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Internet Addiction among Greek University Students: Demographic Associations with the Phenomenon, using the Greek version of Young's Internet Addiction Test

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Abstract

Internet addiction (IA) is a new disorder described in 1996 by the psychologist Kimberly Young. The aim of this paper is to estimate the percentage of IA among Greek university students. Results of a sample survey among 1876 Greek university students, 18-27 years old, are presented. The questionnaire consisted of eight questions from Young's Diagnostic Test for Internet Addiction (YDTIA) as well as an inventory including demographic factors and questions about academic performance, computer and Internet use. YDTIA had a good reliability and diagnostic accuracy, tested with Cronbach's alpha (0.71) and sensitivity analysis. Results show that the percentage of IA (5-8 YDTIA criteria) is 11.6%, while problematic Internet users were (3-8 YDTIA criteria) 34.7%. Men were more likely to be addicted to the Internet than women, and Internet addicted students were associated with poorer academic performance. Multiple logistic regression showed that significant predictors of IA included increased hours of daily Internet use, increased hours visiting chat rooms, sex pages and blogs, male gender, divorced status, poor grades, and accessing the Internet outside of the home. The results of this study will allow health officials to recognise students who are Internet addicted or on the verge of becoming addicted and stress risk factors indicating a need for intervention in order to prevent the appearance of IA.

Keywords: Greece, university students, Internet addiction, gender, academic performance, sex pages

JEL classification: C83, I10, I21

1. Introduction

1.1 Definition: Internet Addiction

The Internet is a widely recognized channel for information exchange, academic research, entertainment, communication and commerce (Moore, 1995; Widyanto and Griffiths, 2006; Douglas et al., 2008; Byun et al., 2009). Although the positive aspects of the

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Internet have been readily praised, there is a growing amount of literature on the negative side of its excessive and pathological use (Chou and Hsiao, 2000; Caplan, 2003; Beard, 2005; Frangos and Frangos, 2009). Byun et al. (2009) estimate that 9 million Americans could be labelled as pathological Internet users with unpleasant consequences for their social life, their professional status and their psychological condition (Shapira et al., 2000; Shapira et al., 2003; Young, 2004; Walker, 2006).

In the scientific literature, several terms have been proposed to describe pathological Internet use: Internet addiction, cyberspace addiction, Internet addiction disorder, online addiction, Net addiction, Internet addicted disorder, pathological Internet use, high Internet dependency, problematic Internet use and others (Widyanto and Griffiths, 2006; Byun et al., 2009). To date, there is neither a conclusive nor a consistent definition for this disorder, making it difficult to establish a coherent picture of this disorder throughout the world. Nevertheless, efforts are being made to reach one uniform definition, which might also be included in the DSM V, the authoritative guidebook for the diagnoses of psychiatric disorders by the American Psychological Association (Block, 2008).

For purposes of this study, we chose the term Internet Addiction (IA) because it was the first term used to describe this phenomenon and for which the first proposed diagnostic criteria were based on an addictive disorder, that of pathological gambling (Young, 1998; Widyanto and Griffiths, 2006). Although the term addiction was combined with technology in England before 1996 (Griffiths, 1995), and even earlier the term 'computer addiction' had been used (Shotton, 1991), IA had been mentioned only as an informal phrase by Ivan Goldberg, MD in 1995 (Federwisch, 1997; YouTube, 2008), in order to describe excessive use of the Internet. However, it was not until 1996 when the psychologist Kimberly Young gave a first serious account of this disorder, proposing diagnostic criteria and describing the collateral consequences of it on specific groups (Young, 1996a; 1998). The major objections concerning this term were in the use of the word "addiction": although Young (1998) uses it to define the compulsiveness accompanying this disorder, Internet addiction is also accompanied with underlying maladaptive cognitions, which would be better described psychologically if the term 'problematic Internet use' was used (Davis, 2001; Beard and Wolf, 2001). Moreover, some researchers argue that a person's overuse or abuse of the Internet is a behavioural manifestation of other things that may be problematic in their lives (Thatcher et al., 2008). Nevertheless, the term Internet addiction is frequently used in scholarly journals, such as *CyberPsychology & Behavior* and *Computers in Human Behavior*. In a recent attempt to meta-analyse quantitative data on IA, Byun et al. (2009, p. 204) note that the matter of the definition of IA is the first challenge to address and suggest developing "a complete definition of Internet addiction that is not only conclusive but decisive, covering all ages, gender, and educational levels".

We follow the definition of IA, according to Beard's holistic approach wherein "an individual is addicted when an individual's psychological state, which includes both mental and emotional states, as well as their scholastic, occupational and social interactions, is impaired by the overuse of the medium" (Beard, 2005, pp. 8-9). We use the eight-item questionnaire as an assessment tool, proposed by Young (1996a; 1998) in her first papers. Young's Diagnostic Test for Internet Addiction (YDTIA) consists of eight yes or no questions about the use of the Internet. Respondents who answered 'yes' to five or more of

the eight criteria were classified as Internet addicted, and the rest were classified as non-addicted (Young, 1998).[1]

1.2 University Students and Internet Addiction

A common group for studying IA has been students. University students are considered as a high risk group for IA (Kandell, 1998; Young and Rogers, 1998; Nalwa and Anand, 2003; Niemz et al., 2005). Possible reasons for this are: (a) students have huge blocks of unstructured time, (b) schools and universities provide free and unlimited access to the Internet, (c) students from the ages of 18 – 22 years are for the first time away from parental control without anyone monitoring or censoring what they say or do online, (d) young students experience new problems of adapting to university life and finding new friends, and often end up seeking a companionship by using different applications of the Internet, (e) students receive full encouragement from faculty and administrators in using the different Internet applications, (f) adolescents are more trained to use the different applications of technological inventions and especially the Internet, (g) students desire to escape university sources of stress resulting from their obligations to pass exams, compose essays and complete their degrees in the prescribed time with reasonable marks, and finally (h) students feel that university life is alienated from social activities, and when they finish their studies, the job market with all its uncertainties is a field where they must participate and succeed in finding employment (Young, 2004).

