Seeking relationships between Internet addiction and depressiveness, daytime sleepiness, as well as perceived social support in young adults

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Abstract. – **OBJECTIVE:** An assessment of the scale of Internet addiction among young adults and seeking relationships between Internet addiction and chosen sociodemographic variables, perceived social support, prevalence of depressiveness, and excessive daytime sleepiness.

PATIENTS AND METHODS: The study was carried out using a diagnostic poll method with author's own questionnaire as well as standardized diagnostic tools: The Internet Addiction Test (IAT), the Beck Depression Inventory (BDI), The Epworth Sleepiness Scale (ESS), as well as The Multidimensional Scale of Perceived Social Support (MSPSS).

RESULTS: The study was conducted on 567 individuals. Pathological Internet use was identified in 1.41% of the surveyed. Perceived social support was significantly lower in the group of respondents who pathologically used Internet in comparison with ones who used Internet in the proper way. Severity of depressiveness symptoms and daytime sleepiness was significantly higher in respondents who were addicted to Internet in comparison with not addicted individuals.

CONCLUSIONS: The scale of pathological Internet use among surveyed was low. Problematic Internet use refers to women and men to the same degree, as well as to single people and individuals in relationships. Persons who work and do not study as well as residents of large and medium cities more frequently use Internet in a more pathological way than individuals who study and live-in small cities and in the countryside. Internet addiction creates a significant relationship with the prevalence of more severe symptoms of depressiveness and excessive daytime sleepiness, whereas pathological pattern of Internet use more often concerns individuals whose perception of social support is low.

Introduction

An addiction is identified as an impaired brain reward, motivation and memory functions which consequently lead to characteristic biological, psychological, and social symptoms resulting from using substances and other behaviours[1]. Other addictive behaviors are characterized by distorted behaviors with addictive character which are not associated with an intake of psychoactive substances. Above all, they include Internet addiction[2].

The world pioneer in the field of pathological Internet use and behaviors in cyberspace, Young[3,4], described Internet addiction as a disruption in habit control which significantly worsens person's functioning in all the domains of his or her life. In order to be diagnosed with Internet addiction, five of the eight of the following symptoms must have occurred in the last 12 months: Increased interest in Internet which manifests itself as a constant wondering about being on-line; the desire to spend more time on functioning on Internet; recurring futile attempts to limit the use of Internet; experiencing negative emotions when not being able to use Internet. Difficulty in organizing time while being on-line; personal and social complications resulting from using Internet; concealing from others the actual amount of time

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spend on-line; perceiving activities on Internet as an escape from troubles, as well as a way to soothe undesired emotional states.

The most common model explaining the underlying cause of behavioral addictions is the biopsychosocial model. It combines three core-lating with one another components which, in a varying degree, explain the determinants of developing behavioral addictions. An important factor is the reward system and its neurotrans-mitter dopamine. Physiological importance of the reward system relies on secretion of dopa-mine because of undertaken actions which have a significant biological meaning. Such activities include eating, drinking, as well as sexual activity, understood in the procreative sense. There is a possibility of activating the reward system through activities which have no fundamen-tal biological meaning. In consequence, actions such as using Internet or shopping, which result in an instant gratification, influence an increased secretion of dopamine as well as functioning of the reward system[5].

Psychological determinants considered a back-ground of the development of behavioral addic-tions concentrate on neurotic personality type and underline the significance of impulsiveness and compulsiveness in the pathogenesis of the discussed phenomenon[6].

Consequences of problematic Internet use cover a wide spectrum of psychosocial disor-ders – inadequate self-esteem, lowered sense of self-worth, increased irritability, aggressiveness, emotional instability, anxiety, depression, and decreased mental immunity. Long-term func-tioning in the virtual world favors personality disorders which result from an illusory sense of membership to an Internet community generating artificial trends and manifesting numerous forms of virtual pathology[7-9].

The implications regarding social sphere led to a gradual isolation from the closest environment as a result of preoccupation with the subject of an addiction. These consequences include worsening social relations, loss of interpersonal skills as well as former interests, and minimizing contacts with loved ones which leads to social isolation and sense of loneliness[10,11].

The aim of this study was to assess the scale of Internet addiction among young adults and seek-ing relationships between Internet addiction and chosen sociodemographic variables, perceived social support, incidence of depressiveness, and excessive daytime sleepiness.

