HEALTHY LIFESTYLE. PREVENTION

L.S. Evert, Yu.R. Kostyuchenko, Yu.V. Zykova ASSOCIATIONS OF RECURRENT CEPHALGIA WITH VARIOUS ONLINE BEHAVIOR OF TEENAGERS

DOI 10.25789/YMJ.2021.74.11

The aim of the study is to study the frequency and structure of recurrent cephalalgias in adolescents with various types of online behavior. *Materials and methods:* 2992 adolescents in Krasnoyarsk at the age of 12-18 years, 1374 (45.9%) - boys and 1618 (54.1%) - girls were examined by the method of random sampling. Online behavior was assessed using the Chen Internet Addiction Scale (CIAS). The type of recurrent cephalalgias was assessed using a screening questionnaire. The indices were compared in 3 groups - with adaptive (API), non-adaptive (NPI) and pathological (PPI) Internet use. The data were processed in the program "Statistica 12". *Results:* The frequency of API was 50.6%, NPI - 42.6% and PPI - 6.8% of the total sample of the surveyed. A distinctive feature of the comorbidity of PPI in adolescents is its more pronounced association with cephalgias (both frequent and rare), more frequent absence of cephalgic episodes, and greater pain intensity. *Discussion:* Comparison of API with other types of addiction (mixed, undifferentiated, and dependence on social networks) revealed a more pronounced association of the latter with rare and frequent cephalgias and greater pain intensity, and similar comparisons of gambling addiction with rare cephalgias and more severe pain. *Conclusions:* A more pronounced association of recurrent cephalgias (especially frequent episodes) in adolescents with maladaptive types of online behavior (PPI and NPI) indicates the adverse effects of computers and the Internet and substantiates the need for a personalized approach to these contingents of adolescents to prevent the development of chronic types of psychosomatic pathology in them.

Keywords: adolescents, online behavior, Internet addiction, recurrent cephalalgias.

Introduction. The problem of dependence on the Internet is extremely relevant in modern society [9,11,17]. The role of the Internet is great as the main channel of communication, a source of information and entertainment, which has both positive and negative effects on the body of users [20,24,27]. The most susceptible to addiction to the Internet are adolescents [15,25,29]. The consequence of problematic use of the Internet (PIP) often becomes a violation of the mental and somatic health of a teenager [1,2,8], a violation of his mental status [14,16], the likelihood of personal, interpersonal [21] and social problems [28] increases, the risk is higher suicidal behavior [3,5,18,23,30] and socio-psychological maladjustment [22].

An increasing problem in all countries of the world is the growth of comorbid diseases and conditions associated with the pathological use of the Internet, including functional somatic disorders, a significant proportion of which are recurrent cephalalgias [8,12,13,26]. The prevalence of cephalalgias in children varies widely depending on the region of residence, methodology, genetic differences, and diagnostic criteria used [6]. The overwhelming majority of all types of cephalgia (95-98%) are primary forms of headache, secondary forms are quite rare (no more than 5% of all cases of cephalgia).

Studies devoted to the pathological use of the Internet in adolescents and functional somatic disorders associated with PPI (including recurrent cephalalgias) are extremely few and require an urgent solution to this problem [19,31]. The presence of episodes of headache (especially frequent) negatively affects the quality of life [7], negatively affects school performance, behavior and social adaptation of adolescents.

All of the above served as a rationale for the need for our study, the *purpose* of which was to study the frequency and structure of recurrent cephalgia in adolescents with various types of online behavior.

Materials and research methods. The object of the research was random samples of adolescents 12-18 years old - students of 10 general educational institutions of Krasnoyarsk in 5 districts of the city. The primary screening program included a questionnaire survey of schoolchildren using 4 questionnaires. The total number of those surveyed was 3055 people. Incorrectly filled out questionnaires were excluded from the analysis, in which there were no answers to some questions, as a result, 2992 questionnaires were subject to statistical processing. Of these, 1,374 (45.9%) are boys and 1,618 (54.1%) are girls.