Internet addiction in university students has been recorded through academic research in the USA (Mitchell, 2000; Fitzpatrick, 2008), South Africa (Thatcher and Goolam, 2005a,b), South Korea (Hur, 2006; Kim et al., 2006; Ko et al., 2006), Taiwan (Chou and Hsiao, 2000; Lin and Tsai, 2002; Tsai and Lin, 2001; 2003), Norway (Johansson and Götestam, 2004), England (Griffiths, 1995; 1996a,b; 1997; 2000; Griffiths et al., 1999), Italy (Ferraro et al., 2007), Switzerland, China (Byun et al., 2009), and Cyprus (Bayraktar and Gün, 2007). However, in Greece, no study has examined IA among university students. Several studies have been carried out among adolescents, and several other studies have examined Internet use among high school students in Greece (Aslanidou and Menexes, 2008; Siomos et al., 2008; Tsitsika et al., 2009). Thus, we conducted an extensive literature review and discovered the demographic factors associated with IA among university students.

1.3 Demographic Risk Factors for Internet Addiction

Gender

Studies indicate that the use of computers and the Internet differs between men and women. Weiser (2000) gave an extensive review and executed a study on gender differences in Internet use patterns and Internet application preferences in a sample of 1190 surveys. He concluded that there were numerous gender differences in preferences for specific Internet applications. Results had shown that men use the Internet mainly for purposes related

1. The questions of YDTIA in English are included in Table 2. The Greek version for these eight questions have been validated in earlier publications of ours and others (Siomos et al., 2008; Frangos and Frangos 2009; Frangos et al., 2009).

to entertainment and leisure, whereas women use it primarily for interpersonal communication and educational assistance. However, additional analyses showed that several gender differences were mediated by differences in age and Internet experience. His results were in accordance with many previous results which had shown mainly that women were less familiar with the use of the Internet (Georgia Tech GVU WWW survey, 1994), suggesting at some period that men comprised 95 % of Internet users and women just 5%. Explanations for this gender gap have been given and rely on gender differences in self-efficacy and attitudes toward computers (Busch, 1995). Male students are generally considered more experienced in programming and computer games than females and report having had more encouragement from parents and friends previously, in contrast to women who might have been discouraged from using modern technologies (Busch, 1995, p. 147). However, this gender gap is predicted to decrease over the years, due to the fact that technology spreads widely towards all available channels (Morahan-Martin, 1998; Sherman et al., 2000; Shaw and Gant, 2002).

In Greece, two studies of high school pupils similarly mention that boys use computers more than girls (Papastergiou and Solomonidou, 2005; Aslanidou and Menexes, 2008). Interestingly, Papastergiou and Solomonidou (2005) mention that boys have more opportunities to access the Internet and use the Internet for entertainment and Web page creation than girls do, with no other differences in other activities. Specifically, the percentages of boys in their sample who used their computer and accessed the Internet from home were 50% and 29.4% respectively compare to 31.8% and 11.8% among girls ($p<0.001$). Boys accessed the Internet more frequently than girls did (44% vs. 5%, $p<0.001$), while, a higher percentage of boys than girls used the Internet in places outside the home (73.5% vs. 55.3%, $p< 0.001$) (Papastergiou and Solomonidou, 2005).

The same gender gap has been noticed with IA. Morahan-Martin and Schumacher (2000) reported that males were more likely than females to be pathological users (12% vs. 3%), whereas females were more likely than males to have no symptoms (28% vs. 26%) or have limited symptoms (69% vs. 61%) of behavioural pathology. Scherer (1997) reported that dependent Internet users included a significantly larger proportion of men to women (71% men and 29% women, respectively) than non-dependent users (50% men and women). Thus, these studies, and several more, demonstrate that at least male college students are more prone to IA (Chou et al., 2005; Widyanto and Griffiths, 2006). The reasons for male predominance in IA have been proposed to be overuse of pornography sites and online gaming addiction. Tsai et al. (2009, p. 298) give a satisfactory explanation supporting the view that pornographic sites leads to more frequent IA:

> "A study on gender differences in sexual arousal found that men tend to be more visual with respect to sexual fantasies while women are more process or verbally oriented. As the cost of bandwidths decreased drastically in recent years, the Internet has become more abundant with graphical information. The increased availability of pornography in cyberspace may be one of the reasons for the higher prevalence rate of Internet addiction in males".

Thus, we hypothesize that:

H1: Men are more likely to belong to the IA group than women.

Academic performance

From the beginnings of research on IA, poor academic performance has been associated with this disorder. Young (1998, p. 241) originally described this:

> "Although the merits of the Internet make it an ideal research tool, students experienced significant academic problems when they surfed irrelevant web sites, engaged in chatroom gossip, conversed with Internet pen pals, and played interactive games at the cost of productive activity. Students had difficulty completing homework assignments, studying, or getting enough sleep to be alert for class the next morning due to such Internet misuse. Oftentimes, they were unable to control their Internet use, which eventually resulted in poor grades, academic probation, and even expulsion from the university."

This initial conclusion was consequently replicated in many studies with university students. Griffiths (2000) described a case of a Greek university student in the UK whose studies had suffered considerably because he spent so much time on the Internet, which left him little time to get on with his degree work. Morahan-Martin and Schumacher (2000) later measured pathological Internet use, including now a new question on the extent to which academic obligations suffered as a result of Internet usage; they found that 27.3% of students with pathological Internet use had missed classes because of online activities. Kubey et al. (2001) evaluated Internet dependency in a sample of 542 university students and found that 9% of the participants classified themselves as being psychologically dependent on the Internet, and also identified themselves as having trouble with schoolwork, missing class time, and having a sense of guilt and lack of control over their Internet use. Internet dependent users seem to be more likely to damage their academic careers due to excessive usage. The results support greater use of the Internet by dependent users and increased probability for them to miss class (Scherer, 1997).