Patients and Methods

The study was conducted on 567 young-adult respondents from West Pomeranian Voivodeship in Poland. The inclusion criteria to the study process were: age between 18 and 29 years and obtaining an informed consent for the participa-tion in the study. The exclusion criteria included: lack of consent for the participation in the study as well as the age bellow 18 or above 29 years. Respondents received a written information on the aim and the course of the study as well as the possibility to withdraw at any stage of the study. The study was conducted in accordance with the Declaration of Helsinki, and the approval of the Bioethical Commission of Pomeranian Medical University in Szczecin was obtained.

The study was conducted using the diagnos-tic poll method with questionnaire technique. Author's own questionnaire form on sociode-mographic data (sex, age, place of residence and marital status) was used along with standardized diagnostic tools.

The Internet Addiction Test (IAT) developed by Majchrzak et al[12] is the Polish adaptation of the Internet Addiction Test by K. Young which con-sists of twenty questions verifying the influence of Internet on different spheres and aspects of individual's life. Scores vary between 20 and 100 points, wherein results between 50 and 79 imply a risk of pathologic Internet use and results above 79 points indicate its pathologic use.

The Multidimensional Scale of Perceived So-cial Support (MSPSS) developed by Buszman et al[13] is the Polish adaptation of The Multidi-mensional Scale of Perceived Social Support (MSPSS) by Zimet et al[14] and others. The de-scribed questionnaire consists of 12 statements regarding subjectively experienced social sup-port by the studied individual from signifi-cant other, family and friends. Results ranged between 1 and 7 points. Scores between 1 and 2.9 points stood for low support, punctuation be-tween 3 and 5 stood for average support, while results ranging from 5.1 to 7 points identified high social support.

The Beck Depression Inventory (BDI) normal-ized is the Polish adaptation of the second version of the Beck Depression Inventory by Beck et al[15]. The inventory consists of 21 positions specifying symptoms of depression which are referred to by a respondent who chooses on of the four possible answers. The obtained result is a sum of points corresponding with the answers and is assigned

to one of the following thresholds: 14-19 – mild depression, 20-28 – moderately severe depression, and above 29 very severe depression[16].

The Epworth Sleepiness Scale is a questionnaire which establishes a probability of falling asleep during each of the eight described situations based on one's experience, including everyday activities. Results within 0-9 mean daytime sleepiness within the norm, 10-14 indicate excessive daytime sleepiness, while results above 14 identify pathological daytime sleepiness[17,18].

The data collected during the study process were gathered in a spreadsheet in Microsoft Office Excel program. The statistical analysis was conducted using R program, version 3.6.2. Analysis of quantitative variables was carried out *via* calculating mean, standard deviation, median, quartiles, minimum and maximum. Whereas the analysis of qualitative variables was performed *via* calculating the number and percent of occurrences for each value. Comparison of qualitative values for each group was carried out with the Fisher exact test. Comparison in three or more groups was conducted using the Kruskal-Wallis test, and in case of detecting significant statistical differences a post-hoc analysis with the Dunn's test was carried out to identify groups differing in a statistically significant way. During the analysis, 0.05 was adopted as the level of significance, thus all *p* values bellow 0.05 were interpreted as indicative of significant relationships.

Results

The study was conducted on 567 individuals (students, graduates, and students at senior high school classes), 305 (53.79%) out of which were women and 262 (46.21%) were men. The age of surveyed ranged between 18 and 29 years and was 20.53 (SD = 2.78) on average. Most respondents had primary education – 250 surveyed (44.09%). The majority of respondents were single – 311 person (54.85%). Most respondents lived in cities with the number of residents greater than 100 thousand – 218 people (38.45%). The structure of study group's professional activity indicated that 352 individuals (61.9%) were unemployed and learning, 180 surveyed (31.75%) simultaneously worked and studied, whereas 35 persons (6.17%) worked and did not study.

The interpretation of the Internet Addiction Test (IAT) indicated that 8 studied (1.41%) char-

acterized with pathological Internet use, 79 persons (13.93%) were at risk of pathological Internet use, while 480 surveyed (84.66%) used Internet in a proper way.

An assessment of depressiveness according to the BDI showed that strong severity of symptoms was presented by 5 individuals (0.88%), 77 surveyed (13.58%) experienced moderate severity of depressive symptoms, 163 of them (28.75%) showed mild severity of symptoms, while 322 (56.79%) respondents did not suffer from depressiveness.

In case of the analysis of daytime sleepiness according to the ESS, 52 respondents (9.17%) experienced pathologic daytime sleepiness, 188 individuals (33.16%) characterized with excessive daytime sleepiness, while 327 surveyed (57.67%) showed normal daytime sleepiness.