The following observation groups were distinguished: by type of online behavior: 1 gr. - with API, 2 gr. - with NPI, 3 gr. - with PPI (with IZ). Allocated the following subgroups: 1 gr. - with gambling addiction, 2 gr. - with addiction to social networks, 3 gr. - with mixed IZ (presence of both gambling addiction and dependence on social networks), 4 gr. - with undifferentiated Internet addiction (adolescents with IZ, confirmed by a total score on the Chen scale \geq 65, but at the same time they do not have gambling addiction and do not depend on social networks). The type of online behavior of adolescents was verified using the internationally accepted Chen Internet Addiction Scale (CIAS) [10], adapted by VL Malygin and KA Feklisov [4]. Chen's total CIAS score ≥ 65 points was taken as the criteria for the presence of PID or Internet addiction; if the value of this indicator corresponded to the range of 27-42 points, the absence of Internet addiction (or TIP) was stated, the total CIAS score included in the range of 43-64 points, indicated the presence of maladaptive Internet use (NPI).

The study was approved by the Ethics Committee of the Scientific Research Institute of the Ministry of Railways and supported by a grant from the Russian Foundation for Basic Research (No. 18-29-22032 / 20). The collection of information on the presence of cephalalgias was carried out by the method of questioning according to the author's screening questionnaire, developed by prof. S.Yu.

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Tereshchenko. The type of headaches was verified taking into account the criteria for the frequency of episodes of cephalalgia set out in the international classification of headaches (ICGB-3b, 2013). The criteria for the type of RSL were the presence and frequency of cephalalgia over the past 3 months: with a headache frequency of no more than 1 time per month (or during this time the head did not hurt at all), it was concluded that there was no RSL, with a headache frequency of 1 to 15 days per month -RSL was considered rare, with a headache frequency of more than 15 days a month - RSL was regarded as frequent. The intensity of pain (in points) was assessed on a VAS scale, graded from 0 to 5, where item "0" corresponds to the answer "pain did not bother", item "5" corresponds to the answer "pain bothered very much, interfered with the usual activities. This scale was included as a section of the questionnaire used in the study. The criterion for the presence of RHL was the intensity of headache \geq 4 points.

When processing the obtained data, the module of nonparametric statistics of the program "Statistica 12" (USA) was used. Confidence intervals for percentages were calculated using the Wilson



Fig. 1. The structure of RH in groups of adolescents with different types of online behavior, in %. Statistical significance of differences according to Pearson's χ^2 test (p) for the "no RH" indicator: p1-2 <0.0001, p1-3 <0.0001, p2-3 = 0.0106; for the indicator "rare RH": p1-2 <0.0001, p1-3 = 0.0001, p2-3 = 0.3205; for the indicator "frequent RH": p1-2 = 0.0047, p1-3 <0.0001, p2-3 = 0.0008.

method using an online calculator. The level of significance of differences (p) for binary features in pairwise comparison of the two groups was assessed using Pearson's chi-squrae test. The form of presentation of the obtained results were:% share, limits of the confidence interval (CI), the absolute value of Pearson's χ^2 test, the degree of freedom (df) for the χ^2 test and the statistical significance of the differences (p). Quantitative characteristics are represented by indicators of the sample mean (M), median (Me) and interquartile range (Q25 – Q75). The

statistical significance of differences in quantitative traits was determined by the Mann – Whitney U-test. The critical level of statistical significance when testing the null hypothesis was taken at the 95% significance level (p≤0.05).

Results and discussion. Of the 2992 surveyed, 1515 (50.6%) were characterized by adaptive use of the Internet (API), 1274 (42.6%) adolescents had non-adaptive use of the Internet (IPI) verified and 203 (6.8%) of the surveyed had pathological use of the Internet (IPI)) or Internet addiction (FROM). The frequen-



Fig. 2. The structure of recurrent headache (RH) in adolescents with various types of Internet-dependent behavior (in %)

a – The structure of RH in adolescents with IPA and with play IA, in %. Note: statistical significance of the differences according to Pearson's χ 2 test (p) for the "no RH" indicator: p1-2 = 0.4217; for the indicator "rare RH": p1-2 = 0.1926; for the indicator "frequent RH": p1-2 = 0.2480;

b – The structure of RH in adolescents with API and undifferentiated IA, in %. Note: statistical significance of differences according to Pearson's χ^2 test (p) for the "no RH" indicator: p1-2 = 0.0019; for the indicator "rare RH": p1-2 = 0.0237; for the indicator "frequent RH": p1-2 = 0.0241;

c – The structure of RH in adolescents with API and addiction from social networks, in %. Note: statistical significance of differences according to Pearson's χ^2 test (p) for the "no RH" indicator: p1-2 <0.0001; for the indicator "rare RH": p1-2 = 0.0024; for the indicator "frequent RH": p1-2 = 0.0063;

d – The structure of RH in adolescents with API and mixed Internet addiction, in %. Note: statistical significance of the differences according to Pearson's χ^2 test (p) for the "no RH" indicator: p1-2 = 0.0020; for the indicator "rare RH": p1-2 = 0.0272; for the indicator "frequent RH": p1-2 = 0.0220

cy of occurrence of PPI (IZ) according to the results of our study turned out to be comparable with the results obtained by other researchers.