Two very large studies from Asia demonstrated yet again the negative effect of excessive Internet use on academic performance. Chen and Peng (2008) conducted an online survey on 49,609 students from 156 universities in Taiwan. They defined heavy Internet users as those who used the Internet over 33.9 hours per week and those under this threshold as non-heavy users. Differences in academic grades and learning satisfaction between heavy and non-heavy Internet users were statistically significant. Non-heavy users had better grades and greater learning satisfaction than heavy users. Although the authors did not study IA per se, the data suggested that students who spend a significant amount of time online, experience academic and learning difficulties. A more recent study by Huang et al. (2009) on a sample of 4,400 college students from China investigated IA, measured by YDTIA, and examined whether poor academic achievement is a risk factor of IA. Multiple logistic regression showed that poor academic achievement was a significant risk factor of IA ($OR=1.54$, $p<0.001$). The two factors of IA that cause poor academic attendance, are the maladaptive cognitions related to Internet addiction (shyness, depression, low self-esteem) (Davis, 2001; Yuen and Lavin, 2004), as well as the physical element of time loss. Internet addicted users spend excessive amounts of time in front of their computers. Moreover, these abnormal patterns of use cause lack of sleep because the user stays awake during late night hours in order to surf different web pages. This lack of sleep causes a lack of concentration and loss of interest in everyday lectures leading to reduced reading of course material and,

consequently, poor marks during the exam period (Lavin et al., 1999; Yuen and Lavin, 2004). Thus, we formed the following working hypothesis:

H2: Internet addicted students will present a poorer academic performance than non-addicted Internet users. Additionally, this variable may be a risk factor of IA.

Family status

University students can be single, married or divorced. Although the possibility of marriage among university students might seem low and even lower for divorce, we could argue the opposite for Greek university students. In Greece circumstances could be different because students are allowed to attend undergraduate courses on a free basis, giving them a greater opportunity to graduate or to complete their studies at a relatively older age. Moreover, many students return to the university to complete another degree or because they didn't access higher education when they were younger. So, among Greek universities we could expect an existing percentage of married or even divorced students. Unfortunately, there are not any studies on percentages on this topic in Greece.

Married university students have always been regarded as a group with increased stressors who might seek sources of social support much more than single or dating students (Bayer, 1972). Until now, most results stem from research on graduate students. McRoy and Fisher (1982) comment on the increasing number of married students attending universities and note, "If appropriate support services are to be available for college students who are married, it is important to understand the stresses on the marriages and on the students. Otherwise, we can expect the dropout rate for students and the divorce rate for student marriages to increase". A recent review on marital satisfaction among graduate students suggested that married students in graduate study experience marital strain that may affect their successes in their marriage or graduate study (Gold, 2006).

The unique educational circumstances in Greece allow a certain degree of extrapolation of these results to married undergraduate students. Taking into account as well that IA is rather prevalent among university students, the combination of marriage and IA would significantly increase the stressors in a family. It has been reported that cybersex addiction among couples, which is a variant of IA, has lead to serious interpersonal problems and even to divorce (Hertlein and Piercy, 2006). Results from a survey on 94 subjects who had experienced cybersex in their couple relationships, indicated that 22% of the respondents had separated or divorced as a result of the compulsive cybersex (Schneider, 2000).

So, there could be a possible link between IA and family status, with worst family status (e.g. divorced) being associated with IA. The question of IA and family status has not yet been studied extensively in IA studies and among university students. Greek higher education conditions afford the opportunity to explore this topic. Thus, we hypothesize:

H3: Divorced students are more likely to develop IA than married couples.

Location of Computer Usage and Internet Addiction

The presence of a computer with Internet access in a person's environment is necessary for the person to develop IA. Davis (2001) suggests that this is *a necessary contributory cause* for the subject to develop pathological Internet use, which is similar to

IA. This was part of his argument in the development of the cognitive behavioural model of pathological Internet use (Davis, 2001)[2]. Research has shown that the environments of Internet usage differ among each student. Some students prefer to access the Internet from home, while others prefer to go outside of their home to places such as the school library or an Internet café. Additionally, it has been proven that the location for accessing the Internet has many times been associated with the development of IA (Young, 2004; Ceyhan, 2008). Places where Internet access is unlimited or free, where there is no guardian or parental supervision increase the possibility for a subject to remain on the Internet. As mentioned above, university students are most prone to this, because in their dorms or in the university, free and unlimited access to the Internet is available with no parental supervision, enabling them to use it without restriction. In two studies on Greek adolescents, regression analyses showed that the primary location of Internet access was a significant risk factor for predicting IA (Siomos et al., 2008; Tsitsika et al., 2009). Their results replicated those of previous studies on adolescents from Norway (Johansson and Götestam, 2004). Thus, we hypothesize:

H4: The location of Internet access is a significant predictor of Internet addiction among Greek university students.

1.4 Aim

This is the first study of IA among Greek university students. In this paper, we analyse the properties of the questionnaire used, which is the first Greek questionnaire for IA in university students, and give sociodemographic correlates. Furthermore, we assess the prevalence of IA among Greek university students and find possible risk factors of IA.

2. Methods

2.1 Sample

For the purposes of our study, we selected by randomized stratified selection a sample of 1,876 students, from 18 to 27 years old (mean age 19.52 ± 2.38), studying in 36 classes among 9 university and technological educational institute (TEI) departments in Athens, Greece (TEI of Athens, TEI of Piraeus, Athens University of Economics and Business, National & Kapodistrian University of Athens, Agricultural University of Athens). Of the studied sample, 878 (47%) were male and 997 were female (53%). The desirable accuracy of the sample or the maximum sampling error E, derived from the formula $n = \left(z_{a/2}\right)^2 / 4E^2$

2. In brief, Davis (2001) proposed a model of the aetiology of pathological Internet use using the cognitive behavioural approach. The main assumption of the model was that pathological Internet use resulted from problematic cognitions coupled with behaviours that intensify or maintain maladaptive response (Widyanto and Griffiths, 2006). It emphasized the individual's thoughts/cognitions as the main source of abnormal behaviour. Davis specified that the cognitive symptoms of pathological Internet use might often precede and cause the emotional and behavioural symptoms rather than vice versa. Similar to the basic assumptions of cognitive theories of depression, it focused on maladaptive cognitions associated with pathological Internet use. Davis next ascribed to specific psychopathologies and conditions, concepts of necessary, sufficient, and contributory causes. For a more extensive description of each cause, see Davis (2001) and Widyanto and Griffiths (2006).

