. Nevertheless, there is a clear upward trend in the "number of errors" parameter as Internet addiction increases.

Summarizing the preliminary results, it can be stated that individuals with IA are less accurate, but faster in making decisions, which makes them similar to individuals with the impulsive cognitive style. On the contrary, individuals with IA are more similar to the reflexive cognitive style due to longer deliberation of a task with greater accuracy of answers.

DISCUSSION

In the present study, new data were obtained on the relationship between IA and the parameters of the impulsivity – reflexivity cognitive style: the higher the level of IA is, the faster the subject makes a decision in a situation of multiple cognitive choice, making more mistakes. On the contrary, the lower the level of IA is, the longer the subject thinks over the solutions, but the more accurate they are.

The J. Kagan's test does not contain criteria for assigning individuals to a particular cognitive style; it is only recommended to rely on medians in a particular sample when making an appropriate psychodiagnostic conclusion. However, from the point of view of psychodiagnostics, this approach is not sufficiently rigorous, since the data can vary greatly from sample to sample for various reasons, and the population for standardization must include at least an order of magnitude more test subjects. At the same time, the trends we observe show that individuals without propensity to IA are apparently closer to the reflexive cognitive style, that is, they make relatively few mistakes, but use a relatively longer time to think over tasks; conversely, individuals with pronounced IA make more mistakes with less thinking time.

The nature of cognitive styles is not fully elucidated. On the one hand, they are associated with temperament and features of interhemispheric asymmetry. On the other hand, they can change to a certain extent during the lifetime under the influence of cultural, social, and psychological factors [14]. There is an opinion that cognitive styles are stable with time, characterizing the features of individual's cognitive activity [15, 16]. However, there is substantiated evidence that cognitive styles are formed *in vivo* in the process of active life [17]. In [18], the analysis of numerous works is presented on the fact that any cognitive tasks are more effectively solved by reflexive individuals. Polar differences have been established between re-

flexive and impulsive individuals in terms of emotionality and activity: reflexive individuals are less emotional and more active; impulsive ones are more emotional and less active. Therefore, impulsive individuals show the first spontaneous reaction in solving the problem emotionally, and the reflexive ones, having more energy, work out additional options for solving problems instead of experiencing strong emotions [19]. At the same time, since persons characterized by the impulsive cognitive style not only make decisions in an insufficiently meaningful way, but are generally characterized by low self-control [20], they are more prone to IA than persons with greater reflexivity.

IA is a powerful factor influencing cognitive processes, including the ones at the brain level [21], and the results of our study suggest that the level of IA may somehow influence the cognitive styles. This highlights the problem of IA even more and requires engagement of different specialists in its solution.

CONCLUSION

The degree of propensity to IA is associated with characteristics of the impulsivity – reflexivity cognitive style. According to the parameters of the J. Kagan's test, individuals with pronounced IA are characterized by shorter decision latency in a cognitive task with a greater number of errors, while individuals without IA tend to take longer time to make a decision with fewer errors. At the same time, individuals with propensity to IA occupy an intermediate position according to the parameters of the J. Kagan's test. The results obtained, to some extent, clarify the phenomenon of clip thinking (fast, shallow, emotional, non-analytical), linking it both with the degree of IA and with a tilt to the impulsive cognitive style.

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