The presence of recurrent headache and its structure in groups with various types of online behavior is illustrated in Figure 1.

The highest prevalence of rare RSL was observed in adolescents with NPI (38.3%) and PPI (42.0%), this type of RSL was recorded much less frequently in those surveyed with IPI (Fig. 1).

The percentage of frequent RSL was the highest in the group of Internet-addicted adolescents (with PPI) - 11.0%, this type of RSL was found much more often (5.0%) among those surveyed with NPI.

From 1/2 to 2/3 of all adolescents examined by us did not suffer from recurrent cephalalgias. More than 2/3 of those surveyed with IPI did not have a history of repeated headache episodes, there were fewer such persons in the group with IPI, and even less was the number of this contingent among adolescents with Internet addiction (with IPI) (Fig. 1).

We carried out a comparative analysis of pain intensity by quantitative values of the headache intensity scale in groups with different types of online behavior. It was found that adolescents with PPI had the highest headache intensity indicators, the second rank was occupied by adolescents with NPI, and those with IPI were characterized by less headache intensity (Table 1).

We carried out a comparative analysis of the frequency and types of GBL in adolescents with different content structures of online behavior (with gambling addiction, addiction to social networks, mixed and undifferentiated Internet addiction) in comparison with a group of adolescents without Internet addiction (group with API).

We failed to identify statistically significant differences in the incidence and structure of RSL in adolescents with gambling addiction and without IZ behavior (Fig. 2a).

The severity of headache, assessed by the visual analogue scale of pain intensity VAS, did not have statistically significant differences in the groups with and without Internet gaming addiction (Table 2).

The group of examinees with gambling addiction differed in a large% of adolescents with no history of headache episodes, while the presence of undifferentiated Internet addiction was associated with a more frequent occurrence of both rare and frequent RSL in comparison with the group of adolescents with adaptive Internet use (Fig. 2b). There were no statistically significant differences in the scores for the intensity of headache in the groups with and without undifferentiated Internet addiction.

In the group with IPA, there were more adolescents without RSL in comparison with those surveyed, characterized by the presence of dependence on social networks, while the latter were distinguished by a greater occurrence of both rare and frequent RSL (Fig. 2c).

Adolescents with addiction to social networks were characterized by a higher intensity of headaches, which was confirmed by the presence of higher VAS scores in them in comparison with similar indicators of the group without dependence on social networks (Table 2).

Adolescents with IPA were significantly more often characterized by the absence of recurrent cephalalgia in comparison with those surveyed with mixed Internet addiction. At the same time, they were distinguished by a higher occurrence of rare and frequent RHLs (Fig. 2d).

Adolescents with mixed Internet addiction were distinguished by a greater intensity of headache, which was demonstrated by higher VAS scores in comparison with similar indicators of adolescents without mixed Internet addiction (Table 2).

We conducted a comparative analysis of the frequency and structure of RSL in

Table 1

Intensity of headache in points of visual analog scales (VAS) in adolescents with various types of online behavior (M; Me, Q25-Q75)

		Examined groups	The statistical significance		
Indicators	1 gr teenagers with adaptive internet use	2 gr teenagers with maladaptive internet use	3 gr adolescents with pathological Internet use	of the differences "p" (by Mann-Whitney U-test)	
Headache intensity (mean VAS score)	1.2 1.0 0.0-2.0	1.6 1.0 0.0-3.0	2.0 2.0 1.0-3.0	$\begin{array}{c} 1\text{-}2 < 0.0001 \\ 1\text{-}3 < 0.0001 \\ 2\text{-}3 < 0.0001 \end{array}$	

Table 2

Intensity of headache in points of visual analog scales (VAS) in groups of adolescents with various types of Internet-dependent behavior (M; Me, Q25-Q75)