(Tabachnick and Fidell, 2000), was E = 0.02, where n = 1876, $z_{\alpha}/2 = 1.96$ is the 97.5 quintile of the Normal Distribution, and $\alpha = 0.05$. Table 1 summarizes additional demographic information.

Table 1: Demographic information of the sample

	Frequencies	**Percentages**
Gender		
Female	997	53.1
Male	878	46.8
NA*	1	0.1
Age		
$18 \leq x < 20$	751	40.0
$20 \leq x < 22$	637	34.0
$22 \leq x < 24$	305	16.1
$24 \leq x < 26$	108	5.8
$26 \leq x < 28$	74	4.0
NA	1	0.1
Personal family status		
Married	63	3.4
Not married	1742	92.9
Divorced	66	3.5
NA	5	0.2
Highest title of studies obtained		
Lykeion Diploma	1632	87.0
Public or Private IEK	46	2.5
Ptychion from Tech. Ed. Inst.(TEI)	148	7.9
B.Sc. from University	12	0.6
Diploma of Postgraduate Studies	8	0.4
Private College (Inst. of Liberal Studies)	10	0.5
NA	20	1.1
Average mark of studies during the last semester		
$x < 5$	94	5.0
$5 \leq x < 6.5$	576	30.7
$6.5 \leq x < 8$	737	39.3
$8 \leq x \leq 10$	148	7.9
NA	321	17.1
Average Mark of entrance exams of 1st year of studies		
$x < 10$	38	2.0

	Frequencies	Percentages
$10 \leq x < 12$	42	2.2
$12 \leq x < 14$	56	3.0
$14 \leq x < 16$	184	9.8
$16 \leq x < 18$	179	9.5
$18 \leq x \leq 20$	137	7.3
NA	1240	66.1
Staying with parents or not		
No	717	38.2
Yes	1145	61.0
NA	14	0.7
Are you working full time?		
No	1065	56.8
Yes	355	18.9
NA	456	24.3
Are you unemployed?		
No	810	43.2
Yes	861	45.9
NA	205	10.9

* NA: not answered

2.2 Questionnaire

The questionnaire contained three parts: demographic information, computer or Internet use information and the YDTIA. The demographic section collected information about gender, age, employment status, and family status. The computer or Internet use portion reported information on the Internet applications that are most frequently used, the location of the computer and the frequency of time spent in certain Internet applications. Young's Diagnostic Test for Internet Addiction (YDTIA) was presented in the introduction. It consists of eight yes or no questions regarding the use of the Internet. In this study, "at-risk Internet users" (ATRIU) were categorised as those who answered 3 to 4 criteria of the YDTIA positively. The category of users who answered yes in 3 to 8 questions were classified as "problematic Internet users" (PIU). This definition has been followed by Siomos et al. (2008), Johannson and Götestam (2005) and Tsai et al. (2009). YDTIA was translated into Greek and back into English by two independent translators. The two versions were then compared, choosing finally the best versions for each question.

Characteristics of YDTIA

The eight items of YDTIA were subjected to principal component analysis (PCA). Prior to performing PCA, the suitability of data for factor analysis was assessed.

Inspection of the correlation matrix revealed the presence of many coefficients of 0.300 and above and Spearman's correlations calculated between the eight items were statistically significant at the 0.001 level of significance ($p<0.001$). The Kaiser-Meyer-Oklin value was 0.81, exceeding the recommended value of 0.6 and Bartlett's Test of Sphericity reached statistical significance, supporting the factorability of the correlation matrix (Pallant, 2007). PCA revealed the presence of two components with eigenvalues exceeding 1, explaining 34.3% and 13.9% of the variance respectively. An inspection of the screeplot revealed a clear break after the second component. Using Catell's scree test, it was decided to retain two components for further investigation. This was further supported by the results of parallel analysis, which showed only two components with eigenvalues exceeding the corresponding criterion values for a randomly generated data matrix of the same size (8 variables x 1876 respondents). The two-component solution explained a total of 48.2% of the variance, with Component 1 contributing 34.3% and Component 2 contributing 13.9%. These values are acceptable because other authors have mentioned similar values of eigenvalues for YDTIA (Johansson and Götestam, 2005; Siomos et al., 2008).

The reliability of YDTIA was tested with Cronbach's alpha (0.71) and Cronbach's alpha based on standardized items (0.72); also the Spearman-Brown coefficient was 0.72, all values indicating satisfactory reliability. Thus, the YDTIA has a good reliability and dimensionality.

Specificity, Sensitivity and Diagnostic Accuracy of the YDTIA for the Study Participants

The eight diagnostic criteria of YDTIA are considered in this section. The sensitivity of a Diagnostic Criterion "A" refers to the probability of a positive answer in A by participants who are addicted according to YDTIA. It measures how well A detects the addiction.

The specificity of a Diagnostic Criterion A refers to the probability of a negative answer in A by participants who are not addicted according to YDTIA. It measures how well the Diagnostic Criterion A excludes addiction. Diagnostic accuracy refers to the overall probability of the detection or exclusion of the addiction due to the answer to Diagnostic Criterion A of the test (American Psychiatric Association, 1994; Riffenburgh, 2005). The positive prognostic value of Diagnostic Criterion A refers to the percentage of participants who answered A positively and are addicted, from all the participants who answered positively in Criterion A. Finally, the negative prognostic value refers to the percentage of participants who answered negatively in A and are not addicted, from all the participants who answered negatively in Criterion A. From Table 2 we find that the fourth diagnostic criterion of Young, *"Do you feel restless, moody, depressed or irritable when attempting to cut down or stop Internet use?"* has the highest diagnostic accuracy (88.4%).