When analyzing the level of perceived social support according to the MSPSS which included support from significant others, family, and friends, it was established that 40 respondents (7.05%) had low general support, 178 persons (31.39%) were supported on an average level, and 349 surveyed (61.55%) declared a high level of general support.

Data analysis showed statistically significant differences (*p*<0.05) between Internet use by the respondents according to the TUI and professional activity as well as the place of residence. It was proven that individuals who worked and did not study were at the risk of pathologic Internet use more than ones who did not work and studied as well as ones who both worked and studied (*p*=0.002). It was also established that living in a place with a great number of residents was associated with the risk of developing a pathologic relationship with Internet among surveyed (*p*=0.001). No statistically significant links were established (*p*>0.05) between using Internet and sex as well as marital status (Table I).

Data analysis showed statistically significant differences (*p*<0.05) between Internet use according to the TUI and perceiving social support according to the MSPSS (Table II). It was demonstrated that individuals who used Internet in the correct way were characterized with greater support of a significant other than respondents who were at risk of pathologic Internet use (Me: 6.5 *vs.* 5; *p*<0.001).

Data analysis showed statistically relevant differences (*p*<0.05) between the risk or pathologic use of Internet in relation to the severity of de-

Table I. Sociodemographic variables and patter of Internet use according to the TUI.

Sociodemographic variables	Using the Internet			*p*
	Correct	Risk of pathologic use	Pathologic	
Sex				
Women (n = 305)	261 (85.6%)	39 (12.8%)	5 (1.6%)	0.651:
Men (n = 262)	219 (83.6%)	40 (15.3%)	3 (1.1%)	
Professional Activity				
Working and not studying (n = 35)	23 (65.7%)	10 (28.6%)	2 (5.7%)	**0.002:**
Working and studying (n = 180)	146 (81.1%)	31 (17.2%)	3 (1.7%)	
Not working and studying (n = 352)	311 (88.4%)	38 (10.8%)	3 (0.8%)	
Place of residence				
Countryside (n = 195)	180 (92.3%)	14 (7.2%)	1 (0.5%)	**0.001:**
Cities below 10 thousand residents (n = 57)	50 (87.7%)	7 (12.3%)	0 (0%)	
Cities with number of residents between 10 and 100 thousand (n = 97)	78 (80.4%)	19 (19.6%)	0 (0%)	
Cities with more than 100 thousand residents (n = 218)	172 (78.9%)	39 (17.9%)	7 (3.2%)	
Marital status				
Informal relationship (n = 31)	28 (90.3%)	2 (6.5%)	1 (3.2%)	0.225:
Formal relationship (n = 225)	186 (82.7%)	34 (15.1%)	5 (2.2%)	
Single (n = 311)	266 (85.5%)	43 (13.8%)	2 (0.7%)	

n: number of respondents, *p*: the Fisher's exact test.

pressiveness symptoms and daytime sleepiness. It was proven that symptoms of depressiveness (Me: 33.5 and 17 *vs.* 8; *p<0.001*) and excessive daytime sleepiness (Me*:* 9.5 and 11 *vs.* 8; *p<0.001*) were substantially higher among respondents who used Internet in a pathologic way or were at risk of it than compared to people using Internet in a proper way (Table III).

Discussion

A global computer network such as Internet provides an easy access to versatile services which facilitate functioning in various spheres of everyday life. This results in an increased use of this medium, which besides unquestionable advantages, has also negative consequences. This

Table II. Internet use according to the TUI and social support according to the MSPSS in the study group.

Support		Using the Internet			*p*
		Correct - A n = 480	Risk of pathologic use - B n = 79	Pathologic - C n = 8	
Significant other	M ± SD	5.6 ± 1.7	4.9 ± 1.6	5.5 ± 1.4	*p* <0.001
	Me	6.5	5	5.7	A > B
	Q1-Q3	4.7-7	4-6.1	5.3-6.3	
Family	M±SD	5.1 ± 1.7	4.5 ± 1.6	4.2 ± 1.7	*p* = 0.002
	Me	5.5	4.5	4.4	A > B, C
	Q1-Q3	4-6.5	3.5-5.7	3.7-5.2	
Friends	M±SD	5.4 ± 1.6	4.8 ± 1.4	4.3 ± 1.6	*p* < 0.001
	Me	5.75	5	4.6	A > B, C
	Q1-Q3	4.7-7	4-6	3.5-5.5	
General	M ± SD	5.4 ± 1.4	4.8 ± 1.2	4.6 ± 1.1	*p* < 0.001
	Me	5.7	4.9	4.9	A > B, C
	Q1-Q3	4.6-6.5	4-5.7	3.9-5.5	

n: number of respondents; M ± SD: mean ± standard deviation; Me: median, Q1-Q3: quartiles; *p*: the Kruskal–Wallis test + post-hoc analysis (Dunn's Test).