Groups	N (number of surveyed)	М	Me	25‰	75‰	The statistical significance of the differences "p" (by Mann-Whitney U-test)
1 gr without gambling internet addiction 2 gr with internet gambling addiction	2673 331	1.43 1.48	1.00 1.00	0.00 0.00	2.00 2.00	0.7828
1 gr without dependence on social networks 2 gr with addiction to social networks	2764 239	1.40 1.90	1.00 2.00	0.00	2.00 3.00	< 0.0001
1 gr no mixed internet addiction 2 gr with mixed internet addiction	2924 79	1.43 1.85	1.00 2.00	0.00 1.00	2.00 3.00	0.0055
1 gr without undifferentiated internet addiction 2 gr with undifferentiated internet	144	1.87	2.00	1.00	3.00	0.2074
addiction	84	2.07	2.00	1.00	3.00	



adolescents with gambling addiction and other types of Internet addiction (dependence on social networks, mixed, undifferentiated).

It was found that among those surveyed with gambling addiction there was a greater number of adolescents without recurrent cephalalgia, while the group with undifferentiated Internet addiction was distinguished by a high frequency of occurrence of both rare and frequent RSL (Fig. 3a).

Comparative analysis of the presence and structure of RSL in groups with gambling addiction and dependence on social networks revealed a statistically significant predominance of rare RSL and a lower incidence of the absence of RSL among adolescents with dependence on social networks, the differences in frequent RSL in the compared groups did not reach statistical significance, although in general it is possible note the high incidence of frequent RSL in adolescents with social addiction. networks (Fig. 3b).

Mixed Internet addiction was significantly more often associated with the presence of rare PCD in adolescents, a more frequent absence of recurrent cephalalgia, with some prevalence of frequent PCD in the absence of statistically significant differences between groups for this indicator (Fig. 3c).

The intensity of pain, assessed in terms of the VAS scale, in the groups with API and undifferentiated Internet addiction was comparable (Table 2).

Based on the results of the study, the following **findings** can be drawn:

1. The structure of types of online behavior was established in 2992 adoles-



Fig. 3 - The structure of RH in adolescents (in %):

a - with gambling and undifferentiated Internet addiction. Note: statistical significance of differences according to Pearson's $\chi 2$ test (p) for the "no RH" indicator: p2-3 = 0.0017; for the indicator "rare RH": p2-3 = 0.0073; for the indicator "frequent RH": p2-3 = 0.2585.

b - with gambling addiction and addiction to social networks. Note: statistical significance of differences according to Pearson's $\chi 2$ test (p) for the "no RH" indicator: p2-4 = 0.0002; for the indicator "rare RH": p2-4 = 0.0011; for the indicator "frequent RH": p2-4 = 0.2426.

c - Structure of RH in adolescents with gambling and mixed Internet addiction. Note: statistical significance of differences according to Pearson's $\chi 2$ test (p) for the "no RH" indicator: p2-5 = 0.0008; for the indicator "rare RH": p2-5 = 0.0084; for the indicator "Regrupt RH": p2-5 = 0.2262

for the indicator "frequent RH": p2-5 = 0.2352.

cents aged 12-18 years in Krasnoyarsk: API was noted in 50.6%, NPI - in 42.6% and PPI (IZ) - in 6.8%.

2. A distinctive feature of PPI comorbidity in adolescents is its more pronounced association with cephalgias (both frequent and rare), and a high intensity of pain.

3. In comparison with the IPA, the presence in adolescents of addiction to social networks, mixed and undifferentiated Internet addiction is more associated with both rare and frequent recurrent cephalgias and a greater intensity of pain.

4. Comparative analysis of gambling addiction with other types of addiction (addiction to social networks, mixed and undifferentiated) showed a more pronounced association of the latter with rare cephalgias, comparability of the occurrence of frequent cephalgias and more frequent absence of cephalgic episodes.

Conclusion. Thus, the presence of functional somatic disorders (in our study, these are recurrent cephalalgias) in adolescents with maladaptive types of online behavior (PPI and NPI) indicates an unfavorable effect of the computer and the Internet on the health of adolescents - Internet users, and in the case of untimely diagnosis and lack of correction of pathological changes can lead to the formation of chronic psychosomatic pathology. All this substantiates the expediency and necessity of a personalized approach to adolescents with maladaptive and pathological Internet use for early diagnosis and prevention of functional somatic disorders and their transformation into chronic forms of psychosomatic pathology.

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