Table 2: Specificity, Sensitivity and Diagnostic Accuracy of YDTIA for the Study Participants

	Answers of addictive users		Answers of non addictive users		Sensitivity	Specificity	Diagnostic Accuracy	Positive prognostic value	Negative prognostic value
	YES	NO	YES	NO					
(1) Do you feel preoccupied with the Internet (i.e., think about previous online activity or anticipate next online session)?	201	34	478	1127	85.5%	70.4%	72.1%	29.6%	97.1%
(2) Do you feel the need to use the Internet with increasing amounts of time in order to achieve satisfaction?	196	44	290	1324	81.7%	82.0%	81.9%	40.3%	96.8%
(3) Have you repeatedly made unsuccessful efforts to control, cut back, or stop Internet use?	141	95	113	1497	59.7%	92.9%	88.1%	55.5%	94.0%
(4) Do you feel restless, moody, depressed, or irritable when attempting to cut down or top Internet use?	157	79	133	1472	66.5%	91.7%	88.4%	54.1%	94.9%
(5) Do you stay online longer than originally intended?	208	28	909	690	88.1%	43.2%	48.9%	18.6%	96.1%
(6) Have jeopardized or risked the loss of a significant relationship, job, educational, or career opportunity?	143	98	135	1472	59.3%	91.6%	87.4%	51.4%	93.8%

	Answers of addictive users		Answers of non addictive users		Sensitivity	Specificity	Diagnostic Accuracy	Positive prognostic value	Negative prognostic value
	YES	NO	YES	NO					
(7) Have you lied to family members, a therapist, or others to conceal the extent of your involvement with the Internet?	141	99	141	1465	58.8%	91.2%	87.0%	50.0%	93.7%
(8) Do you use the Internet as a way of escaping from problems or of relieving a distressed mood (e.g., feelings of helplessness, guilt, anxiety, depression)?	182	60	375	1227	75.2%	76.6%	76.4%	32.7%	76.6%

2.3 Statistical Analysis

We performed univariate analysis to examine the factors of our questionnaire associated with Internet addiction. Chi-square values, degree of freedom and levels of significance are reported. Next, we performed multiple logistic regression with IA as the dependent variable and independent variables including several demographic variables. In all calculations, p values under 0.05 were considered significant. All figures and graphs were produced with SPSS 16.0, Stata 10.0 and SigmaPlot 10.0.

3. Results

3.1 Internet Use and Internet Addiction According to YDTIA

The patterns of computer and Internet use are shown in Table 3 and Table 7 in Appendix. It is evident that 93.2% had knowledge of computers and a similar percentage had knowledge of computer applications (90.8%). Most of the students in the sample accessed their computer from home, followed by Internet cafés (5.8%) and finally at the university at which they studied (4.8%). The great majority of students did not pay for their own Internet subscription (64.7%). Only one-third of our sample (31.3%) had the European Computer Driving License (ECDL) diploma.

Table 3: Computer and Internet Use

	Frequencies	Percentages
Computer knowledge		
No	88	4.7
Yes	1748	93.2
NA*	40	2.1
Computer applications knowledge		
No	110	5.9
Yes	1704	90.8
NA*	62	3.3
Computer access location		
Home	1527	81.4
School	90	4.8
Internet Café	109	5.8
Friends' house	70	3.7
Elsewhere	47	2.5
NA*	33	1.8
Do you pay for your own Internet subscription?		
No	1213	64.7
Yes	472	25.2
NA*	191	10.2
Have you obtained an ECDL diploma?		
No	1102	58.7
Yes	587	31.3
NA*	187	10.0
Internet experience		
1 year	323	17.2
2 years	298	15.9
3 years	334	17.8
4 years	230	12.3
5 years	207	11.0
more than 5 years	447	23.8
NA*	37	2.0
Hours of Internet use daily (hs)		
$x < 0.5$	318	17.0
$0.5 \leq x < 1$	388	20.7
$1 \leq x < 2$	282	15.0
$2 \leq x < 3$	221	11.8
$3 \leq x < 4$	191	10.2
$4 \leq x < 5$	140	7.5

	Frequencies	Percentages
$5 \leq x < 6$	98	5.2
$6 \leq x < 7$	58	3.1
$7 \leq x < 8$	41	2.2
$8 \leq x < 9$	17	0.9
$9 \leq x < 10$	15	0.8
more than 10 hs	76	4.1
NA*	31	1.7

* NA: not answered

The percentage of Internet addicted students was 11.6% and the percentage of at-risk Internet users was 23.1%. The percentage of problematic Internet users (who present 3 to 8 criteria of YDTIA) was 34.7%.

We were also interested in determining the Internet use time patterns according to the criteria satisfied in YDTIA. We designated very frequent (VFIU) and frequent (FIU) Internet users, the ones who used the Internet for more than 28 hours per week and for 8 to 27 hours per week respectively. Table 4 shows the following: a) The percentage of VFIU was 24.1% b) The percentage of FIU was 37.6%. c) It is evident that students who satisfy 5-8 criteria of YDTIA (which signifies that they are addicted Internet users), are in a much greater percentage (45.3%) VFIU than those who satisfy fewer criteria.