Table III. Correlation between Internet use according to the TUI and severity of depression according to the BDI as well as daytime sleepiness according to the ESS.

Support	Using the Internet according to the TUI			p
	Correct - A $n = 480$	Risk of pathologic use - B $n = 79$	Pathologic - C $n = 8$	
	Depressiveness according to the BDI			
M ± SD	11.8 ± 11.5	18.8 ± 11.9	27.6 ± 14.7	**p < 0.001**
Me	8	17	33.5	**C, B > A**
Q1-Q3	3-17	10.5-26	19.2 - 38	
	Sleepiness according to the ESS			
M ± SD	8.2 ± 4.7	10.8 ± 4.7	10.9 ± 5	**p < 0.001**
Me	8	11	9.5	**C, B > A**
Q1-Q3	5-11	8-13	8-14.8	

n: number of respondents; M ± SD: mean ± standard deviation; Me: median; Q1-Q3: quartiles; *p:* the Kruskal-Wallis test + post-hoc analysis (Dunn's Test).

study provides information on the scale of Internet addiction phenomenon among young adults. Moreover, the results obtained throughout the study indicate potential causes or implication of the pathologic Internet use.

Among the respondents, the scale of Internet addiction phenomenon was low, those results were confirmed by other studies[19,20,21]. In the publication on the analysis of the patterns of Internet use among students, Internet addiction according to the Internet Addiction Scale (IAS) was identified in 0.8% of respondents[19]. A cross-sectional study on adolescents living in seven chosen European countries (Poland, Germany, Netherlands, Greece, Spain, Romania, Iceland) showed that the issue of abnormal Internet use concerned 1% of surveyed, while individuals at risk of pathologic Internet use accounted for 12.7%[20]. While in the study on a group of Spanish students, 6.04% were identified with problematic Internet use. The authors who used the same questionnaire as this study, the Internet Addiction Test (IAT) by Kimberly Young, identified a range of possible answers which resulted in separate, in comparison with author's own study results[21].

A meta-analysis which sums up results of studies carried out in 31 countries in Europe, Asia, Oceania, North and South Americas, including 89,281 respondents, identified Internet addiction on the level of 6%. The scale of computer network addiction varied between chosen geographical territories. The lowest percentage, amounting to 2.6% of individuals using Internet in a pathologic way occurred in the countries of North and West Europe, while the highest – 10.9% – was in the Middle East counties. Problematic Internet use was associated, above all, with lower perceived quality of life as well as with longer time spent on commuting[22]. However, studies on young adults from Asian and Middle East countries[22] showed that 16.8-40% of individuals used Internet in a pathological way which might be caused by technological innovation and distinct, in comparison with European countries, social and moral norms. A study on Lebanese medical students established that 16.8% of them were addicted to Internet[23]. Then, a study on Iranian medical students[24] showed that 28.7% of respondents were addicted to the computer network. The greatest scale of Internet addiction phenomenon – 40% (37.1% – moderate addiction, 2.9% – severe addiction) – was identified in the studies on 587 Jordanian students using the IAT[25].

Sociodemographic variables which influenced the prevalence of Internet addiction included place of residence as well as professional status. Results published by other authors also proved that individuals living in cities more frequently presented with problematic Internet use than ones who lived in the country which might be associated with better accessibility to Internet, both in terms of availability of Internet network and owning mobile devices. In the study on 1860 Polish adolescents, it was proven that Internet addiction, measured with the Questionnaire of

Internet Addiction Examination, more frequently concerned individuals living in cities than in the country. Moreover, authors established that residents of cities more frequently used instant messengers, electronic mail, social media as well as online pornography comparing to the residents of countryside[26]. A meta-analysis of 70 articles on the phenomenon of computer network dependence among 122,454 young adults with chosen diagnostic tools, including the same one as in this study – the IAT – also confirmed higher incidence of Internet addiction among inhabitants of cities than ones from the rural areas[27].