Table 4: Percentages of users classified according to positive YDTIA criteria among categories of Internet usage per week

	YDTIA				
	0 Criteria N (%)	1-2 Criteria N (%)	3-4 Criteria N (%)	5-8 Criteria N (%)	Total N (%)
Non frequent Internet users (0-7 h / week)	225 (56.8)	295 (38.6)	122 (28.1)	61 (25.1)	703 (38.2)
Frequent Internet users (8-27 h / week)	127 (32.1)	326 (42.6)	167 (38.5)	72 (29.6)	692 (37.6)
Very frequent Internet users (> 27 h / week)	44 (11.1)	144 (18.8)	145 (33.4)	110 (45.3)	443 (24.1)

3.2 Sociodemographic and Academic Performance Associations with IA

In Table 5 the associations of IA with regard to gender, family condition, academic performance and location of computer of the study participants are displayed. The statistical significance of differences in percentages was done using chi-square statistics.

Table 5: Sociodemographic and academic characteristics of the sample of university students

	Positive Diagnostic Criteria (yes) in YDTIA				
			At risk Internet users	*Addicted Users*	
	0 Positive criteria N (%)	1-2 Positive criteria N (%)	3-4 Positive criteria N (%)	5-8 Positive criteria N (%)	Total N (%)
Section 1 Gender differences	χ^2=45.38, df=3, p<0.001				
Male	160 (40.4%)	329 (43%)	220 (50.7%)	156 (64.2%)	877 (47%)
Female	236 (59.6%)	436 (57%)	214 (49.3%)	87 (35.8%)	990 (53%)
Section 2 Location of computer differences	χ^2=37.34, df=15, p<0.001				
Home	311 (77.9%)	651 (85.1%)	374 (86.0%)	187 (78.6%)	1523 (83%)
School	23 (5.8%)	35 (4.6%)	20 (4.6%)	11 (4.6%)	89 (5%)
Internet Café	26 (6.5%)	40 (5.2%)	23 (5.3%)	20 (8.4%)	109 (5.9%)
Friend's house	30 (7.5%)	23 (3.0%)	10 (2.3%)	7 (2.9%)	70 (3.8%)
Elsewhere	9 (2.3%)	16 (2.1%)	8 (1.8%)	13 (5.5%)	46 (2.5%)

	Positive Diagnostic Criteria (yes) in YDTIA				
			At risk Internet users	*Addicted Users*	
	0 Positive criteria N (%)	1-2 Positive criteria N (%)	3-4 Positive criteria N (%)	5-8 Positive criteria N (%)	Total N (%)
Section 3 Academic performance differences	χ^2=31.45, df=9, p<0.0001 AVEMARK=Average mark in the last semester				
AVEMARK < 5	16 (4.9%)	26 (4.1%)	28 (7.4%)	23 (11.1%)	93 (6%)
5 ≤ AVEMARK < 6.5	116 (35.5%)	234 (36.9%)	137 (36.1%)	87 (41.8%)	574 (37.1%)
6.5 ≤ AVEMARK < 8	159 (48.6%)	325 (51.3%)	178 (46.8%)	71 (34.1%)	733 (47.3%)
8 ≤ AVEMARK ≤ 10	36 (11.0%)	49 (7.7%)	37 (9.7%)	27 (13.0%)	149 (9.6%)
Section 4 Family condition differences	χ^2=31.2, df=12, p<0.001				
Married	15 (3.7%)	25 (3.2%)	16 (3.7%)	8 (3.3%)	64 (3.4%)
Single	380 (92.7%)	732 (94.6%)	408 (93.6%)	213 (87.7%)	1733 (93.1%)
Divorced	15 (3.7%)	17 (2.2%)	12 (2.8%)	22 (9.1%)	66 (3.5%)

There is a statistically significant difference in gender for Internet addicted users (5 to 8 positive criteria in YDTIA). Males were dependent at a higher percentage than females (64.2% vs. 35.8% among Internet addicted users, p<0.0001). Concerning family condition, there was a significant association with Internet addiction. Moreover, we can see that the percentage of divorced students who are addicted to the Internet (9.1%) is greater than that of married students who are Internet addicted (3.3%). In the other categories of positive

diagnostic criteria, the percentage of married and divorced is generally similar; however, the small percentages do not allow for a causal deduction of conclusions.

Regarding *academic performance*, in Internet addicted users (5-8 YDTIA) the percentage of students who failed in the last semester (11.1%) is significantly higher than those who failed in the group of normal Internet users (0 and 1-2 YDTIA) (4.9% and 4.1% respectively, $p<0.05$ in both differences). Moreover, in the group of addicted users, students with grades under 6.5 (52.9%) are slightly higher than students grades over 6.5 (47.1%) ($p = 0.23$). The percentage of addicted users who achieved marks in the scale "very good" or "excellent" (6.5 to 10) is 47.1%, and it is lower than the corresponding percentage of the normal Internet users with 0 positive criteria in YDTIA (59.6%) ($p = 0.005$).

The location of computer usage was also associated significantly with Internet addiction ($p<0.001$). It is worth noting that the group of students addicted to Internet is more likely to visit Internet cafés than the other three groups (8.4% vs. 5.3%, 5.2%, 6.5%), although these proportion differences are not significantly different ($p = 0.12$, $p = 0.07$, $p = 0.37$ respectively).

3.3 Predicting Factors of Internet Addiction

We performed multiple logistic regression with Internet addiction as the dependent variable to assess the impact of a number of factors on the likelihood of developing IA. The model contained nine independent categorical variables: gender, location of computer usage, family status, staying with parents, Internet daily use (hs), average marks during last semester, viewing sex pages, viewing chatrooms, and viewing blogs. The full model containing all predictors was statistically significant, $\chi^2 = 192.09$, $df = 37$, $p<0.0001$, indicating that the model was able to distinguish between Internet addicted and non-addicted students. The model as a whole explained between 14.6% (Cox and Snell R square) and 26.6% (Nagelkerke R square) of the variance in IA, and correctly classified 87.4% of cases. The odds ratios are presented in Table 6 and in Figure 1. All of the independent variables (in various categories) were significant predictors of IA, except for the variable "staying with parents" (Table 6). Although the odds ratio (OR) for gender is not significant, this result is only borderline ($p = 0.067$). So, male gender is most likely a positive predictor of IA, but given this model, we cannot produce an effect. Moreover, students who accessed the Internet from Internet cafés were more likely to develop IA than students who accessed it through their homes (OR = 2.11, 95% CI 1.06-4.20). In regard to the family condition of students, divorced students were significantly more likely to develop IA than married students (OR = 4.33, 95% CI 1.23-15.29). With reference to academic performance, students who had an average grade during the last semester between 5 and 8 out of 10 were about half as likely to develop IA, compared to students who had grades under 5. Concerning general patterns of Internet use, students who used the Internet for more hours during the day and visited sex pages, chat rooms and blog sites, were more likely to become Internet addicted.

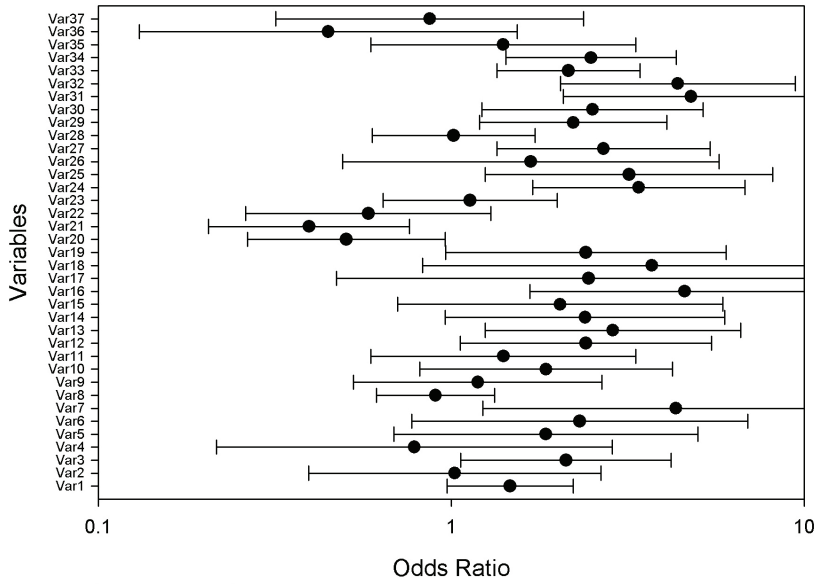
Table 6: Multiple logistic regression with Internet addiction as the dependent variable

Code	Variables	Odds Ratio	p-value	OR 95% CI	
Gender[*]					
Var1	Male	1.47	0.067	0.97	2.21
Computer access location[†]					
Var2	School	1.02	0.961	0.39	2.66
Var3	Internet Café	2.11	0.033	1.06	4.20
Var4	Friends' house	0.79	0.714	0.22	2.86
Var5	Elsewhere	1.85	0.222	0.69	5.00
Personal family Status[‡]					
Var6	Not married	2.31	0.134	0.77	6.91
Var7	Divorced	4.33	0.023	1.23	15.29
Staying with parents or not[§]					
Var8	Yes	0.90	0.598	0.61	1.32
Internet daily use (hs)[**]					
Var9	$0.5 \leq x < 1$	1.19	0.677	0.53	2.68
Var10	$1 \leq x < 2$	1.86	0.141	0.81	4.23
Var11	$2 \leq x < 3$	1.40	0.441	0.59	3.33
Var12	$3 \leq x < 4$	2.40	0.036	1.06	5.46
Var13	$4 \leq x < 5$	2.87	0.013	1.25	6.60
Var14	$5 \leq x < 6$	2.39	0.061	0.96	5.96
Var15	$6 \leq x < 7$	2.03	0.189	0.71	5.87
Var16	$7 \leq x < 8$	4.58	0.003	1.67	12.55
Var17	$8 \leq x < 9$	2.45	0.285	0.47	12.69
Var18	$9 \leq x < 10$	3.70	0.086	0.83	16.53
Var19	more than 10 hs	2.41	0.060	0.96	6.00
Average mark of studies during the last semester[††]					
Var20	$5 \leq x < 6.5$	0.50	0.037	0.26	0.96

Code	Variables	Odds Ratio	p-value	OR 95% CI	
Var21	$6.5 \leq x < 8$	0.39	0.005	0.21	0.76
Var22	$8 \leq x \leq 10$	0.58	0.185	0.26	1.29
Viewing Sex pages[‡‡]					
Var23	$1 \leq x < 3$	1.13	0.671	0.64	1.99
Var24	$3 \leq x < 5$	3.40	0.001	1.70	6.80
Var25	$5 \leq x < 7$	3.19	0.015	1.25	8.15
Var26	$7 \leq x < 9$	1.68	0.408	0.49	5.73
Var27	$x \geq 9$	2.70	0.005	1.34	5.41
Viewing chat rooms[§§]					
Var28	$1 \leq x < 3$	1.01	0.956	0.60	1.72
Var29	$3 \leq x < 5$	2.22	0.011	1.20	4.08
Var30	$5 \leq x < 7$	2.51	0.012	1.22	5.17
Var31	$7 \leq x < 9$	4.78	0.000	2.07	11.00
Var32	$x \geq 9$	4.38	0.000	2.04	9.43
Viewing blogs[***]					
Var33	$1 \leq x < 3$	2.15	0.001	1.35	3.43
Var34	$3 \leq x < 5$	2.49	0.001	1.43	4.33
Var35	$5 \leq x < 7$	1.40	0.441	0.59	3.32
Var36	$7 \leq x < 9$	0.45	0.202	0.13	1.54
Var37	$x \geq 9$	0.87	0.785	0.32	2.37

Notes: i. CI: confidence interval. ii. Reference values for each category: [*]female; [†]home; [‡]married; [§]No; [**]$x < 0.5$; [††]AVEMARK < 5; [‡‡, §§, ***]$0 \leq x < 1$

Figure 1: A scatter plot of the odds ratios produced from multiple logistic regression. The variables Var1-Var37 are explained in Table 6



4. Discussion

We performed the first cross-sectional study of university students in Greece to estimate the percentage of Internet addiction. The diagnostic tool used was Young's Diagnostic Test for Internet Addiction (Young, 1996a; 1998). We tested the reliability and dimensionality of YDTIA and it was in satisfactory accordance with the results of other studies (Johansson and Götestam, 2004; Siomos et al., 2008). The most significant result was that the percentage of IA was 11.6% among our sample, while that of at-risk Internet users was 23.1%. We further defined problematic Internet users as the ones who fulfil 3 to 8 criteria of YDTIA, and found a percentage of 34.7% students met the criteria. Siomos et al. (2008) examined Internet addiction among Greek adolescents (12-18 years of age) and found that 8.2% were addicted to the Internet (6.2% for males and 2% among females), a percentage relatively close to that of this study. This classification allows health officials to recognise students who are on the verge of becoming addicted and signifies a point of intervention in order to prevent the appearance of IA.