Analysis of author's own studies showed no statistically significant differences were established between using Internet and sex as well as the marital status. The results of the study[28] on 263 Polish adolescents also did not identify relationships between sex and Internet addiction because the issue of Internet dependence concerned 10.2% of women and 12.1% of men.

The results of this study showed that individuals addicted to Internet presented with greater severity of depressiveness in comparison with non-addicts which was confirmed by the studies of other authors. Authors analyzing Internet dependence with the IAT and studying severity of depressiveness with the BDI among 392 Turkish medical students indicated that respondents addicted to Internet network much more frequently showed a greater severity of depressiveness than in non-addicted individuals[29]. Similarly, studies carried out on a group of 718 Polish adolescents and young adults confirmed that presence of severe depressive symptoms (measured with *Centre for Epidemiologic Studies Depression Scale – CES-D*) significantly correlated with Internet dependence (identified with the IAT) among surveyed[30]. Similar results were also obtained in a different geographic region, Lebanon. The study on 1103 adolescents confirmed that a higher level of depressiveness (assessed with *Multiscore Depression Inventory*) concerned much more frequently individuals with problematic Internet use habits (identified with IAT) in comparison with ones who used Internet in the correct way[31]. These results are confirmed by other studies[32,33,34,35].

The results of the study identified frequent incidence of daytime sleepiness among persons who pathologically use Internet. Those results confirm the studies carried out among 2350 Turkish students aged between 18 and 25 years according to which individuals who pathologically use Internet characterized with excessive daytime sleepiness (according to the ESS) and more frequently declared disorders of sight, hearing as well as pain, comparing to others who used Internet in the proper way[36].

Author's own studies showed that perceived social support was lower among surveyed who used Internet in the pathologic way than ones who used it correctly. Cited results were also confirmed by studies which used the same as this study diagnostic tools, analyzing level of perceived social support. The study conducted among 246 Iranian adolescents proved that individuals addicted to Internet have lower social support (according to the MSPSS) in comparison with non-addicts. Moreover, authors showed that the most relevant relationship exists between Internet dependence and lowered support of family and friends. In comparison, the results of this study showed that each type of perceived support – of family, friends, significant other and general – was lower in surveyed who pathologically used Internet in comparison with others who used Internet correctly[37]. Researchers also proved that surveyed who experienced intense loneliness more frequently used Internet in a problematic way[38].

The results of this study confirm a correlation between the prevalence of Internet addiction and excessive daytime sleepiness, intensified depressiveness as well as low social support, thus form the basis for the next studies in this respect.

Limitations and Strengths of the Study

An unquestionable limitation of this study is the number of studied materials which does not constitute a representative value of age group being the subject of this study. It is worth noticing that studies, whose results were compared in the paragraphs above, frequently contained values like the study group. The limitation does not invalidate the results of this study.

A different limitation is the way of collecting data that allows identification of addicted individuals. The participants of the study filled out questionnaire forms on their own by self-assessing and choosing the statements which resembled reality the most. The described technique, regardless of the fact that it is anonymous, poses a risk of obtaining answers which are factually incorrect. The cause for the described situation might be a conscious or subconscious manipulation by the respondents, the risk of which increases with the knowledge about the study. Described lim-

itations also do not disqualify the results of this study since each compared study used the same method and technique.

The strong suit of this study was the fact that the used standardized tools were also used in the vast majority of studies, results of which were compared with the results of this study. Another strength of this study was the fact that representants of both sexes comprised similarly numerous groups which minimizes the risk of biased results which is reflected in the quality and credibility of the study.

Conclusions

The scale of the pathological Internet use among surveyed was low. Problematic Internet use refers to women and men to the same degree, as well as to single people and individuals in relationships. People who work and do not study and residents of large and medium cities more frequently use Internet in a more pathological way than studying individuals who live in small cities and in the countryside. Internet addiction creates a significant relationship between the prevalence of more severe symptoms of depressiveness and excessive daytime sleepiness, whereas pathological pattern of Internet use more often concerns individuals whose perception of social support is low.

Conflict of Interest
The Authors declare that they have no conflict of interests.

Ethics Approval and Consent to Participate
The study was carried out in accordance with the Declaration of Helsinki. All subjects were informed about the study and all of them provided informed consent.

Authors' Declaration of Personal Interests
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Authors' Contribution
Material preparation, data collection and analysis were performed by. Study concept and design analysis and interpretation of data M.N., KR., M.S., E.G., obtained funding M.N., M.S., study supervision E.G. The first draft of the manuscript was written by K.R. and E.G. and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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