Additionally, we found significant associations of IA with gender, location of computer usage, family status, and academic performance. The profile of the user addicted to the Internet is a male person, who accesses the most likely from Internet public spots, has poor academic achievement and might be divorced. We performed multiple logistic regression with Internet addiction as the dependent variable, and results showed that increased hours of daily Internet use, increased hours visiting chat rooms, sex pages and blogs, male gender, being divorced, poor grades, and accessing the Internet outside of the home were significant predictors of IA. We set four hypotheses in the Introduction and we tested them to examine their validity.

Concerning the first hypothesis, we truly are in accordance with other researchers, because we found that male students were more likely to be addicted to the Internet and male gender predicted marginally IA on multiple logistic regression. This gender difference is explained by the preference of men to use the Internet for sexual satisfaction (e.g. viewing sex pages) more than women do as well as the increased frequency of online gaming compared to that among females (Young, 1998; 2004; Kraut et al., 2002; Ybarra and Mitchell, 2005; Tsai et al., 2009;). Accordingly, we found that viewing sex pages predicted IA, but our results do not support online gaming as a risk factor of IA. An explanation for the lower percentage of IA among females, involves the fact that female college students often receive more family supervision than males, which may prevent females from spending as much time on the Internet (Tsai et al., 2009).

Concerning our second hypothesis, we found that academic performance was significantly associated with IA, and poorer grades were a predictor. This result is in accordance with other studies put forward in the introduction. Usually, IA causes this outcome because the student loses his capacity to concentrate, most possibly because of late-night Internet sessions. Our third and fourth hypotheses involved the association of IA with family status and the point of accessing the Internet. Being divorced was associated with IA and predicted the phenomenon, and the location of using the computer was also associated with IA. Students who accessed the Internet from Internet cafés were more likely to develop IA than those who accessed it from home. Impaired family status leading to IA could be explained by the cognitive behavioural model of Davis (2001). This model suggests that the presence of maladaptive cognitions, as a result of personal or social disappointments, is a necessary cause to create IA. A divorced person possibly experiences negative feelings resulting from his divorce, such as "I have failed my marriage", "I might not get married again", "It is my fault we divorced", "I feel lonely". This low self-esteem and self-accusatory attitude may find sympathy from others in Internet forums or chat rooms. Hence, they will experience positive emotions from this use, such as feeling more qualified, more social and more comfortable, and these positive feelings play a reinforcing role in the continued use of the Internet.[6] However, it could be that IA addiction leads to divorce in married couples. This has been readily described in studies of online infidelity and cybersex experiences (Schneider, 2000). The cross-sectional nature of this study does not allow us to support whether divorce among students with IA was a result of this behavioural addiction or a cause of it. A prospective design of following up with a group of students with IA could distinguish this.

Overall, IA is a serious behavioural addiction. There is a need for a campaign to inform parents, teachers and state officials about the dangers of the Internet, which are apart from IA, online gambling, trafficking of pornographic material, cybersex and cyberbullying (Young, 2004; Patchin and Hinduja, 2006).

6. This situation is indicative of the conflict described in many addictions. On the one hand, the person is harmed by the behaviour he is addicted to, and on the other hand he experiences the enhancing emotional changes that lead to the recurrence of the addictive behaviour.

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Appendix

Table 7: Time use of certain Internet applications

Time (hs)/week	MSN		Forums		YouTube		Sex pages		Chat	
	F	P	F	P	F	P	F	P	F	P
$0 \leq x < 1$	552	29.4	947	50.5	553	29.5	1173	62.5	966	51.5
$1 \leq x < 3$	424	22.6	323	17.2	514	27.4	178	9.5	292	15.6
$3 \leq x < 5$	252	13.4	168	9.0	278	14.8	62	3.3	132	7.0
$5 \leq x < 7$	167	8.9	74	3.9	175	9.3	40	2.1	77	4.1
$7 \leq x < 9$	90	4.8	35	1.9	84	4.5	25	1.3	44	2.3
$x \geq 9$	251	13.4	48	2.6	111	5.9	93	5.0	69	3.7
NA[*]	140	7.5	281	15.0	161	8.6	305	16.3	296	15.8

Advertisements		Google		Yahoo!		Email		Ftp		Games		Blogs	
F	P	F	P	F	P	F	P	F	P	F	P	F	P
1157	61.7	349	18.6	740	39.4	488	26.0	1185	63.2	809	43.1	992	52.9
253	13.5	550	29.3	440	23.5	516	27.5	169	9.0	374	19.9	287	15.3
87	4.6	391	20.8	256	13.6	316	16.8	76	4.1	182	9.7	145	7.7
59	3.1	211	11.2	116	6.2	167	8.9	50	2.7	85	4.5	60	3.2
19	1.0	122	6.5	79	4.2	104	5.5	16	0.9	63	3.4	36	1.9
23	1.2	147	7.8	61	3.3	132	7.0	29	1.5	99	5.3	39	2.1
278	14.8	106	5.7	184	9.8	153	8.2	351	18.7	264	14.1	317	16.9

[*] NA: not answered

F: Frequency, P: percentage